December 5, 2025

The Honorable Lee Zeldin
Administrator
U.S. Environmental Protection Agency (EPA)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Prime Mover Institute's Supplemental Comment on EPA's *Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards*, 90 Fed. Reg. 36,288 (Aug. 1, 2025), Docket No. EPA-HQ-OAR-2025-0194

Dear Administrator Zeldin:

The Prime Mover Institute is a public interest organization dedicated to advancing energy dominance in America. In our initial comments on EPA's proposed rule, we said:

> The main obstacle to energy dominance is what Robert Bryce calls the "anti-industry industry," the non-profits and lawyers dedicated to defending the status quo. These groups use litigation, regulatory comments, and intimidation to forestall change.

True to form, the anti-industry industry has submitted thousands of pages of comments and supplemental materials to slow down EPA's much-needed repeal. This Gish gallop of legal and scientific claims, while voluminous, is substantively weak and relies on numerous misrepresentations of the scientific record. The Prime Mover Institute submits this supplemental comment to rebut two primary submissions: *Comments of Public Health and Environmental NGOs regarding the Endangerment Finding*, Dkt. ID EPA-HQ-OAR-2025-0194-2608, and *Comments of Environmental and Public Health Organizations regarding the Vehicle Standards Repeal*, Dkt. ID EPA-HQ-OAR-2025-0194-3060.

EPA has discretion to consider this rebuttal comment and include it in the docket. *See Sierra Club v. Costle*, 657 F.2d 298, 397 (D.C. Cir. 1981). We are confident that this rebuttal comment will assist the agency in carrying out this necessary and long-overdue course correction.

Respectfully submitted,
/s/Russell Greene
Russell Greene
Managing Director
Prime Mover Institute

INTRODUCTION

"*Catastrophists are wrong, time after time.*" - Vaclav Smil[1]

The Prime Mover Institute writes to reiterate its strong support of the Environmental Protection Agency's (EPA) proposed rule to reconsider the 2009 Endangerment Finding and to repeal the associated greenhouse gas (GHG) emission standards for motor vehicles. As stated in our initial comments, this proposal represents a necessary and long-overdue restoration of the rule of law and a return to EPA's proper statutory lane. For too long, EPA has allowed Section 202(a) of the Clean Air Act to be weaponized to force a transformation of the American transportation sector that Congress never authorized—a transformation that threatens American energy dominance, grid reliability, and consumer choice. This coup-by-regulation should never have happened. By rescinding these mandates, EPA is correctly prioritizing the text of the statute and the economic realities of the American people over the ideological preferences of the catastrophists and the "anti-industry industry."

The current regulatory morass traces its roots to the Supreme Court's decision in *Massachusetts v. EPA*, and the subsequent 2009 Endangerment Finding. In 2009, EPA determined that six well-mixed greenhouse gases threatened public health and welfare due to their contribution to global climate change. This determination hinged on the assumption that EPA regulation of tailpipe carbon dioxide emissions could peacefully coexist with the Department of Transportation's fuel-economy mandates. Yet, over the last sixteen years, that assumption of regulatory harmony has collapsed.

Under the previous administration, EPA used the Endangerment Finding as a springboard to promulgate *de facto* electric-vehicle mandates. By setting carbon dioxide standards so stringent that they were impossible for new internal-combustion engines to meet, EPA attempted to force a nationwide transition to electric vehicles—a policy of vast economic and political significance that Congress has conspicuously declined to enact, and even expressly prohibited under the fuel-economy laws. These rules are projected to cost many hundreds of billions of dollars, restructure the U.S. energy grid, and eliminate consumer choice, all while having a trivial effect on global atmospheric concentrations. The proposal rightly identifies these legal and factual infirmities and seeks to correct them.

Although many commenters, including PMI, supported EPA's proposal, the anti-industry industry—in the form of around a dozen allied environmental and "public health" non-

[1] Smil, *How the World Really Works* 211 (2022).

governmental organizations (eNGOs)—submitted hundreds of pages of comments and hundreds of supporting documents in a transparent attempt to slow EPA. Their submissions rely on a "Gish gallop" strategy, flooding the docket with a voluminous record to mask the substantive weakness of their catastrophist position.

Upon review, this deluge of arguments is largely meritless. Legally, the eNGOs misinterpret the Clean Air Act to invent procedural obstacles and to expand Section 202(a) beyond its statutory bounds. Scientifically, a targeted review of their citations reveals pervasive infirmities in their catastrophist vision: the eNGOs consistently overstate the certainty of their evidence, rely heavily upon implausible worst-case emissions scenarios, and ignore the nuance in their own source material. And the eNGOs' claim that the evidence is so "overwhelming" that it compels an endangerment finding "mistake[s] the science of global warming for the religion of climate change."[2]

Indeed, eNGOs' submissions reveal a fatal internal contradiction: they defend the vehicle mandates by insisting that green technology is cheaper and market dominance inevitable, yet simultaneously prop up their endangerment claims with studies reliant on RCP 8.5—a "business-as-usual" scenario predicated on technological stagnation and a massive global return to coal. If their techno-optimist claims regarding the superior economics of renewable energy are true, then the coal-heavy catastrophe they predict in their endangerment comments is physically impossible. This incoherence exposes their reliance on RCP 8.5 not as a scientific necessity, but as a convenient fiction used to justify regulatory overreach.

The reality is that neither of these conflicting views holds water. The climate data suggests that risks are manageable and far from catastrophic, while the vehicle market data confirms that a forced march to electrification is technologically precarious and economically ruinous. By insisting on a rigid, expensive electric monoculture to solve an inflated risk, the eNGOs are advancing the least plausible and most destructive mechanism to address the residual risks that do exist.

EPA's proposed rule is correct to reject this approach. As the record demonstrates, there is profound uncertainty regarding the future harms of climate change and the degree to which U.S. motor vehicles contribute to them. Given this uncertainty, EPA is acting well within its broad statutory discretion to exercise its expert judgment to find new motor vehicles do not cause or contribute to a meaningful risk, or, at a minimum, to repeal the aggressive and infeasible motor

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[2] *Id.* at 189.

vehicle standards promulgated by the previous administration. Courts have long recognized that "EPA's scientific judgment about the causal relationship between greenhouse gases and climate change is a scientific determination entitled to an extreme degree of deference."[3] The statute calls for a scientific judgment about what is reasonably anticipated, not a ratification of worst-case fears. Indeed, EPA's "role as an expert is undermined, not furthered, when it distorts that scientific judgment by indulging in worst-case scenarios and pessimistic assumptions to benefit a favored side."[4]

We proceed in three parts. We first address the eNGO comments regarding the proposed repeal of the 2009 Endangerment Finding.[5] We refute their statutory arguments, demonstrating that the Clean Air Act does not authorize the regulation of globally well-mixed GHGs under a provision designed for local and regional air pollution. We then address the scientific record, showing that the contribution of new U.S. motor vehicles to global climate change is entirely *de minimis* and scientifically undetectable. We further provide a rebuttal of the eNGOs' scientific claims, exposing their heavy reliance on implausible emissions scenarios, their overstatement of the certainty of climate modeling, and their failure to establish robust causal links between GHG emissions and specific public health harms.

In the second part, we address the eNGO comments regarding the repeal of the GHG standards for new motor vehicles and engines.[6] We defend EPA's inherent authority to reconsider prior rulemakings and demonstrate that the previous standards constituted an unlawful electric-vehicle mandate. We then review the factual record, showing that EPA reasonably determined the standards were not technologically feasible or cost-appropriate given the insurmountable constraints on critical minerals and the lack of infrastructure. Finally, we defend the procedural soundness of the repeal and the Administrator's exercise of independent judgment.

Finally, to further substantiate our scientific critiques, we have attached an Appendix providing a detailed rebuttal of specific claims about climate science made in the eNGO Endangerment Comments. This non-exhaustive catalog documents misrepresentations, identifying instances where the eNGOs rely on irrelevant sources, cite studies that contradict their own propositions,

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[3] *Coal. for Responsible Regul., Inc. v. EPA,* 684 F.3d 102, 120 (D.C. Cir. 2012).

[4] *Maine Lobstermen's Ass'n v. Nat'l Marine Fisheries Serv.*, 70 F.4th 582, 586 (D.C. Cir. 2023).

[5] Comments of Public Health and Environmental NGOs regarding the Endangerment Finding, Dkt. ID EPA-HQ-OAR-2025-0194-2608 (eNGO Endangerment Comment).

[6] Comments of Environmental and Public Health Organizations regarding the Vehicle Standards Repeal, Dkt. ID EPA-HQ-OAR-2025-0194-3060 (eNGO Vehicle Standards Comment).

or depend on radically speculative or inappropriate methodologies. Misrepresentation of the scientific record pervades their comments. For example:

1. **The Faux Denunciation of RCP 8.5.** The eNGOs claim RCP 8.5 is not treated as a "business as usual" scenario and was never intended it as such.[7] But thousands of studies *have* explicitly labeled and used RCP 8.5 as the "business-as-usual" or default baseline scenario, including more than a dozen of the studies cited by the eNGOs in this very comment. Examples include studies projecting effects on nutrition (Smith & Myers (2018) describing RCP 8.5 as "the scenario most consistent with our current trajectory"), carbon uptake (Green et al. (2019) describing it as "business-as-usual"), ecosystem stability (Canteri et al. (2025) calling it a "business-as-usual emission-intensive scenario"), drought (Udall & Overpeck (2017) calling it a business-as-usual scenario), permafrost (Schuur et al. (2022) calling it a business-as-usual scenario), crop losses (Deutsch et al. (2018) calling it a business-as-usual scenario), economic growth (Kalkuhl & Wenz (2020) calling it a business-as-usual scenario), and many more.[8] The exaggerated damages from this highly implausible scenario make up most of the worst outcomes attributed to GHG emissions.

2. **The "20 Million" Flood Exaggeration.** The eNGOs claim "20 million coastal U.S. residents could be at risk of inundation due to sea level rise and/or storm surge by 2030."[9] This figure is a fabrication derived from a daisy-chain of misinterpretations. The

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[7] eNGO Endangerment Comment at 121 (citing Riahi et al., *RCP 8.5—A Scenario of Comparatively High Greenhouse Gas Emissions*, 109 Climatic Change 33 (2011), https://doi.org/10.1007/s10584-011-0149-y).

[8] Smith & Myers, *Impact of Anthropogenic CO2 Emissions on Global Human Nutrition*, 8 Nature Climate Change 834 (2018), https://doi.org/10.1038/s41558-018-0253-3; Green et al., *Large Influence of Soil Moisture on Long-Term Terrestrial Carbon Uptake*, 565 Nature 476 (2019), https://doi.org/10.1038/s41586-018-0848-x (relying exclusively on RCP 8.5, mischaracterized as "business-as-usual"); Canteri et al., *Mismatch in Reindeer Resilience to Past and Future Warming Signals Ongoing Declines*, 11 Sci. Advances eado3354 (2025), https://doi.org/10.1126/sciadv.adu0175; Udall & Overpeck, *The Twenty-First Century Colorado River Hot Drought and Implications for the Future*, 53 Water Res. Rsch. 2404 (2017), https://doi.org/10.1002/2016WR019638; Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://epic.awi.de/id/eprint/57387/1/Schuur_2022.pdf; Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466; Kalkuhl & Wenz, *The Impact of Climate Change on Economic Growth and Development*, 127 World Dev. 104749 (2020), https://econpapers.repec.org/RePEc:eee:jeeman:v:103:y:2020:i:c:s0095069620300838. For further examples, see the Appendix at A41.

[9] eNGO Endangerment Comment at 114.

eNGOs claim derives from a single sentence in the introduction to a 2023 study (Best et al.), which in turn cites a 2011 study (Curtis & Schneider).[10] A review of that primary source reveals that the authors did not count people living in flood zones. Instead, they summed the entire population of whole counties (like Miami-Dade, FL) if *any* part of the county might be touched by water. Worse, to generate this risk map, the authors used a 1-meter sea-level rise model because they lacked maps for smaller increments. The authors explicitly admitted that realistic rise by 2030 is only 4.2 to 13.9 centimeters and that "overestimating the degree of inundation in this manner may introduce error into [their] analysis," and they caution that their "results should be considered in light of this bias." The eNGOs ignore this caution, however, and effectively claim that the entire population of Miami-Dade County is "at risk of inundation" by 2030 based on a map showing sea levels 7 to 24 times higher than the study's own projections, which even then barely touch urbanized areas of the County.

3. **The Solar Contradiction.** The eNGOs claim that "[w]hile solar radiation has slightly increased during the 20th century, its contribution to global warming is small compared to the contribution from greenhouse gases."[11] To support this claim, the eNGOs cite Ziskin & Shaviv (2012) and Meehl et al. (2004).[12] This is baffling, because Ziskin & Shaviv is famous for arguing the exact opposite. While Ziskin & Shaviv find that anthropogenic emissions account for approximately 60% of warming, they notably conclude that "40% of the 20th century global warming" is attributable to "the sun alone"—a figure the authors describe as "much larger than can be expected" by standard models, like those used in Meehl et al. (2004). Indeed, the study's error margins reveal that the maximum plausible solar contribution (0.34 °C) exceeds the minimum plausible anthropogenic contribution (0.31 °C). In sum, the eNGOs' primary support for their claim shows not that solar

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[10] Best et al., *Demographics and Risk of Isolation Due to Sea Level Rise in the United States*, 14 Nat. Commc'ns 7904 (2023), https://doi.org/10.1038/s41467-023-43835-6 (erratum 14 Nat. Commc'ns 8305) (citing Curtis & Schneider, *Understanding the Demographic Implications of Climate Change: Estimates of Localized Population Predictions Under Future Scenarios of Sea-Level Rise*, 33 Population & Env't 28 (2011), https://doi.org/10.1007/s11111-011-0136-2).

[11] eNGO Endangerment Comment at 135–36.

[12] Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Research 762 (2012); Meehl et al. *Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate*, 17 Journal of Climate 3721 (2004).

contribution to global warming is "small," but that it is a substantial contributor that is typically underestimated by standard climate models.

4. **The Zombie Hurricane Mortality.** The eNGOs claim that "mortality effects for each hurricane can persist for 15 years."[13] But the cited study (Young & Hsiang) uses a statistical model to identify "indirect" deaths that the authors admit yield a "surprising" total count orders of magnitude higher than official records.[14] The authors concede they "initially believed that these findings resulted from calculation errors" and cannot empirically identify a causal pathway for these deaths, instead attributing them to "cascades" of unspecified "indirect effects." Indeed, 99% of the infant deaths attributed to the storm "occur more than 21 months" after the storm, meaning those "infants were not conceived prior to landfall," an implausible result that the authors speculate might result from broad, again unspecified, post-storm societal changes. The eNGOs rely on these unexplained statistical correlations as robust proof of endangerment.

5. **The Snowpack Reversal.** The eNGOs claim that "[s]nowpack is declining across the western U.S.."[15] This is a misreading of the cited study. Musselman et al. (2021) actually found that Snow Water Equivalent—the standard metric for snowpack magnitude—*did not decline at approximately 88% of stations* in western North America analyzed.[16] Even when limited to western U.S. stations with longer records, nearly 67% of stations showed no decline. The study distinguishes between winter melt trends (which are increasing) and snowpack magnitude (which is largely stable), noting that Snow Water Equivalent trends are driven primarily by precipitation variability rather than warming. Citing this study to claim a uniform decline in snowpack depth contradicts the study's own data.

6. **The Fishery "Collapse."** The eNGOs claim that climate change driven marine heatwaves "have led to the collapse of local fisheries along the west coast of North

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[13] eNGO Endangerment Comment at 126.

[14] Young & Hsiang, *Mortality Caused by Tropical Cyclones in the United States*, 635 Nature 121 (2024), https://doi.org/10.1038/s41586-024-07945-5.

[15] eNGO Endangerment Comment at 113.

[16] Musselman et al., *Winter Melt Trends Portend Widespread Declines in Snow Water Resources*, 11 Nature Climate Change 418 (2021), https://doi.org/10.1038/s41558-021-01014-9.

America and the east coast of Australia."[17] But the cited study (Frölicher & Laufkötter) does not state that fisheries in the West Coast or Australia "collapsed."[18] Instead it refers to the "closing" of fisheries—a regulatory management tool, not a biological extinction event. Furthermore, the study explicitly attributes the specific heatwaves to natural phenomena: "predominant La Niña conditions" for Western Australia and "strong positive sea level pressure anomalies" for the Northeast Pacific (the "warm blob"). The eNGOs frame a regulatory closure caused by natural climate variability as a biological "collapse" caused by fossil fuels.

7. **Hallucinated Studies.** The eNGOs cite a study purportedly titled "Mortality Risk from Climate-driven Wildfire Smoke" by Carleton et al. to support claims of "macroeconomic damages as approximately six times larger than previously estimated" and "large health and labor losses overlooked by aggregate growth regressions."[19] economic damages. This appears to be a hallucination. No such study by Carleton—or anyone else for that matter—appears to exist with that title. And the DOI link provided by the eNGOs in their footnote directs the reader to a completely unrelated paper titled "Misdemeanor Prosecution." While there is an article by Carleton in the same journal discussing global mortality,[20] neither the words "wildfire" nor "smoke" appear and the only time the word "six" appears is comparing projected climate fatalities in 2100—again using RCP 8.5.This suggests the eNGOs did not read, and perhaps did not even locate, the evidence they claim supports their economic arguments.

   The eNGOs also repeatedly cite to a "Conference Report: Attribution Science and Climate Law" by Jessica Wentz for claims varying from increased "death, respiratory disease, cardiac events, and negative birth outcomes" from air pollution,[21] to "increase[d] severe precipitation, storm, and flooding events,"[22] and even increases in

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[17] eNGO Endangerment Comment at 111.

[18] Frölicher & Laufkötter, *Emerging Risks from Marine Heat Waves*, 9 Nat. Commc'ns 650 (2018), https://doi.org/10.1038/s41467-018-03163-6.

[19] eNGO Endangerment Comment at 151.

[20] Carelton et al., Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits, 137 Quarterly J. Econ. 2037 (2022), https://doi.org/10.1093/qje/qjac020.

[21] *Id.* at 166.

[22] *Id.* at 168.

the "risk and potential severity of wildfires,"[23] while pointing to various studies that report purportedly cited in support. But that report, while real, says absolutely nothing about those claims and cites none of the studies the eNGOs claim it does.

This review demonstrates a systemic lack of rigor in the eNGOs' presentation of the scientific evidence and confirms that EPA's caution regarding the "cause or contribute" finding is well-founded.

[23] *Id.*

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RESPONSE TO eNGO ENDANGERMENT FINDING COMMENT

This part refutes several of the central legal, statutory, and scientific claims made by the eNGOs against the proposed rescission of the 2009 Endangerment Finding for well-mixed greenhouse gas (GHG) emissions from motor vehicles. Contrary to the eNGO comments, the proposed rescission is a lawful course correction, grounded in a reasonable reinterpretation of the agency's discretionary judgment. EPA may reasonably conclude that GHG emissions from new motor vehicles don't contribute to a reasonably anticipated threat to the public health or welfare in the United States. GHG emissions from U.S. new motor vehicles are trivial given the enormous cascade of uncertainty involved in predicting emission effects on the public health of welfare the United States. The eNGOs' narrative about the "catastrophic" risks of climate change is also misleading, contradicted by the weight of the evidence, or premised on farfetched worst-case emissions scenarios or global harms that fall well outside of the scope of EPA's judgment under the Clean Air Act.

1. THE CLEAN AIR ACT DOES NOT AUTHORIZE REGULATION OF GLOBAL CLIMATE CHANGE UNDER SECTION 202(A)(1)

Replies to eNGO Endangerment Comment Sections II, III, and IV (pp. 8–77).

The eNGOs rely upon a series of rigid and flawed interpretations of the Clean Air Act and the scope of EPA's authority under Section 202(a). This section addresses some of the main legal errors in their analysis.

1.1. Neither *Massachusetts v. EPA* Nor Principles of Statutory *Stare Decisis* Prevent the Agency from Reinterpreting Section 202(a)(1)

Replies to eNGO Endangerment Comment Section II.A (pp. 8–25).

eNGO Claim: The eNGOs' primary argument is that the Supreme Court's 2007 decision in *Massachusetts v. EPA* settled the scope of EPA's authority under Section 202(a)(1). They contend that the Court unambiguously held that Section 202(a) authorizes EPA to regulate GHGs to address the risks of global climate change. They argue that congressional action (and inaction) since 2007 has ratified this authority, and that the agency's current proposal fails to properly consider the principles of *stare decisis*.

Refutation: EPA has already explained why it disagrees with the eNGOs' capacious reading of *Massachusetts*.[24] But even if *Massachusetts* settled EPA's legal authority to regulate GHGs from

[24] *See* 90 Fed. Reg. at 36,302.

motor vehicles in order to address the risk of climate change, EPA may ask the Supreme Court to overrule precedent.[25] Although the Executive Branch must respect and follow the judgments of the Supreme Court, it may disagree with the reasoning of the Supreme Court's opinions. The Executive Branch retains the prerogative to adopt what it believes is the best reading of the statute and, consequently, to ask the Supreme Court to reconsider and overrule erroneous prior precedent.[26]

The eNGOs fault EPA for failing to analyze the *stare decisis* factors in the preamble, arguing the agency must explain "what specific factors counseled overruling that precedent."[27] Not so. EPA must only consider the *statutory* factors and reliance interests under *State Farm*, not *stare decisis* factors. *Stare decisis* factors are for the Supreme Court to consider, not for agencies, which have no power to overrule Supreme Court precedent.[28] The Solicitor General of the United States represents EPA before the Supreme Court, not the Administrator.[29] If the Solicitor General asks the Supreme Court to overrule *Massachusetts*, then the Solicitor General will brief the *stare decisis* factors.

In any event, all of the usual *stare decisis* factors counsel in favor of overruling *Massachusetts*. Although in statutory cases, "*stare decisis* is comparatively strict,"[30] the Court has never treated statutory precedent as untouchable.[31] As the States explained in their comments on the proposal, the relevant factors—including the poor quality of the superficial textualism in *Massachusetts* and the workability of the rule it established, which has required repeated interventions by the courts

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[25] Comment of Prime Mover Institute 12–17, Dkt. ID EPA-HQ-OAR-2025-0194-7549 (hereinafter PMI Comment); *see also* Comment of West Virginia et al. 21–26, Dkt. ID EPA-HQ-OAR-2025-0194-1487 (hereinafter West Virginia Comment).

[26] *Cf.* Baude, *The Judgment Power*, 96 Geo. L.J. 1807, 1845 (2008) ("Judgments derive their authority from the combination of judicial power and jurisdiction enshrined by the originally understood text and structure of the Constitution. Opinions must find another path to authority, if they find one at all.").

[27] *Contra* eNGO Endangerment Comment 24–25.

[28] *Cf. Hayburn's Case*, 2 U.S. (2 Dall.) 409 (1792).

[29] 28 C.F.R. § 0.20.

[30] *Ramos v. Louisiana*, 590 U.S. 83, 118 (2020) (Kavanaugh J., concurring in part); *cf.* Barrett, *Statutory Stare Decisis in the Courts of Appeals*, 73 Geo. Wash. L. Rev. 317 (2005).

[31] *See, e.g.*, *Leegin Creative Leather Prods., Inc. v. PSKS, Inc.*, 551 U.S. 877, 900 (2007).

to curb EPA's zeal to transform the energy and transportation sectors—weigh heavily in favor of reconsideration.[32] We endorse that analysis.

Crucially, a key legal assumption underpinning *Massachusetts* has proven to be false, providing a compelling justification for overruling the precedent, at least as applied to Section 202(a). In *Massachusetts*, the Supreme Court assumed that EPA regulation of carbon dioxide under the Clean Air Act could be harmonized with the Department of Transportation's (DOT) longstanding fuel economy regulations under the Energy Policy and Conservation Act (EPCA). The Court dismissed concerns about regulatory conflict, claiming, "there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency."[33]

As we explained in our comments, this assumption has been proven to be gravely mistaken.[34] Regulating carbon dioxide emissions from motor vehicles that use fuel is functionally identical to regulating fuel economy; reducing carbon dioxide requires burning less fuel. Yet the statutory regimes governing EPA and DOT are fundamentally incompatible.

Under EPCA, Congress explicitly prohibited DOT from considering the fuel economy of "dedicated automobiles"—namely, electric vehicles—when setting maximum feasible fuel economy standards.[35] Congress wanted fuel economy standards to enhance the efficiency of automobiles that use fuel, such as gasoline or diesel, not to force a shift to alternative fuels by regulatory fiat.

But the Biden EPA, relying upon *Massachusetts*, claimed authority under Section 202(a) to set carbon dioxide standards so stringent that they effectively compel a nationwide transition to electric vehicles—the very technology Congress prohibited DOT from considering when setting its standards to prevent fuel switching. The practical effect of the Biden-era standards is to mandate electric vehicles, as automakers have confirmed that compliance is impossible without a shift to electric fleets.[36]

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[32] West Virginia Comment at 21–26.

[33] *Massachusetts v. EPA*, 549 U.S. 497, 532 (2007).

[34] *See* PMI Comment at 15–18.

[35] 49 U.S.C. § 32902(h).

[36] Comment of Alliance for Automotive Innovation at 13–16, Dkt. ID EPA-HQ-OAR-2025-0194-7547 (hereinafter Auto Innovators Comment).

This creates an untenable statutory conflict. EPA is asserting an authority that Congress explicitly withheld from the agency that Congress specifically charged with regulating fuel economy. This expansive reading of Section 202(a) directly conflicts with the Nation's fuel-economy laws.[37] If allowed to stand, this interpretation would nullify clear congressional prohibitions in EPCA, effectively supersede the fuel economy laws of the United States, and render them surplusage.

Finally, the eNGOs argue that subsequent legislation, particularly the Inflation Reduction Act, ratified *Massachusetts*. This is unpersuasive. If anything, the Act highlights the weakness of *Massachusetts*. The Inflation Reduction Act demonstrates that when Congress wants to address GHGs within the Clean Air Act, it knows how to do so explicitly. The Inflation Reduction Act added specific definitions of "greenhouse gas" and listed GHGs as "air pollutants" within the context of specific new programs.[38] At a minimum, just like the eNGOs say about the One Big Beautiful Bill, the Inflation Reduction Act "says nothing about EPA's … authority to regulate vehicle greenhouse gas emissions under separate statutory authority that it did not amend."[39]

1.2. The Best Reading of Section 202(a) Excludes Well-Mixed Greenhouse Gases

Replies to eNGO Endangerment Comment Section II.B (pp. 25–50).

eNGO Claim: The eNGOs insist that EPA's authority under Section 202(a) extends to "any" air pollutant, claiming that the agency's attempt to read this provision as addressing only local and regional air quality problems is atextual.[40]

Refutation: The eNGOs mischaracterize EPA's argument and ignore the ordinary meaning of the statutory terms at the time of enactment, historical context, and the overall structure of the Clean Air Act. EPA's proposed understanding that "air pollution" in Section 202(a) refers to localized contamination that degrades regional ambient air quality, and not substances that "change the atmosphere around the world," is by far the best reading of the statute.[41]

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[37] PMI Comment at 15.

[38] *See, e.g.*, 42 U.S.C. § 7432(d) (defining air pollution to include GHGs "for purposes of this section"); *id.* § 7437(d)(2) ("The term 'greenhouse gas' means the air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride.").

[39] eNGO Endangerment Comment at 23.

[40] *See id.* at 26–50.

[41] *Massachusetts v. EPA*, 549 U.S. 497, 541 (2007) (Roberts, C.J., dissenting).

The term "air pollution" is not defined in Section 202(a). Therefore, it must take its ordinary meaning at the time Congress enacted the provision.[42] The Motor Vehicle Air Pollution Control Act, which introduced the language of Section 202(a), was passed in 1965. At that time, the term "pollution" generally meant "defilement" or "uncleanness."[43]

The historical record surrounding the passage of the Act confirms this understanding. The driving force behind federal air pollution legislation in the 1950s and 1960s was the tangible, visible problem of smog and smoke plaguing American cities.[44] Events such as the lethal smog in Donora, Pennsylvania, in 1948, the Great Smog of London in 1952, and the photochemical smog in Los Angeles dominated public consciousness and legislative debate.[45] The focus was entirely on regional contaminants that irritated the eyes, damaged crops, soiled property, and caused acute respiratory distress.

The legislative history of the 1965 Act is saturated with references to these localized harms. The Senate subcommittee report that formed the basis for the Act, "Steps Toward Clean Air," focused intensely on "automotive air pollution, or smog," identifying culprits such as hydrocarbons, carbon monoxide, and nitrogen oxides—pollutants that lead to the formation of photochemical smog.[46] During floor debates, representatives repeatedly spoke of the "menace of air pollution," "poisoned air," "fogs, the smogs, the hazes, the smazes," and the "fumes and filth which clog our air and choke our throats."[47]

In this context, no ordinary speaker of English in 1965 would have referred to harmless, odorless, and naturally occurring well-mixed atmospheric gases such as carbon dioxide as "unclean" or

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[42] Even if "air pollution" takes meaning from the defined term "air pollutant," courts may consider ordinary meaning and statutory context. *See Sackett v. EPA*, 598 U.S. 651, 672 (2023). This distinction is critical because the Act defines the agent ("air pollutant" in § 302(g)) but not the resulting condition ("air pollution"). Under *Sackett*, the broad statutory definition of the agent cannot necessarily be used to implicitly expand the undefined scope of the condition; particularly if, as here, there is good reason to understand "air pollution" to be limited to the ordinary public understanding of the term in 1970.

[43] *Funk & Wagnalls New Standard Dictionary of the English Language* 1921 (1946); *Webster's International Dictionary* 1910 (2nd ed. 1954).

[44] *See generally* West Virginia Comment at 2–13 (detailing the history of the Clean Air Act and Section 202).

[45] *Id.* at 2–3.

[46] *Id.* at 7–8 (citing *Special Subcomm. on Air & Water Pollution, Steps Towards Clean Air, Report of the Senate Committee on Public Works* (Oct. 1964)).

[47] *Id.* at 12–13 (citing 111 Cong. Rec. 25049-65 (1965)).

"contamination." In fact, carbon dioxide was viewed as the benign byproduct of clean, complete combustion. As one Representative noted during the 1965 debates, "Ideally, the only type of emissions that would occur from gasoline powered or diesel engines would be carbon dioxide and water."[48] Consistent with ordinary meaning, Section 202(a) was understood to cover ambient air pollution that degrades regional air quality, not globally dispersed atmospheric gases that do not make local airsheds "unclean."[49]

The statutory context reinforces this interpretation. Section 202 itself specifically references ambient air pollutants such as carbon monoxide, hydrocarbons, nitrogen dioxide, and particulate matter.[50] The term "air pollution" is known by the company it keeps in Section 202. These references therefore illustrate that the provision was meant to protect U.S. airsheds from pollution that degrades regional air quality. The stated purpose of the Clean Air Act, after all, is "to protect and enhance the quality of *the Nation's* air resources."[51] Protecting the Earth's global energy balance is inconsistent with this geographically limited purpose.

Furthermore, the broader structure of the Clean Air Act demonstrates that "air pollution," particularly when linked to an "endangerment" finding, refers to ambient air pollution. The Act's primary mechanism for reducing air pollution is the National Ambient Air Quality Standards (NAAQS) system. Under Section 108, EPA designates as "criteria" pollutants those substances that "cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare"—the exact same "endangerment" text used in Section 202(a).[52]

Similar phrases in different provisions are ordinarily accorded the same meaning.[53] Yet the NAAQS system makes no sense for GHG emissions. EPA sets ambient air quality standards, and states bear the primary responsibility for attaining those standards within their airsheds.[54] This regionally focused regulatory scheme cannot be sensibly applied to globally well-mixed GHGs.[55]

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[48] 111 Cong. Rec. 25,050 (1965) (statement of Rep. Harris).

[49] *See Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 622 (D.C. Cir. 1973).

[50] *See* PMI Comment at 12–17; *see also* West Virginia Comment at 21–26.

[51] 42 U.S.C. § 7401(b)(1) (emphasis added).

[52] *Id.* § 7408(a).

[53] *Pulsifer v. United States*, 601 U.S. 124, 149 (2024).

[54] 42 U.S.C. §§ 7409, 7410.

[55] *See* 2008 ANPRM, 73 Fed. Reg. at 44,367.

The concentration of carbon dioxide is roughly the same everywhere in the world.[56] A state therefore cannot control the concentration of carbon dioxide in its airshed through local regulation. This structural mismatch strongly suggests that the term "air pollution" in the parallel language of Section 202(a) does not reach globally well-mixed GHGs.

The eNGOs argue that the general definition of "welfare" in Section 302(h), which includes effects on "weather" and "climate," controls the meaning of "air pollution" in Section 202(a).[57] This is unpersuasive. The broad definition of "welfare" does not define what constitutes "air pollution" in the first place. Traditional ambient air pollutants can certainly affect local weather and climate. For example, particulates may impair local climate conditions by blocking sunlight or causing localized temperature changes. The inclusion of "climate" does not automatically expand the scope of "air pollution" to include global atmospheric phenomena detached from localized air quality degradation.

The eNGOs attempt to dispute the local/regional distinction by analogizing GHG emissions to pollutants such as nitrogen oxides and mercury, which can travel long distances.[58] These comparisons are inapt. Nitrogen oxides, although they can be transported, eventually settle in a particular airshed and contribute to localized problems such as particulate matter, degrading the air quality of that region.[59] Mercury is a toxic heavy metal; it deposits and bioaccumulates in local ecosystems, making it fundamentally different from GHGs.[60] EPA also has never regulated mercury emissions under Section 202(a), so the example doesn't support the eNGOs' expansive reading. Rather, it supports EPA's.

Finally, the eNGOs claim that methane emissions also contribute to tropospheric (ground-level) ozone, or photochemical smog.[61] Not so. Methane is non-reactive and is effectively removed from the atmosphere by oxidation.[62] Because of its low reactivity, methane is explicitly excluded from the definition of a "volatile organic compound" under EPA's longstanding regulations

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[56] *See Am. Elec. Power Co. v. Connecticut*, 564 U.S. 410, 422 (2011); Koonin, *Unsettled* 33, 51 (2021).

[57] *See* eNGO Endangerment Comment at 36, 42.

[58] *See id.* at 38–41.

[59] 75 Fed. Reg. 6475 (Feb. 9, 2010).

[60] eNGO Endangerment Comment at 38–41.

[61] *Id.* at 44 & n.43.

[62] Smil, *Natural Gas: Fuel for the 21st Century* 168–69 (2015).

governing smog precursors, which EPA is not reopening.[63] But even if methane contributed marginally to smog, that would only justify regulating it as a traditional ambient pollutant, not as a basis for claiming broad authority to address the global climate effects of well-mixed GHGs under Section 202(a).

1.3. The Major-Questions Doctrine Counsels Against Applying Section 202(a) to Regulate the Entire U.S. Economy

Replies to eNGO Endangerment Comment Section III (pp. 50–75).

eNGO Claim: The eNGOs claim that the major-questions doctrine doesn't apply to Section 202(a). They argue that *Massachusetts* precludes the proposal's reliance on the major-questions doctrine when it considered and rejected similar arguments about context. They further argue that the proposal deviates without adequate explanation from EPA's prior understanding of its authority. Finally, they argue that regulating GHGs from motor vehicles under Section 202(a) does not offend the major-questions doctrine because EPA's actions aren't "transformative."[64]

Refutation: These arguments are based on an anachronistic view of the law and a disingenuous characterization of the Biden-era rules.

First, the eNGOs' heavy reliance on *Massachusetts* ignores the significant development of the major-questions doctrine since 2007. Although *Massachusetts* briefly discussed *Brown & Williamson*, it predated the formulation of the major-questions doctrine found in recent cases such as *West Virginia v. EPA*.[65] The legal landscape has shifted significantly.

Moreover, the Supreme Court in 2007 did not foresee the tsunami of intrusive regulation that would be built upon the 2009 Endangerment Finding. The *Massachusetts* Court operated under the assumption that EPA would merely "regulate emissions" and that its authority would not lead to "extreme measures."[66]

Yet, "extreme measures" are exactly what followed. EPA has used this authority to do far more than improve the efficiency of engines; it has attempted to effectively phase out gasoline and diesel engines and to fundamentally restructure the U.S. transportation sector.[67] The Biden

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[63] 40 C.F.R. § 51.100(s)(1).

[64] eNGO Endangerment Comment at 50–75.

[65] *West Virginia v. EPA*, 597 U.S. 697 (2022).

[66] *See* eNGO Endangerment Comment at 51–52.

[67] *See* PMI Comment at 5–6, 44–45.

administration's radical, transformative standards aimed to compel the electrification of roughly 70% of new light-duty vehicles and nearly half of all new heavy-duty trucks by model year 2032.[68]

This is the kind of "transformative expansion" of regulatory authority over a question of "vast economic and political significance" that requires clear congressional authorization.[69] The claim of such "unprecedented power over American industry" cannot rest on ambiguous or ancillary provisions.[70] Yet that is what EPA interpreted Section 202(a)—a provision historically used to address smog—to authorize.[71]

The eNGOs' assertion that EPA's standards do not constitute an "electric vehicle mandate" is disingenuous and wrong.[72] Although the standards are nominally performance-based, their stringency ensures that the practical effect is to force a transition to electric vehicles, as compliance is infeasible without producing electric vehicles. As the automakers themselves explained about this argument:

> This [argument] is akin to a requirement to travel from Los Angeles to Boston in 18 hours and claiming it is a performance-based requirement that does not require any specific travel mode, like flying. There's simply no way to get from Los Angeles to Boston in 18 hours without jets for a substantial part of the trip. Likewise, there's no way to meet the GHG standards without [electric vehicles] for a substantial part of the new vehicle fleet.[73]

Furthermore, a new administration has discretion to re-evaluate the legal underpinnings of prior policies. The prior administration's view that its actions did not trigger the major-questions doctrine was based on this misleading characterization of its rules as a mere "flexibility" rather than mandates. A new administration has the discretion to re-evaluate the legal underpinnings of prior policies. This administration now may reasonably conclude that the practical effect of these

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[68] *Id.* at 5.

[69] *West Virginia*, 597 U.S. at 724, 731 n.4.

[70] *Id*. at 728 (quotation omitted).

[71] *See* Opening Brief of Petitioners in *Kentucky v. EPA*, No. 24-1087 (D.C. Cir.).

[72] *See* eNGO Endangerment Comment at 56–57.

[73] Auto Innovators Comment at 13.

GHG standards—forcing a nationwide transition away from the internal-combustion engine—constitutes a major question that Congress did not clearly assign to EPA under Section 202(a).[74]

The eNGOs argue that even if using Section 202(a) to transition the nation to electric vehicles would be major, this does not justify eliminating GHG standards entirely.[75] But as *West Virginia* and other cases demonstrate, the major-questions doctrine turns on the scope of the legal authority claimed by the agency, not just on the agency's particular exercise of that power. Here, by taking the mistaken step of including well-mixed GHGs as air pollution under Section 202(a), EPA claimed the unheralded authority to restructure the entire transportation sector.

EPA's prior claim of authority to require fuel switching is suspect because, as discussed in Section 1.1, *supra*, it allows EPA to exercise power that Congress explicitly withheld from DOT. EPA is claiming the authority to mandate fuel switching without clear authorization from Congress, and indeed, in the teeth of clear statutory prohibitions applicable to the DOT under EPCA.

The eNGOs attempt to separate the authority to regulate GHGs from the authority to mandate fuel switching. But this is a false distinction. By their very nature, motor vehicles using gasoline or diesel emit carbon dioxide as a natural byproduct of clean combustion. Regulating carbon dioxide emissions from motor vehicles inevitably invites fuel switching as internal-combustion engines reach the physical limits of efficiency.

At a minimum, as discussed below and in our comments, as well as the comments of automakers, and truck and engine manufacturers, the major-questions doctrine requires repealing the Biden-era Phase 3 GHG regulations for heavy-duty vehicles and the model year 2027 and later GHG regulations for light- and medium-duty vehicles, as their feasibility is premised on fuel switching.

1.4. EPA's Proposal Would Not Affect the Displacement of Federal Common Law

Replies to eNGO Endangerment Comment Section IV (pp. 75–77).

eNGO Claim: The eNGOs contend that repealing the Endangerment Finding would remove the legal basis for the Supreme Court's decision in *AEP v. Connecticut*. *AEP* held that the Clean Air Act displaces the federal common law of interstate nuisance over GHGs because Congress had delegated regulatory authority over greenhouse gases to EPA under the Clean Air Act. If the

[74] *See* eNGO Endangerment Comment at 57–59.

[75] *See id.* at 70–71.

agency now says that it lacks authority, the eNGOs argue, then industries will lose their "liability shield" under *AEP* and be exposed to a "fresh wave[] of common-law suits."[76]

Refutation: This argument is more scare tactic than sound legal analysis. It's not as if the eNGOs are opposed to the weaponization of tort liability to deindustrialize the U.S. Their argument relies upon a fundamental misunderstanding of *AEP*, the principles governing the displacement of federal common law, and the practical reality of ongoing climate litigation in the United States.

EPA's proposed rescission is based on a specific interpretation of EPA's authority to regulate air pollution from *motor vehicles* under Section 202(a). It doesn't affect EPA's authority under any other parts of the Clean Air Act, such as Section 111, the statutory provision at issue in *AEP*.

As the Supreme Court has held, the displacement of federal common law rests upon EPA's discretionary regulatory authority under the Act, not on any single provision, let alone a single regulation. When *AEP* was decided, there were no regulations for GHG emissions from power plants in place, but the possibility of regulation in the future meant that federal common law was displaced. The eNGOs are thus "patently incorrect"[77] when they assert that EPA's regulations control the analysis. Rather, unless *Massachusetts* is overruled by the Supreme Court, the federal common law of interstate air pollution for GHG emissions remains displaced. Indeed, even if that happened, subsequent legislative developments, such as the recent addition of specific greenhouse-gas regulatory requirements such as the Waste Emissions Charge program for methane, would defeat the argument that the Clean Air Act does not displace federal common law.

In any event, however, the liability "shield" the eNGOs tout has not effectively deterred a wave of lawsuits under state law.[78] If federal common law were somehow revived by the agency's rule,

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[76] *See id.* at 75–77.

[77] *Id.* at 75–77.

[78] *See, e.g.*, *California v. BP p.l.c.*, No. RG17875889 (Cal. Super. Ct., Cnty. of Alameda); *California v. BP p.l.c.*, No. CGC-17-561370 (Cal. Super. Ct., Cnty. of S.F.); *California v. Exxon Mobil Corp.*, No. CGC-23-609134 (Cal. Super. Ct.); *City of Imperial Beach v. Chevron Corp.*, No. 17CV01227 (Cal. Super. Ct.); *County of Marin v. Chevron Corp.*, No. 17CV02586 (Cal. Super. Ct.); *County of San Mateo v. Chevron Corp.*, No. 17CV03222 (Cal. Super. Ct.); *City of Richmond v. Chevron Corp.*, No. 18CV00055 (Cal. Super. Ct.); *City of Santa Cruz v. Chevron Corp.*, No. 17CV03243 (Cal. Super. Ct.); *County of Santa Cruz v. Chevron Corp.*, No. 17CV03242 (Cal. Super. Ct.); *Connecticut v. Exxon Mobil Corp.*, No. HHDCV206132568S (Conn. Super. Ct.); *Delaware v. BP Am. Inc.*, No. N20C-09-97 (Del. Super. Ct.); *District of Columbia v.*
(footnote continued on next page)

then the wave of lawsuits brought in state court under state law would be immediately preempted by the federal common law.[79] It is only because of the displacement of federal common law under *AEP* that the states now claim they can sue under state tort law.

2. EPA Has Broad Discretion to Determine That New Motor Vehicle Emissions Do Not "Contribute" to Endangerment

Replies to eNGO Endangerment Comment Section V.B (pp. 85–91) and Section VII (pp. 170–173), and eNGO Vehicle Standards Comment VII.C.i.b (pp. 104–110).

The eNGOs defend the 2009 Endangerment Finding by insisting on a wooden reading of Section 202(a), arguing that so long as GHGs across the world collectively endanger public health and welfare, then *any* emission of those gases from U.S. motor vehicles—no matter how infinitesimal or how attenuated the effect—compels a "cause or contribute" finding.[80]

This stilted interpretation ignores background principles and the extreme degree of deference owed to the agency's judgment. EPA must exercise a discretionary "judgment" and may reasonably decide that emissions with no measurable effect on the risk to the United States don't contribute to the danger.

Exxon Mobil Corp., No. 2020 CA 002892 B (D.C. Super. Ct.); *Hawaiʻi v. BP p.l.c.*, No. 1CCV-25-717 (Haw. Cir. Ct.); *City & County of Honolulu v. Sunoco LP*, No. 1CCV-20-380 (Haw. Cir. Ct.); *County of Maui v. Sunoco LP*, No. 2CCV-20-283 (Haw. Cir. Ct.); *City of Chicago v. BP p.l.c.*, No. 2024CH01024 (Ill. Cir. Ct.); *Maine v. BP p.l.c.*, No. PORSC-CV24-442 (Me. Super. Ct.); *Massachusetts v. Exxon Mobil Corp.*, No. 1984CV03333 (Mass. Super. Ct.); *Mayor & City Council of Baltimore v. BP p.l.c.*, No. 24-C-18-4219 (Md. Cir. Ct.); *Anne Arundel County v. BP p.l.c.*, No. 02-CV-21-565 (Md. Cir. Ct.); *City of Annapolis v. BP p.l.c.*, No. 02-CV-21-250 (Md. Cir. Ct.); *Minnesota v. Am. Petroleum Inst.*, No. 62-CV-20-3837 (Minn. Dist. Ct.); *Platkin v. Exxon Mobil Corp.*, No. MER-L-1797-22 (N.J. Super. Ct. Law Div.); *City of Hoboken*, No. HUD-L-3179-20; *City of New York v. Exxon Mobil Corp.*, No. 451071/2021 (N.Y. Sup. Ct.); *City of New York v. BP p.l.c.*, No. 18-cv-182 (S.D.N.Y.); *Town of Carrboro v. Duke Energy Corp.*, No. 24CV3385-670 (N.C. Super. Ct.); *County of Multnomah*, No. 23-CV-25164; *Bucks County v. BP p.l.c.*, No. 2024-1836 (Pa. C.P.); *Rhode Island v. Chevron Corp.*, C.A. No. PC-2018-4716 (R.I. Super. Ct.); *Vermont v. Exxon Mobil Corp.*, No. 21-CV-02778 (Vt. Super. Ct.); *King County v. BP p.l.c.*, No. 18-2-11859-0 (Wash. Super. Ct.); *Makah Indian Tribe v. Exxon Mobil Corp.*, No. 23-2-25216-1 (Wash. Super. Ct.); *Shoalwater Bay Indian Tribe v. Exxon Mobil Corp.*, No. 23-2-25215-2 (Wash. Super. Ct.); *Municipality of Bayamón v. Exxon Mobil Corp.*, No. 3:22-cv-1550 (D.P.R.); *Municipality of San Juan v. Exxon Mobil Corp.*, No. 3:23-cv-1608 (D.P.R.).

[79] *See Int'l Paper Co. v. Ouellette*, 479 U.S. 481, 488, (1987) ("*Milwaukee I* therefore held that these cases should be resolved by reference to federal common law; the implicit corollary of this ruling was that state common law was preempted.") (citing *Illinois v. Milwaukee*, 731 F.2d 403, 414 (7th Cir. 1984)).

[80] eNGO Endangerment Comment at 85–91.

2.1. The Statutory Framework Demands Deference to the Administrator's Judgment and Incorporates a *De Minimis* Threshold

Replies to eNGO Endangerment Comment Section V.B (pp. 85–91).

eNGO Claim: The eNGOs claim that so long as U.S. motor vehicles emit any GHGs, and so long as GHGs collectively from all sources all over the world are anticipated to pose any risk to human health or welfare in decades to come when ignoring human adaptation, EPA has no choice but to regulate emissions from motor vehicles under Section 202(a), no matter how trivial that contribution might be to the risk.[81]

Refutation: The statute does not automatically require regulation of motor vehicles based on the mere emission of an air pollutant that has a trivial effect on the risk. Rather, it requires nuanced exercise of expert "judgment." And EPA may determine that trivial emissions don't contribute to the risk.

2.1.1 EPA Must Exercise "Judgment"

Section 202(a)(1) directs the Administrator to prescribe standards for emissions "which *in his judgment* cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[82] The explicit inclusion of the phrase "in his judgment" is a clear statutory directive that the determination of contribution is not merely a ministerial duty or a mathematical calculation. Instead, it calls for the weighing of complex scientific evidence and the balancing of risks.

As the Supreme Court clarified in *Loper Bright*, when Congress explicitly delegates the authority to make a "judgment" or exercise "discretion," that means the agency "is authorized to exercise a degree of discretion" in construing the statutory terms.[83] Courts must afford EPA substantial deference in determining what level of emissions "cause" or "contribute" to an anticipated danger.

The eNGOs attempt to bypass this discretion by arguing that the Supreme Court's decision in *Massachusetts* settled the meaning of "contribute."[84] They claim that because the Court asserted that U.S. motor-vehicle emissions made a "meaningful contribution" to GHG concentrations for

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[81] *Id.*

[82] 42 U.S.C. § 7521(a)(1) (emphasis added).

[83] *Loper Bright Enters. v. Raimondo*, 603 U.S. 369, 395 & n.6 (2024).

[84] eNGO Endangerment Comment at 85–87.

purposes of Article III standing, the Court effectively set a permanent floor for EPA's scientific judgment.[85] This misreads the Court's holding.

Massachusetts did not decide what it means to "contribute" to danger under Section 202(a). Although the Court held that GHGs fit the definition of "air pollutant" and that EPA could not avoid its statutory duty based on policy considerations unrelated to the statute, it remanded the ultimate question of whether these emissions cause or contribute to climate change back to the agency, recognizing that this required "scientific judgment."[86]

The eNGOs seize upon the Court's statement that the emissions from U.S. motor vehicles make a "meaningful contribution" to climate change.[87] But they quote this statement out of context. The statement was made based upon "uncontested affidavits" in the context of holding that *Massachusetts* had Article III standing—which requires only a showing of injury "fairly traceable" to the challenged action.[88] That is distinct from the requirement that the Administrator exercise expert "judgment" to determine whether emissions "cause, or contribute" to endangerment.[89] The Supreme Court's inexpert assertion of opinion premised on uncontested affidavits does not control EPA's expert judgment here.[90]

Nor is the Supreme Court, or any court for that matter, well suited to make this kind of judgment in the first instance. The judiciary is ill-equipped to determine whether a source's emissions are "meaningful" under the statute; that is the type of fact-bound technical judgment that Congress committed to the executive branch. *Massachusetts* did not eliminate EPA's discretion to make a judgment within the legal contours of "contribute."

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[85] *Massachusetts*, 549 U.S. at 525.

[86] *Id.* at 533–34.

[87] *Id.* at 525.

[88] *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560–61 (1992).

[89] 42 U.S.C. § 7521(a)(1).

[90] In *AEP*, the Court evenly divided on whether the contribution of an electric-generating utility was sufficient for standing, showing that at least some Members of the Court doubt the causation claims suffice even to show standing. *AEP*, 564 U.S. at 420 ("Four members of the Court, adhering to a dissenting opinion in *Massachusetts, id.*, at 535 (opinion of Roberts, C.J.), or regarding that decision as distinguishable, would hold that none of the plaintiffs have Article III standing.").

2.1.2 EPA Need Not Regulate Trivial Emissions

The eNGOs' claim that *any* emission from a source contributes to the risk subject to regulation ignores the principle that agencies need not regulate *de minimis* or trivial matters.[91] This doctrine recognizes that the law does not concern itself with trifles (*de minimis non curat lex*) and avoids compelling agencies to pursue regulatory actions that don't help solve a problem.[92] As the D.C. Circuit has recognized under the Clean Air Act, "[u]nless Congress has been extraordinarily rigid, there is likely a basis for an implication of *de minimis* authority … when the burdens of regulation yield a gain of trivial or no value."[93] In other words, a source's emissions must be "[non]trivial" to warrant regulation.[94] "A primary goal" of the Clean Air Act, after all, "is to encourage or otherwise promote *reasonable* Federal, State, and local governmental actions, consistent with the provisions of this chapter, for pollution prevention."[95] Regulating trivial sources of emissions is unreasonable.

The eNGOs themselves ultimately concede that "contribute" excludes trivial emissions. They admit that a source with "trivial" or *de minimis* emissions does not meaningfully "contribute" to the danger.[96] In fact, the eNGOs rely heavily on this principle to explain why anthropogenic water vapor from motor vehicles should not be regulated under Section 202(a). They contend that water vapor emissions don't "contribute" to endangerment because that water vapor does not meaningfully add to the risk of climate change. The eNGOs' attempt to define *de minimis* in a way that excludes only water vapor while capturing every molecule of carbon dioxide from motor vehicles is a transparent attempt to substitute their policy preferences for the agency's reasoned judgment.

By arguing that water vapor emissions from motor vehicles are too trivial, the eNGOs necessarily concede that EPA has the authority to evaluate the relevance of a source's emissions relative to

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[91] *See, e.g.*, *Alabama Power Co. v. Costle*, 636 F.2d 323, 360 (D.C. Cir. 1979) ("Categorical exemptions may also be permissible as an exercise of agency power, inherent in most statutory schemes, to overlook circumstances that in context are *de minimis*.")

[92] *Id.*

[93] *Id.*; *see also Industrial Union Dep't, AFL-CIO v. Am. Petroleum Inst.*, 448 U.S. 607, 645, 651 (1980) (plurality) (OSHA may regulate only "significant" risks).

[94] *Bluewater Network v. EPA*, 370 F.3d 1, 13, 15 (D.C. Cir. 2004) (endorsing requirements that emissions be "nontrivial" and "involve more than a *de minimis* contribution").

[95] 42 U.S.C. § 7401(c) (emphasis added).

[96] eNGO Endangerment Comment at 87–91.

the overall pollution problem. The debate, therefore, is not *whether* a *de minimis* threshold exists, but *what* that threshold should be and *who* gets to decide it. The answer, dictated by the statute and reinforced by *Loper Bright* and longstanding principles of administrative law, is EPA, exercising delegated judgment. Courts may only ask whether EPA has engaged in "reasoned decisionmaking" in making such a technical finding—so courts must be at their most deferential.[97]

2.1.3 The Need for Reasonable Scoping

In exercising this judgment, EPA may reasonably determine that the "cause or contribute" analysis must be limited, both temporally and geographically. The eNGOs advocate for an unbounded analysis, considering cumulative global emissions over centuries and impacts anywhere in the world. This unbounded approach is precisely the kind of interpretive error the Supreme Court cautioned against in *Fischer v. United States*. The Court's "usual approach" is "to 'resist reading' particular sub-provisions 'to create a coverall' statute."[98] Instead, a word is "given more precise content by the neighboring words with which it is associated."[99] The word "contribute" also cannot be read in isolation; it must be read in the context of the specific statutory object it modifies: "new motor vehicles." EPA must therefore ground its reading in the text and structure of Section 202, which allows EPA to set reasonable temporal and geographic limits.

First, EPA's analysis must be tied to the regulated source and time-bound. Section 202(a) concerns emissions only from "*new* motor vehicles."[100] EPA's unit of analysis is therefore not the on-road fleet, which EPA lacks authority to regulate, but only new motor vehicles or engines. And EPA's emissions standards apply only for the "useful life" of those new motor vehicles.[101] EPA should therefore focus on the effect of emissions occurring during the useful life of those motor vehicles. As currently defined by EPA, the full useful life for new motor vehicles is at most

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[97] *Loper Bright*, 603 U.S. at 395.

[98] *See Fischer v. United States*, 603 U.S. 480, 496–97 (2024) (quoting *Yates v. United States*, 574 U.S. 528, 549 (2015)).

[99] *Id.* at 2184 (explaining a word is "given more precise content by the neighboring words with which it is associated").

[100] *Massachusetts*, 549 U.S. at 544 (Roberts, C.J., dissenting) ("[T]he Clean Air Act covers only new motor vehicles and new motor vehicle engines, so petitioners' desired emission standards might reduce only a fraction of 4 percent of global emissions.").

[101] 42 U.S.C. § 7521(a).

"15 years or 150,000 miles," whichever occurs first.[102] EPA's analysis should thus be bounded to a period of around 15 years or around 2040. EPA should not (or at least need not) accept "a century-long time horizon and a series of compounded estimates."[103] The Clean Air Act doesn't require a "crystal ball inquiry."[104] It requires addressing only those risks that are "reasonably anticipated" over the useful life of the motor vehicles. Yet the vast majority of eNGO citations rely upon farfetched predictions decades from now, making them irrelevant to EPA's judgment.

Second, as the 2009 Endangerment Finding conceded, the analysis and the evidence must be geographically tied to the United States. The Clean Air Act's purpose is "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population."[105] Although climate change is global, the endangerment judgment focuses on the risks and impacts *within the United States*. EPA may therefore not rely upon studies relating to the effects of global climate change across the world, such as claims about heat effects in tropical countries that have a vastly different climate and economy. Yet the eNGO citations repeatedly rely upon claims about global harms that have at best a tenuous connection to the United States.

Within these limits, the agency may conclude that new motor vehicles do not contribute to global warming trends because scientifically undetectable or statistically insignificant emissions are *de minimis*. If the effect of emissions from a new source category cannot be discerned from the background noise of natural climate variability or the inherent uncertainties of climate modeling, then the agency is well within its discretion to conclude that those emissions do not meaningfully "contribute" to the even more uncertain risks to the United States.

2.2. The Contribution of New Motor Vehicles to Global Climate Change is *De Minimis*

Replies to eNGO Endangerment Comment Section VII (pp. 170–173) and V.D (p. 95) and eNGO Vehicle Standards Comment VII.C.i.b (pp. 104–110).

eNGO Claim: The eNGOs insist that U.S. new motor vehicles meaningfully contribute to the asserted danger of climate change, criticizing EPA's analysis that the effect of these emissions is

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[102] 40 C.F.R. § 86.1805-17(b).

[103] *Massachusetts*, 549 U.S. 542 (Roberts, C.J., dissenting).

[104] *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375, 391 (D.C. Cir. 1973).

[105] *See, e.g.*, 42 U.S.C. § 7401(b)(1).

undetectable given the margin of error in global warming trends.[106] They argue that even a small percentage contribution (e.g., 3%) is "real and incredibly impactful" and criticize EPA for not relying on alternative modeling projections that predict a minute difference in global mean surface temperatures by 2100 or for relying on national emission shares rather than global ones.[107]

Refutation: The eNGOs' arguments fail to grapple with uncertainties of the global climate system, the inherent limitations of climate modeling, and the vanishingly small effect of U.S. motor vehicle emissions in that context. Applying any reasonable measure, the contribution of new U.S. motor vehicles is *de minimis* and has no measurable effect on risks from climate change.

2.2.1 The Cascade of Nested Uncertainties in Climate Modeling

The eNGOs' demand for precise modeling projections ignores that predicting the effect of a specific sector's emissions on future harms involves navigating a complex chain of causation, with significant uncertainty compounding at each step. This cascade of uncertainty renders precise predictions unreliable and highlights the difficulty of attributing specific harms to specific emissions.

To assess the impact of U.S. vehicle emissions, one must accurately model several sequential steps, each with its own difficulty and uncertainty:

1. **Observational Uncertainty:** What are the current average global temperatures and warming trends?
2. **Scenario Uncertainty:** What will future global emissions be?
3. **Carbon Cycle Uncertainty:** What effect will those future emissions have on atmospheric concentrations (i.e., how will natural sinks and sources respond)?
4. **Climate Sensitivity Uncertainty:** What effect will those concentrations have on future global temperatures?
5. **Downscaling/Localization Uncertainty:** What effect will those future temperatures have on localized climate outcomes (e.g., sea-level rise, hurricane intensity)?
6. **Impact and Adaptation Uncertainty:** What effect will those localized outcomes have on U.S. public health and welfare, considering human adaptation?

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[106] eNGO Vehicle Standards Comment at 104.

[107] *Id.* at 107–09.

At each step, the uncertainty compounds, making it virtually impossible to attribute specific future harms to the emissions of a single sector in a single country with any degree of scientific certainty.

Observational Uncertainty: Uncertainty in observed global warming trends stems primarily from limits in observational coverage, changes in measurement techniques over time, and the inherent natural variability of the climate system. As noted by EPA in the proposal, this uncertainty is on the order of 10% to 15%.[108]

The eNGOs critique this number, calling it unsupported, but this range is supported by ample evidence. EPA's figure closely tracks the analysis of the European Union's Copernicus Climate Change Service: using the ERA5 reanalysis dataset, the Copernicus Climate Change Service provides an estimated warming of 0.21±0.03 °C per decade for the period 1979-2024, an uncertainty of around 14%.[109]

Similarly, the IPCC Sixth Assessment Report (AR6) concluded that the human-caused global surface temperature increase from 1850–1900 to 2010–2019 was 1.07 °C, with a likely range of 0.8 °C to 1.3 °C, an uncertainty of around 23%.[110]

The eNGOs dispute EPA's claimed uncertainty in global warming trends since 1979 (15%) by countering with one study they claim supports a margin of error of 6%.[111] But the study cited by the eNGOs uses a novel filtering technique to reduce the variability in the data; the study's unfiltered data shows an uncertainty of approximately 11 percent (0.19 ± 0.02 °C), closer to the 15 percent figure that EPA notes in the preamble.[112] And in any event, as will be seen below, this

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[108] 90 Fed. Reg. at 36,311 (noting "[g]lobal warming trends from 1979 to 2023, the period with the best available data, were determined to a precision (or margin of error) of plus or minus 15 percent total").

[109] *Climate Indicators: Temperature*, Copernicus Eur. Comm'n, https://climate.copernicus.eu/climate-indicators/temperature (last visited Nov. 19, 2025) ("The average rate of temperature increase, according to ERA5, is 0.21°C per decade from 1979 to 2024, with a 95% confidence interval of ±0.03°C.").

[110] IPCC, *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers* at 5 (V. Masson-Delmotte et al. eds., 2021), https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/ (IPCC AR6 WGI).

[111] eNGO Vehicle Standards Comment at 105.

[112] *See* Samset et al., *Steady Global Surface Warming from 1973 to 2022 but Increased Warming Rate After 1990*, 4 Commc'ns Earth & Env't 400, at 3 (2023), https://doi.org/10.1038/s43247-023-01061-4.

6% figure alone dwarfs the contribution of emissions from new motor vehicles in the United States.

Scenario Uncertainty: Even if the current warming trends were known with perfect certainty, the next step in the cascade—predicting human behavior, technological innovation, and global regulatory policy over the next century—introduces a far greater degree of uncertainty into future predictions.

Projecting future GHG emissions over the timescales that matter for the risks of climate change (many decades or even centuries) requires predicting future socioeconomic development, such as economic and population growth, technological innovation, and global policy decisions over the next century. The IPCC uses various scenarios (Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs)) to model potential futures. As discussed in Section 3.1.1, *infra*, the divergence between these scenarios is vast. As Zeke Hausfather explains, these scenarios are highly uncertain:

> Global CO_2 emissions vary considerably across the different SSP baselines. In general, one of the strengths of the SSP framework is to highlight the importance of baseline assumptions on resulting emissions and temperatures. In the relatively sustainability-focused SSP1, emissions peak between 2040 and 2060 – even in the absence of specific climate policies, declining to around 22 to 48 gigatonnes of CO_2 ($GtCO_2$) per year by 2100…. In the "middle of the road" SSP2, emissions continue to increase through the end of the century, reaching between 65$GtCO_2$ and 85$GtCO_2$…. Models show a wide range of possible baseline emissions for the "regional rivalry" SSP3, with most runs showing increases up to around 76-86$GtCO_2$ by 2100, but one model (MESSAGE) having emissions of 129GtCO2, the highest of any SSP…. Despite its high inequality, emissions are relatively low in SSP4 due to rapid technological progress on low-carbon energy sources. SSP4 emissions range from 34$GtCO_2$ to 45$GtCO_2$ by 2100…. Finally, the high-growth energy-intensive SSP5 shows the most overall emissions of any SSP, ranging from 104$GtCO_2$ to 126$GtCO_2$ in 2100.[113]

[113] Hausfather, *Explainer: How 'Shared Socioeconomic Pathways' Explore Future Climate Change*, Carbon Brief (Apr. 19, 2018), https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change/.

Averaging across the full range of scenarios (but excluding the SSP3 MESSAGE model), the mean predicted emissions in 2100 are 69.1 $GtCO_2$ per year with a range of 22–126 $GtCO_2$ per year—an uncertainty of plus or minus 75%. Even focusing solely on the "middle of the road" SSP2, the mean is 35 $GtCO_2$ per year with a range of 22–48 $GtCO_2$ per year—an uncertainty of around 37%.

Carbon Cycle Uncertainty: The vast uncertainty in emissions scenarios (±75%) is compounded when translating these scenarios into ultimate atmospheric GHG concentrations, which requires modeling the complex interplay of Earth's natural systems. This is because the Earth's natural "sinks"—its forests, soils, and oceans—currently absorb and store away more than half of all the carbon dioxide we emit.[114] The future atmospheric concentration depends on future efficiency of these natural sinks. If they absorb less, then more of our emissions will stay in the atmosphere, and vice versa.

On one side, increased carbon dioxide in the atmosphere acts like a fertilizer, leading to "global greening" where plants grow more robustly and lock away more carbon. On the other hand, increased atmospheric concentrations of GHGs can decrease the ability of currently large sinks (such as the oceans) to uptake carbon dioxide at the same rate. The final atmospheric concentration depends heavily on which of these competing effects will dominate in the coming decades.

There is large uncertainty in how this process will balance out. For example, land models disagree widely on the extent of cumulative net carbon uptake over the last half-century.[115] This disagreement in model structure—how the models are built—leads to a 200 petagrams of carbon (or 200 billion metric tons) difference in estimates of the total cumulative land sink since 1959.[116] The largest source of this variability is the effect of carbon dioxide on plant fertility, which is uncertain in the models: models calculate a mean cumulative uptake of 94.1 petagrams with a

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[114] IPCC AR6 WGI, at 699 (Ch. 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks) (Canadell et al.) (explaining that that during the decade of 2010–2019, 46% of emitted carbon dioxide accumulated in the atmosphere, while 23% was taken up by the ocean and 31% was stored by terrestrial ecosystems (totaling 54% absorbed by sinks)); *see also* Friedlingstein et al., *Global Carbon Budget 2020*, 12 Earth Sys. Sci. Data 3269 (2020), https://doi.org/10.5194/essd-12-3269-2020.

[115] Huntzinger et al., *Uncertainty in the Response of Terrestrial Carbon Sink to Environmental Drivers Undermines Carbon-Climate Feedback Predictions*, 7 Sci. Reps. 4765 (2017), https://doi.org/10.1038/s41598-017-03818-2.

[116] *Id.*

standard deviation of ±80.6 petagrams—an uncertainty of 85% in the models.[117] Similarly, for the ocean sink, model structural uncertainty is also a key factor.[118] There is even large variability at a regional level. In the California Current, for example, the uncertainty regarding the average rate of carbon dioxide transfer resulting from natural internal variability alone is roughly half as large as the average transfer rate itself.[119] In other words, the natural ups and downs of the ocean's absorptivity are so significant that they make it hard to get a precise reading on the average amount of carbon being moved.

This significant uncertainty regarding the mass of carbon that remains in the atmosphere is entirely distinct from the next stage of modeling, which addresses the atmosphere's thermal response to that mass. Determining the atmospheric concentration is merely the input for the next, separate phase of the cascade. We must next bridge the gap between concentration and temperature—a conversion governed not by the biological efficiency of sinks, but by the thermodynamic physics of the atmosphere.

Climate Sensitivity Uncertainty: Even if future GHG concentrations were known with certainty (the mass of carbon in the system), the climate system's thermal response remains highly uncertain.[120]

To model this response, climate scientists commonly use a benchmark known as the equilibrium climate sensitivity or ECS, or the measure of the global average warming that will occur after the climate system reaches a steady state following a doubling of atmospheric carbon dioxide levels relative to pre-industrial levels (280 ppm). The IPCC's AR6 "likely" range for the equilibrium climate sensitivity is between of 2.5 °C to 4.0 °C, and the "very likely" range is between 2.0 °C and 5.0 °C.[121] Many climate models from the Coupled Model Intercomparison Project (CMIP)[122]—the standard framework used by the world's major modeling groups to compare data

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[117] *Id.*

[118] Dunne, *Quantifying Uncertainty in Future Ocean Carbon Uptake*, 30 Global Biogeochemical Cycles 1563 (2016), https://doi.org/10.1002/2016GB005525.

[119] *Id.*

[120] *See generally* Koonin, *supra* note 56, at 91–96; *see also* Hausfather, *Explainer: How Scientists Estimate 'Climate Sensitivity'*, Carbon Brief (June 19, 2018), https://www.carbonbrief.org/explainer-how-scientists-estimate-climate-sensitivity/.

[121] IPCC AR6 WGI, at 199 Fig. 1.16 (Ch. 1: Framing, Context, and Methods) (Chen et al.).

[122] *See generally* World Climate Research Programme, *CMIP Phase 6 (CMIP6)*, Coupled Model Intercomparison Project, https://wcrp-cmip.org/cmip-phases/cmip6/ (last visited Nov. 20, 2025).

for the IPCC—however, exhibit equilibrium climate sensitivity values well above the likely range of 4.0 °C, sometimes even exceeding 5.0 °C.[123]

A model's temperature projections for a given emissions scenario reflect this compounded uncertainty. For instance, under the IPCC's intermediate emissions scenario (SSP2-4.5)—often considered the most plausible baseline—the best-estimate global warming by 2100 is around 2.7 °C. But the likely range falls somewhere in between 1.68–3.09 °C or 1.98–3.82 °C by 2080–2100, depending on the chosen sensitivity.[124]

This range of scientific disagreement is orders of magnitude larger than the projected effect of U.S. motor vehicle regulations, which is typically measured in thousandths of a degree. If the scientific community cannot agree within 1.4 °C on the total global warming outcome, then it is scientifically unsound to attribute any increased risk to the minuscule contribution of new motor vehicles in the United States.

Downscaling/Localization Uncertainty: As discussed at length below, in Section 3.3, *infra*, translating increased global temperature changes into specific, localized harms in the United States—is perhaps the most uncertain part of the cascade. It requires downscaling global models and understanding complex, dynamic local systems. Often, the empirical data contradicts the alarming projections cited to support the 2009 Endangerment Finding, suggesting that the link between global temperatures and specific harms to the United States is far weaker than EPA has previously assumed.

Impact and Adaptation Uncertainty: Finally, accurately predicting let alone quantifying future harm to public health and welfare is a highly speculative endeavor. Unlike criteria pollutants, most of the harms from climate change happen on the scale of decades or centuries so human societies can adapt to the risk, particularly in a prosperous Nation with abundant energy such as the United States. Industrial civilization has an impressive track record of adaptation, achieving an over 90 percent decline in annual global deaths from extreme weather over the last century, even as the global population tripled, in no small part because of abundant energy.[125] Wealthier developed societies with abundant energy and technology are far better at adapting to different

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[123] Koonin, *supra* note 56, at 92 fig.4.6.

[124] Scafetta, *Impacts and Risks of "Realistic" Global Warming Projections for the 21st Century*, 15 Geosc. Frontiers 101774 (2024), https://doi.org/10.1016/j.gsf.2023.101774.

[125] Ritchie & Rosado, *Natural Disasters*, Our World in Data (Jan. 2024), https://perma.cc/W9CH-QRWU.

climates; for instance, by installing air conditioners or building on higher ground to avoid floods. As the World Health Organization has explained, "the attributable mortality is zero when 100% adaptation is assumed."[126]

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These uncertainties are not independent. In climate modeling, the process is sequential and often multiplicative: emissions are processed by carbon cycle models to determine GHG levels, which are then processed by climate sensitivity parameters to determine temperature change. The uncertainty propagates and compounds.

Although a full analysis requires complex methods, the magnitude of this compounding effect can be illustrated using standard statistical methods. Combining just the relative uncertainties of the key stages discussed above—Scenario Uncertainty (±75%), Carbon Cycle Uncertainty (±85%), and Climate Sensitivity Uncertainty (±23%)—yields a total compounded relative uncertainty of more than 100%.[127]

This demonstrates that the margin of error is larger than the central estimate itself. If a model projects 2.7 °C of warming (the IPCC best estimate for SSP2-4.5), an uncertainty of 100% implies a range so wide (spanning roughly 0 °C to 5.4 °C) as to severely limit the projection's utility for precise attribution. This uncertainty envelope—the "noise" in the system—sets the stage for evaluating the significance of any single emissions source.

2.2.2 The Effect of Future U.S. New Motor Vehicle Emissions Is Undetectable and Trivial

Against this noisy backdrop, EPA must judge whether the emissions from new motor vehicles in the United States meaningfully "contribute" to the anticipated danger. When making causal judgments about the specific harms of specific emissions sources, a critical issue is the relative magnitude of the uncertainty (the "noise") compared to the magnitude of the effect measured (the "signal").

When the compounded scientific uncertainty regarding the climate system's response to *all* global emissions exceeds 100%, it is impossible to reliably detect the minuscule contribution of

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[126] World Health Organization, *Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death* 23 (2014), https://tinyurl.com/24wc8ddv.

[127] We use a standard root sum of squares approach. This likely understates the total uncertainty as it doesn't capture deep structural uncertainties (fundamental disagreements in how models represent the physical world) or interdependencies among variables.

emissions from new motor vehicles certified in the United States—a signal typically measured in hundredths or thousandths of a degree.

When the noise is vastly larger than the signal, the signal becomes statistically indistinguishable. It is scientifically unsound to claim that an effect dramatically smaller than the uncertainty of the model used to predict it constitutes a meaningful contribution to the claimed risk. The eNGOs' reliance on precise modeling outputs involves a false precision that obscures this fundamental limitation.

Calculating the effect of U.S. vehicle emissions using standard models, the contribution is trivial. The eNGOs criticize EPA's comparison of the effect of U.S. motor vehicle emissions to the margin of error in global warming trends, arguing over the precise percentage of that warming uncertainty. Regardless of whether the uncertainty in historical warming trends is 6%, 11%, or 15%, the effect of U.S. new motor vehicles is far smaller.

The eNGOs urge EPA to rely upon climate modeling, pointing to a prior EPA analysis using the MAGICC model for the 2012–2016 standards.[128] Those analyses predicted a reduction in global mean surface temperatures of 0.006 to 0.015 degrees Celsius by 2100.[129] The results are similarly negligible when the MAGICC model is run here. In our previous comment, we compared the predicted global temperatures with and without EPA's estimated emissions reductions from the multipollutant rule using MAGICC and a likely emissions scenario—SSP2-4.5. The results are presented again in the figure and table below.

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[128] eNGO Vehicle Standards Comment at 110.

[129] 75 Fed. Reg. at 25,495 (applying the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC)).

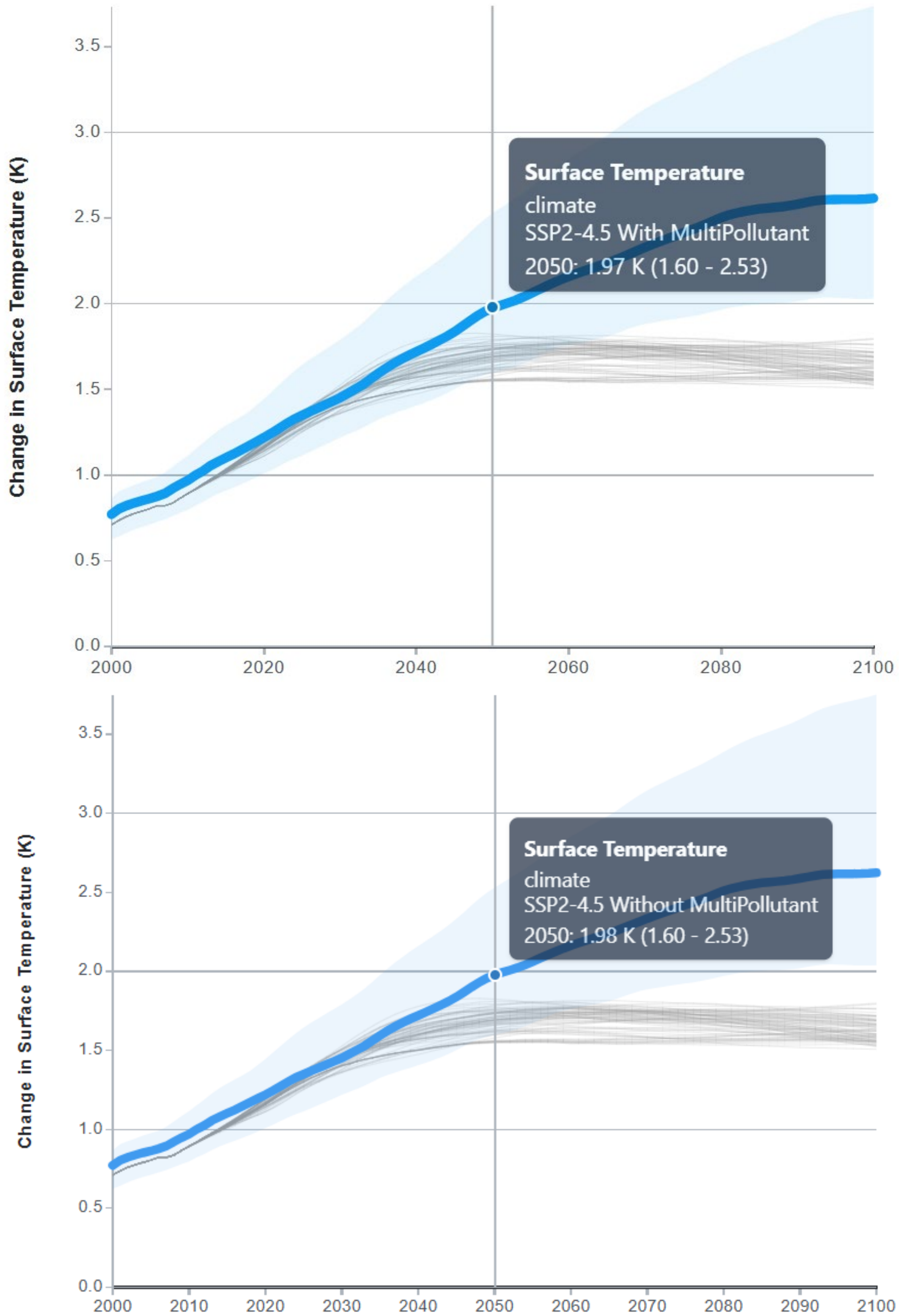

Figure: MAGICC projected surface temperature with (top) and without (bottom) emissions reductions from EPA's multipollutant rule. [130]

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[130] Both scenarios were run with MAGICC v7.5.3, as described in Meinshausen et al., *Emulating coupled atmosphere-ocean and carbon cycle models with a simpler model, MAGICC6 - Part 1: Model description and calibration*, 11 Atmos. Chem. Phys. 1417 (2011), https://doi.org/10.5194/acp-11-1417-2011, with updates

(footnote continued on next page)

MAGICC projected surface temperature with and without EPA's multipollutant Rule

Year	SSP2-4.5 (with EPA's Multipollutant Rule) [K/°C]	SSP2-4.5 (without EPA's Multipollutant Rule) [K/°C]	Difference [K/°C]
2030	1.45125	1.45129	0.00004
2040	1.71955	1.72007	0.00052
2050	1.97470	1.97652	0.00182
2060	2.15919	2.16260	0.00340
2070	2.32903	2.33433	0.00529
2080	2.50192	2.50898	0.00706
2090	2.58025	2.58785	0.00760
2100	2.61517	2.62423	0.00906

A temperature change attributable to the repeal of the multipollutant regulations, projected 25 and even 75 years into the future, is functionally zero. In 2040, a more relevant year for today's new motor vehicles, the total projected reduction in surface temperature as a result of keeping the rule is 0.00052 K or °C. By mid-century, it is only 0.00182 °C. Even making farfetched projections to 2100, far beyond the useful life of new motor vehicles, the total temperature reduction rises to 0.009 °C, though nearly all of this difference is from declines in motor vehicle emissions occurring more than 40 years in the future.

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from Meinshausen et al., *The shared socio-economic pathway (SSP) greenhouse gas concentrations and their extensions to 2500*, 13 Geosci. Model Dev. 3571 (2020), https://doi.org/10.5194/gmd-13-3571-2020.This setup matches the configuration used throughout IPCC AR6 and is described extensively in Cross-Chapter Box 7.1 of the Working Group 1 Contribution to the IPCC's AR6. Both scenarios were run probabilistically using a 100-member ensemble. The emissions input for the scenario with EPA's multipollutant rule used the default SSP2-4.5 emissions template, while the emissions input for the scenario without EPA's rule used the same template but added EPA's projected emissions reductions from Table 204—*Estimated GHG Impacts of the Final Standards Relative to the No Action Scenario*, 89 Fed. Reg. at 28,097. The carbon dioxide equivalent emissions avoided were added to the baseline emissions in the appropriate decadal slot to the "Emissions|CO2|MAGICC Fossil and Industrial" row. For example, 40594.7 MT of CO_2e in 2030 in the template became 40618.7 MT in the "without" scenario when the 24 MT avoided predicted in the final rule was added. For years past 2050, emissions additions of 410 MT were assumed.

To put this in perspective, the MAGICC model's reported warming by 2050 is 1.97 °C relative to pre-industrial temperatures, with an uncertainty range spanning between 1.60 – 2.53 °C. The predicted decline in temperatures by 2050 is thus 0.09% of the projected warming and, critically, represents less than 0.2% of the MAGICC model's own uncertainty range for that scenario.

This conclusion is reinforced by analyses considering all U.S. emissions. If the United States achieved net-zero emissions across the entire economy tomorrow—an outcome far beyond the scope of Section 202(a)—EPA's climate model predicts a reduction in year 2100 global temperatures of merely 0.137 °C.[131] Even this total U.S. impact is itself barely detectable against the backdrop of natural variability and modeling uncertainty and is trivial.

It is scientifically unsound to claim that an effect that is dramatically smaller than the uncertainty of the model used to predict it constitutes a "meaningful contribution." If the effect cannot be detected, then it cannot be said to "contribute" to the danger in anything but a symbolic sense. "The mismatch suggests that" the eNGOs' "true goal for this [regulation] may be more symbolic than anything else."[132] But EPA's role under Section 202(a) is to protect Americans from air pollution, not to inspire foreign leaders.[133]

When the aggregate effect of new U.S. motor vehicles on global temperatures is undetectable against background noise, EPA may reasonably conclude that the contribution is *de minimis*.

2.2.3 The "Futility" Argument and Reasoned Decisionmaking

The eNGOs argue that EPA cannot decline to regulate based on the argument that its actions alone will not solve the climate crisis, citing *Massachusetts*.[134] They characterize this as a "futility" argument that the D.C. Circuit has rejected. This fundamentally mischaracterizes the issue and the statutory standard.

The argument here is not that U.S. policymakers should do nothing because the United States or EPA cannot solve the entire problem. Rather, the argument is that the specific emissions from this sector do not meaningfully "contribute" to the problem in the first place because their impact is trivial and scientifically undetectable. EPA is making a judgment about the nature of the

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[131] Comment of Benjamin Zycher 3, Dkt. ID EPA-HQ-OAR-2025-0194-0093 (Zycher Comment).

[132] *Massachusetts*, 549 U.S. at 546–47 (Roberts, C.J., dissenting).

[133] It is "fanciful" in any event to claim that Russia and China will change their domestic leadership out of solidarity with Americans forced to pay higher prices for motor vehicles. *Massachusetts*, 549 U.S. at 546 (Roberts, C.J.).

[134] eNGO Vehicle Standards Comment at 107.

contribution from motor vehicles, not the technological or economic feasibility of means of mitigating that contribution. Of course, the purpose of delegating to EPA a "cause or contribute" judgment in the first place reflects a *congressional* judgment that "[i]t would make no sense to require [automakers] to spend billions" on the highly uncertain chance that will "save one more fish or plankton."[135] But that remains true "even if the industry might somehow afford those billions."[136]

The eNGOs attempt to blur this distinction by using inapt analogies. They argue that dismissing small emissions is like arguing that small expenditures do not contribute to the federal deficit, asserting that every contribution, no matter how small, matters to the aggregate debt.[137] This analogy fails because it compares a purely arithmetic problem to a complex physical system governed by uncertainty and natural variability.

The federal deficit is an accounting identity; every dollar spent is directly measurable and unequivocally adds to the total debt. There is zero uncertainty in the contribution of that dollar. The climate system, by contrast, is characterized by enormous, compounded uncertainty.

The latter uncertainty is known as "Knightian uncertainty," a situation where future outcomes are inherently unknowable and cannot be quantified with probabilities, unlike risk which can be measured based on historical data. In *Sierra Club v. Department of Energy*, the Court upheld an agency's refusal to rely on modeling where "uncertainties in modeling ... would render any analysis 'too speculative to inform the public interest determination.'"[138] As the Court explained, this "classic instance of 'Knightian uncertainty'" differs fundamentally from risk assessment: "risk assessment" occurs where "it is possible to identify outcome[s] and assign probabilities to them," whereas Knightian uncertainty "recognizes the impossibility of assigning probabilities to possible outcomes."[139]

The eNGOs' reliance on the federal deficit analogy erroneously treats the climate system as a matter of calculable risk. However, because the contribution of new motor vehicles is overwhelmed by the noise of global variables, it is effectively impossible to assign a probability to

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[135] *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 232–33 (2009).

[136] *Id.*

[137] *Id.*

[138] *Sierra Club v. Dep't of Energy*, 134 F.4th 568, 575 (D.C. Cir. 2025) (quoting *Sierra Club v. Dep't of Energy*, 876 F.3d 189, 199 (D.C. Cir. 2017)).

[139] *Id.* at 574.

the marginal impact of these emissions. Under *Sierra Club*, because the "uncertainties in the global energy markets" and environmental responses make definitive conclusions impossible, EPA acts reasonably in finding that such "speculative" impacts do not warrant regulation.[140] EPA is a risk regulator, not a speculation regulator.

In this context, a "contribution" must be discernible from the background noise to be scientifically meaningful. It is not akin to adding a known dollar to a known deficit. It is akin to attempting to measure the effect of adding a single drop of water to the damage from a storm. The drop theoretically adds to the volume of water, but its effect is completely swamped by the natural variability and the measurement uncertainty. It is scientifically impossible to distinguish the effect of the drop from the background noise.

If the projected effect of a regulation (e.g., 0.009 °C by 2100) is orders of magnitude smaller than the uncertainty of the system (e.g., the 1.4 °C range for the SSP2-4.5 scenario), that effect cannot be detected. If an effect cannot be detected, then it cannot reasonably be said to "contribute" to the danger in a manner that warrants regulation under the statute.

Massachusetts does not compel EPA to impose costly regulations that yield no measurable benefit. The Administrator's exercise of judgment must be reasonable. Imposing enormous regulatory burdens on the American public and automakers in exchange for a temperature reduction of thousandths of a degree decades in the future—an effect that provides no measurable benefit to public health or welfare of the United States because it is lost in the noise of uncertainty—is the definition of arbitrary and capricious rulemaking. EPA is well within its discretion to conclude that such a trivial impact does not meet the statutory threshold for "contribution."

The eNGOs also argue that EPA should consider other domestic metrics, such as the domestic share of transportation emissions, rather than the global share. EPA need not consider these metrics. "Because local greenhouse gas emissions disperse throughout the atmosphere and remain there for anywhere from 50 to 200 years, it is global emissions data that are relevant."[141]

3. EPA May Rationally Conclude That the Scientific Record Does Not Support an Endangerment Finding for Well-Mixed Greenhouse Gases

Replies to eNGO Endangerment Comment Sections VI (pp. 98–170).

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[140] *Id.* at 574–75.

[141] *Massachusetts*, 549 U.S. at 543.

The eNGOs have submitted a voluminous record, a tactic often described as a "Gish gallop," attempting to overwhelm the docket with quantity to mask a lack of quality. We have not attempted to verify every single citation in this massive tranche of documents. However, a review of the evidence the eNGOs cite as "dispositive" reveals significant and pervasive infirmities. The analysis below represents the findings of a targeted quality assurance review. It demonstrates that the eNGOs consistently overstate the certainty of their evidence and fail to grapple with the nuance and uncertainty present in their own source material. Even this non-exhaustive review confirms that the scientific record is far more uncertain than the eNGOs allege, and that the Agency's caution regarding the "cause or contribute" finding is well-founded in the actual text of the scientific literature.

The eNGOs' claim that the scientific evidence for endangerment from GHG emissions is so overwhelming that no matter how the agency interprets Section 202(a), it cannot rationally conclude that endangerment does not exist.[142] But this fundamentalist portrayal of the scientific evidence as overwhelming and certain is mistaken. "To believe that our understanding of these dynamic, multifactorial realities has reached the state of perfection is to mistake the science of global warming for the religion of climate change."[143] Applying the proper standard, and appropriately limiting the scope of its judgment to harms that are reasonably anticipated within the United States over the useful life of new motor vehicles, *see supra* 2.1.3, EPA may reasonably conclude that there is no endangerment given the speculative nature of the net risks. Courts may not second-guess this determination even if they disagree: "EPA's scientific judgment about the causal relationship between greenhouse gases and climate change is a scientific determination entitled to an extreme degree of deference."[144]

3.1. Pervasive Methodological Flaws Undermine Climate Modeling and Impact Projections

Before digging into the specific claims made by the eNGOs, it is worth pausing to examine a few persistent methodological and framing errors that appear repeatedly in claims about GHGs and climate science. The core error is one of framing: although certain foundational aspects of GHG emissions and climate change are well understood, many aspects are not; but environmental

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[142] *See* eNGO Endangerment Comment at 99, 170.

[143] Smil, *supra* note 1, at 189.

[144] *Coal. for Responsible Regul.*, 684 F.3d at 120.

advocates and the media nonetheless often portray the science as conclusively representing a catastrophic outcome to push their preferred policy agenda.

This distortion, however, is partly enabled by problems within the scientific literature. The internal problems with these studies generally fall into several broad categories: the use of implausible, extreme emissions scenarios; the reliance on flawed or biased climate models; the misinterpretation of observational data; and the use of opaque damage models that minimize human adaptation and employ speculative assumptions. Often, while an individual study is technically correct, this precision is achieved by ignoring relevant factors. Researchers will construct technically sound but implausible "dream world" scenarios which ignore compensatory factors, natural variability, or plausible human responses, creating a body of research that, in aggregate, paints a misleading and needlessly alarming picture.

When taken together, these internal flaws and their external amplification suggest a pattern where uncertainty is minimized and the most alarming outcomes are cherry-picked, resulting in projections of future climate impacts that are systematically exaggerated and unsuitable for sound policymaking.

EPA's role is to make a judgment about *reasonably anticipated* risks to the public health and welfare of the United States, which is inconsistent with relying on an implausible worst-case scenario. "[EPA's] role as an expert is undermined, not furthered, when it distorts that scientific judgment by indulging in worst-case scenarios and pessimistic assumptions to benefit a favored side."[145] Several of the internal methodological or analytical flaws—present to one degree or another in nearly all of the studies relied on by the eNGOs—are explained below.

3.1.1 The Persistence of Implausible Scenarios

Projecting climate damages requires accurately estimating emissions scenarios. Climate models incorporate atmospheric physics, biogeochemical cycles, and feedbacks to simulate how future GHG emissions and the resultant atmospheric concentrations will translate into global and regional changes in temperature, precipitation patterns, and extreme weather events. Essentially, emissions scenarios provide the input signal that determines the magnitude and character of the climate response we project.

A foundational flaw in much of the climate impact literature cited by the eNGOs, and by federal agencies in prior regulatory proceedings, is the reliance on an emissions scenario called

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[145] *Maine Lobstermen's Ass'n*, 70 F.4th at 586.

Representative Concentration Pathway 8.5 (RCP 8.5) or its equivalent. Though it is often labeled the "business-as-usual scenario," RCP 8.5 is now widely regarded by the climate science community as implausibly extreme.[146] For example, the latest projections of the International Energy Agency expect a median warming of around 2.4 °C by 2100, but RCP 8.5 projects a temperature rise of more than twice that, around 5 °C.[147] This is far above the 2 °C to 3 °C that is considered plausible based upon our current trajectory.[148]

Despite this, RCP 8.5 is now firmly lodged in the scientific literature as the expected trajectory of radiative forcing. Thousands of scientific studies refer to RCP 8.5 as the "business-as-usual" scenario.[149] Among these are many of the studies that form the basis of the conclusions reached by the IPCC, the National Climate Assessments, and which are routinely and tirelessly cited by the eNGOs to advocate for ever more stringent regulation.

3.1.1.1. The Origins and Misuse of RCP 8.5

Scientists create emissions scenarios by first defining socioeconomic assumptions about factors such as economic and population growth, energy use, land-use changes, and pollution levels. These assumptions about future human behavior on a global scale are then fed into integrated assessment models to produce different possible pathways for future emissions. The resulting emissions scenarios include time-resolved predictions of carbon dioxide, methane, and nitrous oxide emissions over the coming decades. These scenarios are fed into more complex climate models, which are, in turn, used to calculate radiative forcing (a measure of atmospheric energy imbalance), which in turn feeds climate models that project future climate conditions such as global temperature or sea-level rise.

Early climate research relied on scenarios that were highly idealized and focused on exploring what would happen if, for example, carbon dioxide concentrations doubled from their pre-

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[146] Meinshausen et al., *A Perspective on the Next Generation of Earth System Model Scenarios: Towards Representative Emission Pathways (REPs)*, Geoscientific Model Dev. (preprint) (Sept. 6, 2023), https://doi.org/10.5194/gmd-2023-176; Hausfather & Peters, *Emissions – The Business as Usual Story Is Misleading*, 577 Nature 618 (2020), https://www.nature.com/articles/d41586-020-00177-3.

[147] Int'l Energy Agency, *World Energy Outlook* 2023 22 (2023), https://perma.cc/8S7J-8R88; Hausfather & Peters, *supra* note 146; Hausfather, *Explainer: The High-Emissions 'RCP 8.5' Global Warming Scenario*, Carbon Brief (Aug. 21, 2019), https://perma.cc/9LD9-EGDU.

[148] Roger Pielke, Jr., *Plausible 2005–2050 emissions scenarios project between 2°C and 3°C of warming by 2100*, 17 Environ. Res. Lett. 024027 (2022).

[149] *See* CWG Draft Report at 15; Google Scholar Search, https://scholar.google.com/scholar?hl=en&as_sdt=0%2C6&q=RCP 8.5+%22business+as+usual%22&btnG= (searching "RCP 8.5 'business as usual'").

industrial levels or increased at a steady rate of 1 percent per year. When it was formed in 1988, the IPCC introduced several more sophisticated scenarios intended both to predict the current trajectory and to try to understand how changes in emissions patterns could result in alternate futures. The 1990 IPCC report created four scenarios to model "four hypothetical future patterns of greenhouse gas emissions and their effect on the atmosphere."[150] Climate policies could then be evaluated based on the benefits that might come from changing emissions patterns to conform with one of the reduced scenarios, or the consequences associated with sticking with the baseline.

The first scenario of these four scenarios was called the "business-as-usual scenario," and was meant to capture what the future would look like in the absence of unforeseen events or changes to emission rates either through a shift in energy sources, a reduction in energy use, or changes in population trajectories. That scenario projected that cumulative GHG emissions would result in an atmospheric concentration in the year 2100 of more than 1,200 parts per million of carbon dioxide equivalent, a consequent radiative forcing of 10 watts per square meter, and a global temperature rise of between 2.9 and 6.2 degrees Celsius above preindustrial values.[151] The second scenario assumed that various energy efficiency measures and emissions controls would be adopted globally, and that the share of the world's primary energy provided by natural gas would increase and the share of coal would decrease.[152] "Under this scenario, the cumulative effect of such measures is a CO_2 equivalent doubling around 2060" as opposed to 2025 in the business-as-usual scenario. The remaining two scenarios were intended to reflect futures where countries make more efforts to reduce emissions, including: "utilization of renewable energy sources, strengthening of the Montreal Protocol, and adoption of agricultural policies to reduce emissions from livestock systems, rice paddies, and fertilizers."[153]

The IPCC has since updated its emission scenarios several times. In 2005, the IPCC began efforts to produce a new generation of emissions scenarios. As a temporary stopgap, the IPCC selected four radiative forcing pathways to the year 2100 to be used immediately by researchers while developers worked in parallel to develop socioeconomically plausible emissions scenarios to match. These pathways, called Representative Concentration Pathways, or RCPs, were drawn

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[150] IPCC, *Policymaker Summary of Working Group III* (Formulation of Response Strategies 121 (1990), https://perma.cc/XE7U-DXNF.

[151] *Id.* at 121–23 (*see* Figure 3).

[152] *Id.*

[153] *Id.* at 121.

from the hundreds of existing emissions scenarios to represent low, medium, high, and very high radiative forcing pathways. These scenarios were called RCP2.6, RCP 4.5, RCP 6.0, and RCP 8.5, respectively, indicating the radiative forcing expected by 2100 (e.g., RCP 8.5 assumed a pathway that reached a radiative forcing of 8.5 watts per square meter in 2100).

Unlike the IPPC's 1990 predictions, these scenarios were not intended to be accurate predictions of different policy pathways. Indeed, in 2008 the IPCC stressed that "[i]t is an open research question as to how wide a range of socioeconomic conditions could be consistent with a given [RCP] pathway of forcing, including its ultimate level, its pathway over time, and its spatial pattern."[154] The IPCC warned researchers and policymakers against reading too much into the different scenarios: "The differences between the RCPs can therefore not directly be interpreted as a result of climate policy or particular socioeconomic developments."[155]

But somewhere along the way, wires got crossed. When the RCP scenarios were published, RCP 8.5 began to be labeled in the climate modeling literature as the "business-as-usual" scenario, seemingly branding the most extreme scenario as the no-action baseline against which all future policies should be analyzed. This label was seized by climate activists such as Tom Steyer, who had been looking for ways to "make climate change feel real and immediate."[156] Steyer, joined by Michael Bloomberg and Hank Paulsen, eventually funded projects such as the 2014 *Risky Business* report, which characterized RCP 8.5 not as one of several possibilities, but instead, without evidentiary support, "as the pathway closest to a future without concerted action to reduce future warming."[157]

The Risky Business Project spawned a host of studies that uncritically adopted this assumption. One 2016 study, published in Science, compared the social and economic impacts from the "business as usual (RCP 8.5)" and "stringent emissions mitigation (RCP 2.6)."[158] Another frequently cited study used the same assumptions to project a 10 percent loss in U.S. GDP

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[154] IPCC, *Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies: IPCC Expert Meeting Report* ix, 43 (Sept. 2007), https://perma.cc/NKC2-GULA.

[155] RCP Database (version 2.0, 2009), https://perma.cc/UJR3-MTYT.

[156] Helm, *Climate Change's Bottom Line*, N.Y. Times (Jan. 31, 2015), https://tinyurl.com/4ehefamv.

[157] Roger Pielke Jr., *Climate Cooking*, The Honest Broker (Apr. 13, 2024), https://perma.cc/D3BA-E4PS; *see also* Risky Bus. Project, *Risky Business: The Economic Risks of Climate Change in the United States* 10 & Fig. 1 (2014), https://perma.cc/KDN4-BNSD.

[158] Carleton & Hsiang, *Social and Economic Impacts of Climate*, 353 Science 1112 (2016), https://doi.org/10.1126/science.aad9837.

"under business-as-usual emissions (Representative Concentration Pathway 8.5)."[159] These studies, and many like them, have since been cited thousands of times, including in the eNGO Endangerment Comment.

3.1.1.2. RCP 8.5 Is an Implausible Future

Whatever its likelihood when it was first published, RCP 8.5 has become increasingly implausible with every passing year.[160] There is strong evidence that both near-term and long-term GHG emissions are already well below those needed to create a future consistent with RCP 8.5.

This is for two primary reasons. First, the emission pathways to get to RCP 8.5 generally require an unprecedented *fivefold* increase in coal use by the end of the century, an amount larger than some estimates of all recoverable coal reserves.[161] But this is highly unlikely to occur. Global coal use will likely peak around 2025 before plateauing or declining after 2027. With coal-derived energy gradually being replaced by natural gas or other low-carbon sources, emissions per unit of energy will tend to decline.[162] Second, the high emissions scenarios associated with RCP 8.5 also generally rely upon continued rapid growth of the global population. But this isn't likely to happen either. Overall, fertility has declined steadily at a global level since 1950 and is likely to continue to do so until 2100, leading to a stabilizing or contracting global population before the end of the century.[163]

These and other factors have already led EPA to acknowledge that RCP 8.5 is not a plausible emissions pathway. When it began updating its Social Cost of Greenhouse Gases methodology in 2022, EPA excised RCP 8.5 from its own emissions projections "based on a review of available sources of long-run projections for socioeconomic variables and GHG emissions necessary for damage calculations."[164] Instead, EPA decided to use "the socioeconomic and emissions

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[159] Hsiang et al., *Estimating Economic Damage from Climate Change in the United States*, 356 Science 1362 (2017), https://doi.org/10.1126/science.aal4369 (see Figure 5A).

[160] Hausfather & Peters, *supra* note 146, at 619.

[161] *Id.*

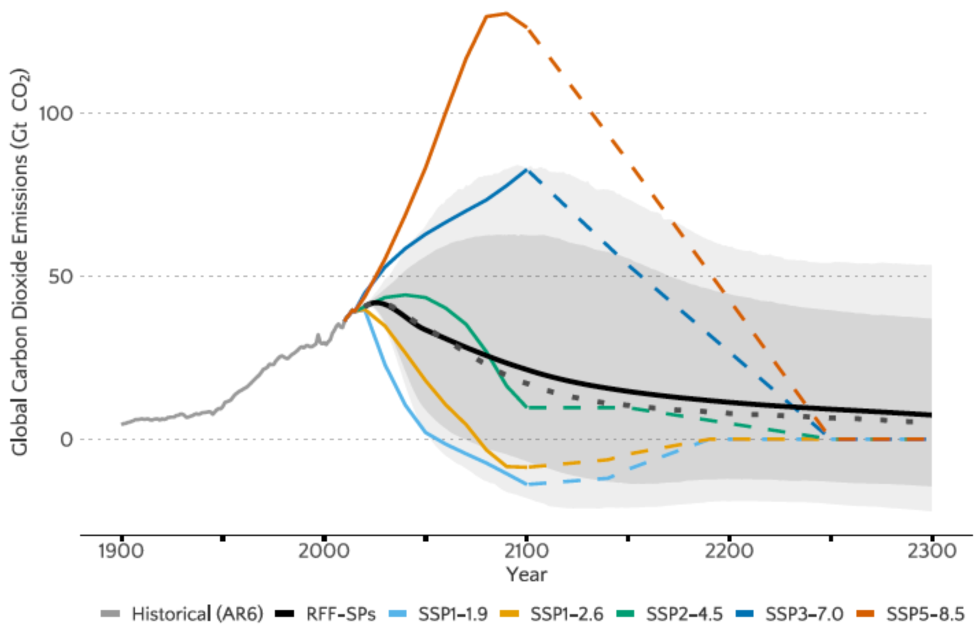
[162] *Id.*

[163] GBD 2021 Fertility and Forecasting Collaborators, *Global Fertility in 204 Countries and Territories, 1950–2021, with Forecasts to 2100*, 403 Lancet 82 (2024), https://doi.org/10.1016/S0140-6736(24)00550-6.

[164] EPA, *External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* 19 (Sept. 2022), https://perma.cc/QB6W-LBH7.

projections recently developed under the Resources for the Future Social Cost of Carbon Initiative."[165]

The modern successor to RCP 8.5 is SSP5-8.5—a more complete scenario that reaches the same radiative forcing paired with specific socioeconomic assumptions to get there. As shown in the figure below, the Resources for the Future emissions projections that EPA used (black line) are far, far less than those of SSP5-8.5 (orange line). Indeed, SSP5-8.5 is such an outlier compared to other scenarios that EPA felt the need to explain that SSP5-8.5 is the "only SSP-RCP pairing with CO_2 emissions projections outside the 1st to 99th percentile range of RFF-SPs."[166] In other words, it is the only scenario discussed in the Social Cost of Greenhouse Gases modeling that EPA considers to be essentially impossible. Because both models target the same extreme radiative forcing level, the EPA's rejection of the former applies equally to the latter.



Net Annual Global Emissions of Carbon Dioxide (CO_2) *under RFF-SPs and SSPs, 1900-2300.*[167]

[165] *Id.*

[166] *Id.* at 24.

[167] *Id.* at 25 (Figure 2.1.3).

3.1.2 Compounding Errors in Climate Modeling

The exaggeration caused by implausible emissions scenarios is often compounded by the use of models that project the most extreme warming from those emissions ("hot models") and a tendency to present highly uncertain projections of resultant harm with false certainty.

3.1.2.1. Climate Sensitivity and "Hot Models"

As explained earlier, *supra* 2.2.1, a key determinant of projected warming in climate models is equilibrium climate sensitivity, which estimates how much the global average temperature would rise in response to a doubling of atmospheric carbon dioxide compared to pre-industrial levels. The IPCC's AR6 provided a "likely" climate sensitivity range of 2.5°C to 4.0 °C.[168]

Many studies cited by eNGOs rely on models from the Coupled Model Intercomparison Project (CMIP) that exhibit values well above 4.0 °C, sometimes exceeding 5.0 °C.[169] These "hot models" are increasingly recognized as running too hot, as they systematically overstate observed warming trends.[170] When hot models are prioritized or used exclusively in impact studies, the resulting projections of future temperature rise, sea-level rise, and extreme weather are skewed toward the high end of the plausible range, or beyond it.

3.1.2.2. False Certainty and Model Choice

The climate system is characterized by complex feedback loops, such as the effect of clouds and aerosols, which remain major sources of uncertainty in climate modeling. Whether clouds will amplify or dampen warming is perhaps the largest unknown. Yet, impact studies frequently downplay these limitations, presenting their model outputs as definitive predictions rather than contingent projections.

This false certainty is reinforced by flawed modeling practices. Some studies cited in regulatory comments rely on the output of a single climate model or a single model run, rather than a multi-model ensemble. Findings derived from a single model are not representative of the full range of

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[168] IPCC AR6 WGI, at 199 Fig. 1.16 (Ch. 1: Framing, Context, and Methods) (Chen et al.).

[169] The most prominent "hot" models identified in various studies include: CanESM5 (Canadian Earth System Model 5); NESM3 (NorESM Earth System Model 3); IPSL-CM6A-LR (IPSL Climate Model 6A, Low Resolution); EC-Earth3-Veg (European Community Earth-System Model 3, with vegetation); EC-Earth3 (European Community Earth-System Model 3); CESM2 (Community Earth System Model 2); ACCESS-ESM1-5 (Australian Community Climate and Earth-System Simulator 1.5), and; INM-CM4-8 and INM-CM5-0 (Institute for Numerical Mathematics Climate Model).

[170] *See* Cooper et al., *Last Glacial Maximum Pattern Effects Reduce Climate Sensitivity Estimates*, 10 Sci. Advances 9461 (2024), https://www.science.org/doi/10.1126/sciadv.adk9461.

possibilities and are considered scientifically indefensible for policy use, as they misrepresent the actual range of scientific understanding and uncertainty.[171]

Conversely, when multi-model ensembles are used, the ensemble average is often presented as the most likely outcome. However, if the ensemble itself is skewed by the inclusion of numerous "hot models" that are inconsistent with observational evidence, the average will also be biased high.

3.1.3 Flaws in Observational Data

The 2009 Endangerment Finding and many of the studies cited by the eNGOs relied heavily on observed trends in warming and extreme weather. But the analysis of observed historical data frequently suffers from methodological weaknesses that exaggerate the perceived effects of climate change. Groups such as the eNGOs often rely on these analyses to claim that recent observations are unprecedented—but these claims often dissolve under serious scrutiny. The reliability of the observational record is compromised by several factors, including adjustments to raw data, the merging of disparate data types, sparse historical coverage, evolving measurement technologies, and inconsistent reporting standards.

3.1.4 Data Homogenization, Siting Biases, and the Urban Heat Island Effect

The instrumental temperature record is not a pure climate signal. It is affected by numerous non-climatic biases, including changes in instrumentation, station relocations, and, most significantly, the Urban Heat Island (UHI) effect. As a result of UHI, as urban areas grow around temperature stations, the detected local environment becomes warmer due to infrastructure and waste heat.[172]

Furthermore, the quality of station siting is critical, independent of urbanization. Stations located near artificial heat sources, buildings, or air conditioning units record localized warming unrelated to the background climate. Audits of monitoring networks, such as the U.S. Historical Climatology Network (USHCN), have revealed widespread non-compliance with established

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[171] *See* IPCC AR6 WGII, at 562 (Ch. 4: Future Global Climate) (Lee et al.) ("While single-model initial-condition large ensembles … are useful … Multi-Model Ensembles (MMEs) are required to sample model structural uncertainty."); *see also* Flato et al., Evaluation of climate models, in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* 755 (2013) ("Owing to uncertainties in the model formulation and the initial state, any individual simulation represents only one of the possible pathways the climate system might follow. To allow some evaluation of these uncertainties, it is necessary to carry out a number of simulations either with several models or by using an ensemble of simulations with a single model.")

[172] EPA, *What Are Heat Islands?*, https://www.epa.gov/heatislands/what-are-heat-islands (updated Sept. 2, 2025).

siting standards, introducing significant warming biases.[173] For example, rural stations located near new oil and gas developments may indicate an increase in temperatures as a result of the increased radiant heat.[174]

To be reliable for analyzing long-term climate trends, raw temperature data must be "homogenized"—statistically adjusted to correct for these biases. Homogenization typically involves comparing a station's record to its neighbors, assuming that localized divergences are non-climatic.

However, the methods to correct for bias are often opaque and can introduce biases themselves. If poor siting or urbanization is widespread in a region, the process may inadvertently spread these warming biases rather than remove them. Instead of correcting biased stations to match high-quality rural stations, the algorithm may blend the biased data, effectively spreading the artificial warming trend from poorly sited or urban stations into the records of well-sited rural ones. Studies that rely on raw or poorly homogenized data invariably exaggerate the observed warming trend. Many studies fail to adequately account for the UHI effect, particularly in rapidly developing regions, leading them to conflate local, urbanization-driven warming with the global climate signal. Studies that rely on raw or poorly homogenized data invariably exaggerate the observed warming trend.[175]

3.1.4.1. Improper Data Grafting

To claim that current warming is "unprecedented" over millennia, some studies employ a methodologically invalid technique known as "data grafting." This involves appending a modern, instrumental record (e.g., thermometer data) onto a long-term "proxy" record (e.g., tree rings, ice cores).

This comparison is statistically invalid because the two datasets have vastly different levels of uncertainty, resolution, and reliability. Proxy data provides a low-resolution, indirect measure of past climate conditions, smoothing out historical peaks and valleys. The instrumental record by contrast provides high-resolution, direct measurements. Grafting high-resolution data onto a low-resolution history—a technique infamously used in the "Hockey Stick" graph—manufactures an

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[173] *Station Data Bias*, Sustainability Directory (May 5, 2025), https://climate.sustainability-directory.com/term/station-data-bias.

[174] Koonin, *supra* note 56, at 31–34.

[175] Dumitrescu et al., *Long-Term Homogenized Air Temperature and Precipitation Datasets in Romania, 1901–2023*, 12 Sci. Data 1116 (2025), https://pmc.ncbi.nlm.nih.gov/articles/PMC12214662.

appearance of abrupt, unprecedented recent warming that is a statistical artifact of the grafting process.[176]

This practice is sometimes employed to address the "divergence problem," where certain tree-ring proxies that correlated with temperature in the past began to diverge (showing a decline in growth despite rising temperatures) from instrumental records after 1960. Rather than presenting the divergence, some graphs truncate the declining proxy data and graft the instrumental record in its place, visually exaggerating the trajectory of modern warming relative to the proxy reconstruction.[177]

3.1.4.2. Spatial Coverage Gaps and Interpolation Biases

The historical instrumental record suffers from significant gaps in geographic coverage. Monitoring stations have historically been concentrated in North America and Europe, with sparse coverage across vast regions of the oceans, the poles, and the Global South. Reliable instrumental records with quasi-global coverage only date back to approximately 1850.[178]

To create a "global" temperature average, organizations use spatial interpolation (e.g., Kriging) to "infill" data for regions where no measurements exist. This process estimates the temperature in unmonitored areas based on distant stations. This introduces substantial uncertainty, particularly where data is sparse. The statistical methods used for infilling rely upon assumptions about the relationship between data-rich and data-poor areas. If these assumptions are incorrect, or if the interpolation techniques do not adequately account for localized factors such as elevation changes, then the resulting global average can be biased.

3.1.4.3. Detection and Reporting Biases in Extreme Weather

Claims that extreme weather events, such as tornadoes and hurricanes, have increased in their frequency and intensity often rely upon historical databases biased by dramatic improvements in detection capabilities and changes in reporting standards.

For example, the historical tornado record exhibits a sharp increase in reported events since the 1990s. But this is largely attributable to the deployment of the Doppler radar network (WSR-

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[176] For a more detailed account of the origins of the hockey stick graph, *see* Rapp, *Revisiting 2,000 Years of Climate Change (Bad Science and the "Hockey Stick")*, 3 IgMin Res 160 (2025), https://doi.org/10.61927/igmin296.

[177] *See, e.g.,* Montford, *The Hockey Stick Illusion: Climategate and the Corruption of Science* (2010).

[178] Nat'l Rsch. Council, Surface Temperature Reconstructions for the Last 2,000 Years 30 (Nat'l Acads. Press 2006), https://nap.nationalacademies.org/read/11676/chapter/5.

88D), increased storm chasing, and greater public awareness, all of which improved the detection of weak tornadoes that previously went unreported.[179] This "detection bias"—where more events are recorded simply because more people are present to see them or better technology makes it easier to detect—creates an artificial upward trend in total counts.[180]

The historical hurricane record has a similar bias. Before the advent of global satellite monitoring in the 1970s, detection relied entirely upon ship logs and coastal observations, so many storms that remained at sea were missed. Studies suggest that the recorded century-scale increase in Atlantic hurricane frequency is largely consistent with these changes in detection practices rather than a true climate trend.[181]

Some studies rely upon economic loss data to infer climate trends. But that, too, is flawed because it fails to account for socio-economic changes. Increased population, wealth, and development in vulnerable areas naturally lead to higher economic losses over time, even if the intensity of the meteorological events remains unchanged.

3.1.4.4. Cherry-Picking Timeframes

The selection of specific start and end dates can significantly influence the appearance of a trend. Climate trends are generally defined over periods of at least 30 years to distinguish the climate signal from natural variability.[182] However, some studies analyze short-term trends or use suspicious start/end dates—for example, starting on a known low year (such as a major La Niña event) and ending on a high year (such as a major El Niño event)—to manufacture a statistically significant trend.[183] Such cherry-picking of timeframes misrepresents the long-term data and conflates natural variability with a long-term climate signal.

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[179] Nat'l Oceanic & Atmospheric Admin., Nat'l Severe Storms Lab., *Severe Weather 101: Tornado Detection*, https://www.nssl.noaa.gov/education/svrwx101/tornadoes/detection/ (last visited Nov. 20, 2025).

[180] Elsner et al., *The Decreasing Population Bias in Tornado Reports Across the Central Plains*, 5 Weather, Climate & Soc'y 237 (2013), https://doi.org/10.1175/WCAS-D-12-00040.1.

[181] Vecchi et al., *Changes in Atlantic Major Hurricane Frequency Since the Late-19th Century*, 12 Nat. Commc'ns 4056 (2021), https://doi.org/10.1038/s41467-021-24268-5.

[182] ClimateData.ca, *Establishing the 30-Year Baseline*, https://climatedata.ca/resource/30-years-data/ (last visited Nov. 20, 2025).

[183] For examples of studies relied upon by the eNGOs that cherry-pick timelines, see A20, A49, A67, and A121.

3.1.5 The Distortion of Damage Modeling

The errors in emissions scenarios and climate modeling propagate into the assessment of climate change impacts and economic damages. The methodologies used to translate temperature increases into economic losses are often speculative and highly sensitive to initial modeling assumptions.

3.1.5.1. How Extreme Scenarios Skew Damage Functions

The reliance on RCP 8.5 fundamentally undermines the damage predictions frequently cited by eNGOs. Many impact studies utilize "pre-processing," where damages are individually related to increasing temperatures via the development of a mathematical function—typically a simple linear regression of damages on changes in temperature.

But these impact functions are often developed using RCP 8.5 (or even more extreme scenarios). Because damages do not increase linearly, the more extreme the values included when creating a damage function, the higher the damage function will be at *all* temperatures. Thus, the use of the extreme RCP 8.5 scenario results in much larger damage at lower, more plausible temperatures (e.g., 2 °C to 3 °C) than would result if extreme scenarios were not included, simply due to the linear fitting used to create the impact function.

For example, projections of temperature-related mortality—which often dominate total damage calculations—frequently rely on studies heavily dependent upon RCP 8.5. Virtually all damages associated with mortality in these studies are dependent upon the extreme temperatures generated by RCP 8.5. At lower temperatures, up to around 3 °C, the data often shows virtually no correlation between temperature and mortality.

This is unsurprising, as the broader scientific literature suggests that there may be a decrease in mortality at low levels of warming, due to a reduction in cold-related deaths. A 2015 meta-study found that 17 times more deaths are attributable to low temperatures than to high.[184] Similarly, a 2021 study found that, while heat-related deaths have increased somewhat over the last two

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[184] *See, e.g.*, Lee & Dessler, *Future Temperature-Related Deaths in the US: The Impact of Climate Change, Demographics, and Adaptation*, 7 GeoHealth e2023GH000799 (2023), https://doi.org/10.1029/2023GH000799.

decades, they were more than offset by reductions in cold-related deaths, with the net effect that climate-related mortality has decreased globally.[185]

Similarly, assessments of air quality often rely on studies that use only RCP 8.5 to generate temperature changes. When a linear regression excludes warming levels above 4.5 °C (only possible with RCP 8.5), any significant relationship between mean warming and air-quality deaths may disappear. The use of RCP 8.5 creates extreme values that, when fitted with a linear trend, results in increasing losses at lower temperatures despite no evidence of these losses in the underlying data.

3.1.5.2. Speculative Damage Functions

Beyond the influence of extreme scenarios, the specification of the damage functions themselves is often arbitrary and lacks empirical foundation. Many Integrated Assessment Models (IAMs), used to calculate the Social Cost of Carbon (SCC) and overall economic impacts, employ simple polynomial functions (e.g., $\text{Loss} = k * (\Delta T)^2$) to link temperature rise to economic losses.[186]

These functions are typically calibrated, not estimated from empirical data. The choice of a quadratic function, for instance, inherently assumes that damage accelerates rapidly as temperatures rise. This assumption is not necessarily supported by historical evidence or robust economic theory. The resulting projections of economic "damage" are therefore highly sensitive to these non-empirical, assumed mathematical formulas, which can make their outputs unreliable for policy decisions.[187]

The seminal review of these models by MIT economist Robert Pindyck exposes the fatal weakness of this approach.[188] Pindyck concludes that the damage functions—the "guts" of the models that translate temperature into dollars—are "completely ad hoc, with no theoretical or empirical foundation."[189] He explains that the functional forms chosen by modelers are "just

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[185] Zhao et al., *Global, Regional, and National Burden of Mortality Associated with Non-optimal Ambient Temperatures from 2000 to 2019: A Three-stage Modelling Study*, 5 Lancet Planetary Health e415 (2021), https://doi.org/10.1016/S2542-5196(21)00081-4.

[186] See, for example, the DICE model. Ctr. for Robust Decision Making on Climate & Energy Pol'y, *Damages*, WebDICE, http://webdice.rdcep.org/glossary/damages (last visited Nov. 20, 2025).

[187] Pezzey, *Why the Social Cost of Carbon Will Always Be Disputed*, , 10 WIREs Climate Change e558 (2018), https://doi.org/10.1002/wcc.558.

[188] Pindyck, *Climate Change Policy: What Do the Models Tell Us?*, 51 J. Econ. Lit. 860 (2013), http://dx.doi.org/10.1257/jel.51.3.860.

[189] *Id.* at 860.

arbitrary functions, made up to describe how GDP goes down when T goes up."[190] There is simply "no economic theory" that dictates whether the relationship between temperature and GDP is quadratic, exponential, or otherwise, yet the choice of function drastically alters the resulting cost estimate. Consequently, the models create a veneer of rigorous analysis that disguises what is essentially "guesswork" by the modeler regarding the values of key parameters.[191]

This lack of foundation renders the eNGOs' reliance on high-impact damage estimates functionally useless. Pindyck notes that most modelers calibrate their parameters to yield small damages for small temperature increases (e.g., 2 °C) based on "common wisdom."[192] However, the eNGOs and the agencies often input extreme temperature scenarios (such as those from RCP 8.5, projecting 5 °C or more) into these same functions. Pindyck explicitly warns that this is statistically invalid: because the damage functions "tell us nothing about what to expect" at high temperatures, "putting T = 5 or T = 7 into [these equations] is a completely meaningless exercise."[193] The resulting catastrophic damage estimates are not the result of scientific inquiry, but of extrapolating arbitrary curves into a realm where we have zero data. As Pindyck bluntly assesses, these damage functions "are completely made up."[194]

3.1.5.3. Misattribution of Harms and Failure to Normalize

A common claim in the eNGO comments is that economic losses from extreme weather are increasing due to climate change. But the studies cited to support this claim frequently fail to "normalize" the data, leading to a fundamental misattribution of the causes of rising costs.

Normalizing is the process of adjusting economic loss data to account for increases in population, wealth, and infrastructure over time. As societies become wealthier and more populated, there is simply more property value in harm's way. A hurricane hitting a developed coastline today will

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[190] *Id.* at 867.

[191] *Id.* at 868.

[192] *Id.*

[193] *Id.*

[194] *Id.*

cause vastly more damage than the same intensity hurricane hitting the same location decades ago, purely due to increased development. This is known as the "expanding bull's-eye effect."[195]

Studies that report rising economic damages without normalizing the data are misattributing losses caused by socioeconomic growth to climate change. When the data is normalized, it often shows no significant trend in economic losses attributable to changes in the frequency or intensity of extreme weather events.[196]

3.1.5.4. Misuse of Unreliable Extreme Event Attribution Studies

Furthermore, the eNGOs and other commenters often misuse so-called probabilistic extreme "event attribution" studies to support definitive causal claims. It is frequently claimed that climate change *caused* a specific event, ignoring the precise, probabilistic language of the studies they cite (e.g., "climate change made the event X% more likely").[197] Such definitive causal assertions are rarely supported by the underlying climate science. The tendency to attribute any weather volatility or "weird weather" (including events such as cold snaps or tornadoes where the causal links are highly speculative) to climate change lacks scientific rigor and contributes to an exaggerated perception of climate risk.

The fundamental flaw in event attribution studies is their reliance on unverifiable counterfactuals. These studies typically attempt to quantify a change in the odds of an extreme event by comparing rare, extreme events in the real world to a fictional, counterfactual world without human influence. The validity of the results of the modeling exercises rests entirely on the assumption that the model can accurately simulate this fictional baseline without human influence—an assumption that is impossible to verify. Because the "control group" (an Earth

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[195] Patrick Brown, *Are Floods Dramatically Increasing Due to Climate Change? Part Two*, Breakthrough J. (May 22, 2024), https://thebreakthrough.org/journal/no-20-spring-2024/are-floods-dramatically-increasing-due-to-climate-change-part-two.

[196]Alimonti & Mariani, *Quantifying the climate crisis: a data-driven framework using response indicators for evidence-based adaptation policies*, Environmental Hazards (2025), https://doi.org/10.1080/17477891.2025.2583703.

[197] *See, e.g.,* eNGO Endangerment Comment at 100 ("Climate change has already affected the severity of many extreme weather events—like making the 2021 Pacific Northwest heatwave eight times more likely.") (citing Leach et al., *Heatwave Attribution Based on Reliable Operational Weather Forecasts*, 15 Nat. Commc'ns 4530 (2024), https://doi.org/10.1038/s41467-024-48280-7).

without humans) does not exist, the modeling outputs cannot be tested or falsified. As such, these studies fail the basic evidentiary standard for scientific knowledge.[198]

Attribution studies further rely on the assumption that General Circulation Models (GCMs) are fit for the purpose of simulating localized, extreme weather statistics. This assumption is frequently unjustified. As climatologist Judith Curry has demonstrated, standard attribution claims often suffer from "apparent circular reasoning" regarding the causes of observed changes.[199] By "dismissing natural internal multidecadal variability" in favor of anthropogenic forcing, these methodologies artificially inflate confidence in human causation. Curry warns that this failure to account for fundamental "indeterminacy and ignorance" results in "misleading overconfidence" regarding the link between emissions and specific climate phenomena. Consequently, results are highly sensitive to the subjective parameterizations built into the models. Different studies analyzing the same event often produce widely varying results, undermining the notion that attribution science offers reliable evidence of causation. Dr. Roger Pielke Jr., whose climate work has earned him numerous awards and withstood the test of official IPCC assessment, has called these studies "pseudoscience."[200]

Specific attribution initiatives, such as the World Weather Attribution (WWA) initiative—a Bezos Earth Fund funded group aiming to stoke climate alarm—use methodologies with fatal logical flaws. For example, the WWA analyses often assume an extreme value distribution that doesn't change *except as a result of global mean surface temperature*. By assuming *a priori* that global mean surface temperature is the *only* variable driving changes in distribution, the model forces a finding of attribution.[201] This failure to control for factors such as internal climate variability renders the results scientifically meaningless; indeed, this methodology has been shown to

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[198] *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 593 (1993) ("Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested.").

[199] Curry, *Reasoning About Climate Uncertainty*, 108 Climatic Change 723 (2011), https://doi.org/10.1007/s10584-011-0180-z.

[200] Roger Pielke, Jr., *Behind the Curtain*, The Honest Broker (Apr. 5, 2025), https://rogerpielkejr.substack.com/p/behind-the-curtain.

[201] *Id.*

spuriously attribute changes in the distribution of extreme events to manmade global warming *even in pre-industrial climate model simulations* where such human influence is impossible.[202]

Many attribution studies make specific probability claims for specific weather events (such as hurricanes) where according to the IPCC long-term climate signals are not detectable let alone attributable to anthropogenic climate change.[203] Relying upon isolated attribution studies that contradict the broader scientific consensus regarding long-term trends is arbitrary.

Furthermore, these studies exhibit a distinct availability bias. By focusing exclusively on the "costs" of extreme heat or volatility, they ignore the benefits of the real world as compared to the hypothetical counterfactual scenario, such as a reduction in extreme cold events. EPA's judgment should focus on net risk. Focusing on only one aspect of the problem (increased risk of extreme heat) but ignoring the other (lowered risk of extreme cold) would be arbitrary.

Finally, the intense focus on attributing extreme events to climate change often misdirects policy discussions away from the most significant factors determining disaster losses: exposure and vulnerability.[204] Disaster costs are overwhelmingly driven by societal changes—where and how we build, and the increasing value of assets placed in harm's way, as explained *supra*, 3.1.4.3. Attribution studies often focus narrowly on the hazard (the weather event) while ignoring these dominant socioeconomic factors.

3.1.5.5. Omission of Adaptation

Another critical flaw pervasive in the climate impact literature cited by the eNGOs is the assumption of no or limited adaptation. But human beings are not potted plants. Human societies respond to environmental changes, particularly over the decades or centuries considered in many of the modeling forecasts used to estimate damage from climate change. Fossil-fueled powered civilization has an impressive track record of reducing vulnerability to extreme weather. Annual global deaths from extreme weather over the last century have fallen over 90 percent even while the world population has more than tripled.[205]

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[202] Sherman et al., *On the Attribution of Weather Events to Climate Change Using Empirically Fit Extreme Value Distributions*, 38 Journal of Climate 2799 (June 15, 2025), https://doi.org/10.1175/JCLI-D-23-0542.1.

[203] *Id.*

[204] Pielke Jr., *The Rightful Place of Science: Disasters and Climate Change* (2020).

[205] Hannah Ritchie & Pablo Rosado, *Natural Disasters*, Our World in Data (Jan. 2024), https://perma.cc/W9CH-QRWU.

One recent study documented a "a clear decreasing trend in both human and economic vulnerability, with global average mortality and economic loss rates that have dropped by 6.5 and nearly 5 times."[206] This is because wealthier developed societies with abundant access to energy and technology are far better at adapting to extreme weather than our predecessors. When hot weather threatens heat stress, humans install air conditioners. When areas become prone to flooding, humans build on higher ground or build levees and dikes. Indeed, the World Health Organization has explained in its own *Quantitative Risk Assessment of the Effects of Climate Change*, that "the attributable mortality is zero when 100% adaptation is assumed."[207]

But the climate-change impact literature largely ignores this reality. Instead, projections often assume no additional adaptation in critical sectors, including heat-related mortality, which dominates damage calculations.

This effect is exacerbated by a restrictive definition of adaptation broadly adopted by the climate impacts literature. In this literature, adaptation is often narrowly defined as only those actions *deliberately* taken to adapt to the impact of climate change. Thus, if some technological or socioeconomic trend would have occurred in the absence of climate change, then it cannot be counted as adaptation. "For example, the adoption of tractors instead of manual labor can cause a large increase in [crop] yields, but this would not be an explicit adaptation to climate change, and thus it would typically not be considered in a projection of future [crop] yields that 'accounts for adaptation.'"[208]

The future effect on economic output such as crop yields is then misleadingly labeled a "decrease" by comparing it to a fanciful counterfactual. As analyst Patrick Brown explains:

> Herein lies the obscurantism. Although most readers will understand the word "decrease" to mean a decrease relative to today, the IPCC uses the word to mean a decrease relative to a hypothetical world without climate change. So crop yields can be projected to continue to increase overall, but still be said to decrease

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[206] Formetta & Feyen, *Empirical Evidence of Declining Global Vulnerability to Climate-related Hazards*, 57 Glob. Env't Change 101920 (2019), https://doi.org/10.1016/j.gloenvcha.2019.05.004.

[207] WHO, *Quantitative Risk Assessment of the Effects of Climate Change* 23 (2014), https://tinyurl.com/24wc8ddv.

[208] *See* Brown, *The IPCC Report on the Impacts of Climate Change is Depressing*, Breakthrough Inst. (Mar. 30, 2023), https://perma.cc/NKF4-WC9H.

compared to a hypothetical world with no climate change but in which everything else is the same.[209]

Although precise quantification of future reduced vulnerability is difficult, there is no doubt that at least some adaptation will occur. Even with no technological changes—a highly improbable future—there are already meaningful ways that populations can reduce their exposure to the most damaging aspects of climate change. Failure to consider this important aspect of the problem further undermines the validity of projected damages. This is particularly important in the context of climate-related regulation because money spent to avoid climate change could also potentially be used to "adapt" or advance other sectors. If the regulation is ineffective and expensive, it could exacerbate climate harms by diverting funds that could be spent on adaptation or other societal needs. Furthermore, the economic burden of compliance reduces real income, thereby increasing health risks associated with poverty.[210]

3.1.6 The Role of Discount Rates

Finally, when the flawed science discussed above is translated into economic terms, such as the SCC or a present value of future damage, the analysis is further skewed by the arbitrary selection of discount rates. The discount rate is used to determine the present value of future damages.

The choice of discount rate has an enormous effect on the resulting damage estimate. A low "ethical" or "prescriptive" discount rate (e.g., 1-3%) places a high value on future impacts, while a higher "market" or "descriptive" discount rate (e.g., 5-7%), reflecting real-world investment returns and opportunity costs, results in a much lower present value of damages.[211]

Many economic analyses cited by the eNGOs utilize low, poorly justified discount rates that are inconsistent with market realities and so inflate the present value of future impacts. The resulting headline-grabbing damage figures are not empirical findings but are a direct, mechanical result of this non-obvious assumption. Pindyck explains that because the discount rate is essentially a chosen "policy parameter" rather than a scientific fact, modelers have a great deal of freedom to

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[209] *Id.*

[210] *See, e.g.*, Stephen Breyer, *Breaking the Vicious Circle: Toward Effective Risk Regulation* 23 (1993) ("[D]eprivation of real income itself has adverse health effects, in the form of poorer diet, more heart attacks, more suicides.").

[211] For a more fulsome discussion of the manipulability of the Social Cost of Carbon and the discount rate, *see infra*, Sec. 3.3.5.

derive the result they want.[212] Because the models are so sensitive to this arbitrary input, Pindyck notes that "these models can be used to obtain almost any result one desires." This practice artificially inflates the calculated benefits of regulation and favors costly interventions based on an economic assumption rather than a scientific finding.[213]

3.2. Scientific Evidence Does Not Unequivocally Establish that GHGs Endanger Public Health and Welfare

Replies to eNGO Endangerment Comment Section VI.A (pp. 99–115).

eNGO Claim: The eNGOs argue that the scientific evidence supporting the 2009 Endangerment Finding is "overwhelming" and "beyond scientific dispute," claiming this evidence has only "grown stronger" in the intervening years.[214] They present reports from bodies such as the IPCC, the National Climate Assessment, and the National Academies as unimpeachable consensus that the agency must accept.[215] This body of evidence, they claim, documents intensifying harms, such as a 200% increase in billion-dollar disasters.[216]

Refutation: This assertion rests on an unbalanced and curated interpretation of the scientific literature. Although foundational aspects of climate science—such as the fact that GHG concentrations are increasing and global average temperatures have risen—are established, the eNGOs' catastrophic portrayal of the resulting impacts is grossly overstated. Their submission presents a narrative that systematically ignores contrary findings, omits critical context regarding non-climatic drivers of environmental change, and relies heavily upon flawed methodologies and implausible worst-case scenarios discussed in Section 3.1, *supra*. By treating complex statistical attributions and speculative modeling outputs as established facts, the eNGOs misrepresent the actual state of the science.

When reviewed critically, the scientific evidence is far from "overwhelming." Instead, the record is characterized by profound uncertainties and significant confounding factors that undermine the case for endangerment.

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[212] Pindyck, *supra* note 188, at 864.

[213] *Id.* at 863.

[214] *See* eNGO Endangerment Comment at 99, 102.

[215] *Id.* at 99–115.

[216] *Id.* at 103.

3.2.1 The eNGOs' Broad Claims of Harm Rely on Misleading Framing and Omit Critical Context

The eNGOs begin their scientific case with a sweeping assertion: that GHG emissions "have led to" a laundry list of negative impacts, ranging from increases in average temperatures and sea-level rise to lower crop yields and worsening air quality.[217] This framing is deceptive in several ways.

First, the eNGOs improperly conflate straightforward observations (such as rising temperatures) with highly complex, model-dependent statistical attributions (such as effects on crop yields) and speculative future projections (such as the spread of diseases). By presenting this mixture in the past tense ("have led to"), the eNGOs misrepresent highly uncertain attributions and speculative model outputs as established, historical facts.

Second, in support of their generalized assertion of harm, the eNGOs provide a citation dump to a 90-page IPCC Technical Summary. This tactic obscures the weakness of the underlying evidence for many of their specific claims and allows the commenters to present a one-sided list of harms without any explanation of uncertainty. As will be illustrated below, virtually all of the specific claims are rife with uncertainty.

Third, the most alarming of the negative impacts referenced in the eNGOs' cited literature are not being observed now but are projections of the future. Virtually all the worst future impacts are predicated on high-end, "worst-case" emissions scenarios, specifically RCP 8.5 or its successor, SSP5-8.5. For example, projections regarding the collapse of carbon sinks[218] or rapid sea-level rise[219] are explicitly tied to these exaggerated scenarios. As discussed in Section 3.1.1, *supra*, these scenarios are now widely understood in the scientific literature to be implausible, high-impact "shock" scenarios, not "business-as-usual" or likely outcomes. This reliance on

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[217] *Id.* at 100 (citing IPCC, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* 37–118 (Pörtner et al. eds., 2022) (IPCC AR6 WGII),

[218] Green et al., *Large Influence of Soil Moisture on Long-Term Terrestrial Carbon Uptake*, 565 Nature 476 (2019), https://doi.org/10.1038/s41586-018-0848-x (relying exclusively on RCP 8.5, mischaracterized as "business-as-usual").

[219] DeConto et al., *The Paris Climate Agreement and Future Sea-Level Rise from Antarctica*, 593 Nature 83 (2021), https://doi.org/10.1038/s41586-021-03427-0 (projecting rapid acceleration only under high-end scenarios like RCP 8.5 and relying on the speculative "Marine Ice Cliff Instability" hypothesis).

implausible scenarios as a baseline for risk assessment constitutes a fundamental methodological flaw.

The other major issue with the eNGOs' framing of climate harms is that it conspicuously fails to adequately account for the global-scale benefits of increased atmospheric carbon dioxide. For example, the eNGOs claim that GHGs have led to "shifts in weather patterns that can lead to lower crop yields and nutritional value." [220] This ignores the dominant, empirically observed impact of carbon dioxide on agriculture: the fertilization effect. Elevated carbon dioxide levels directly enhance photosynthesis and improve plant water use efficiency, contributing significantly to greening the planet and increasing agricultural productivity. [221]

The eNGOs later try to preempt this reality by claiming that carbon dioxide fertilization effects "are increasingly limited by drought and warming." [222] Yet, this mischaracterizes their cited source, Li et al. (2023). That study explicitly finds that the positive carbon dioxide fertilization effect is the *dominant* factor controlling long-term global vegetation growth. The study concludes that elevated carbon dioxide "dominated" changes across 53% to 75% of the globe's vegetated land. [223] Although the study also claims that negative effects from warming (in particular, a vapor pressure deficit) may "partly offset" this trend in the future, the study acknowledges that this claimed offsetting effect needs further investigation and that isolating the extent of this offsetting effect is a very difficult and highly uncertain endeavor. Again, the eNGOs selectively ignore findings that contradict their narrative and state uncertain and tentative risks as historical facts.

3.2.2 Claims Regarding Extreme Weather Events Are Based on Speculative Attribution and Ignore Confounding Factors

A central pillar of the eNGOs' argument is the assertion that climate change is demonstrably increasing the frequency and intensity of extreme weather events. The eNGOs' attempt to establish these links relies heavily upon the emerging field of extreme weather event attribution, a field whose methodologies are fundamentally speculative, cannot prove causation, and often fail to account for significant confounding variables.

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[220] *See* eNGO Endangerment Comment at 100.

[221] Prior, et al., *A Review of Elevated Atomospheric CO2 Effects on Plant Growth and Water Relations*, 46 Horticultural Science 158 (2011), https://doi.org/10.21273/HORTSCI.46.2.158.

[222] *See id.* at 108–09.

[223] Li et al., *Vegetation Growth Due to CO2 Fertilization is Threatened by Increasing Vapor Pressure Deficit*, 619 J. Hydrology 129292, 5 (2023), https://doi.org/10.1016/j.jhydrol.2023.129292.

3.2.2.1. Heatwaves and Extreme Heat

The eNGOs emphasize the 2021 Pacific Northwest heatwave, citing studies claiming the event was made "eight times more likely" [224] by climate change or was "virtually impossible" without climate change. [225] As explained above, *supra* Section 3.1.5.4, these types of studies are fundamentally unscientific. [226]

The specific studies cited also suffer from profound limitations that suggest that these models are not capable of reliably making these sorts of predictions. As an initial matter, for example, Leach et al. start by conceding that "major challenges are still apparent when it comes to quantifying human influence in the most extreme weather events. Such events are particularly difficult to draw confident conclusions about due to the lack of historical analogues, and their often poor representation in the climate models normally used for event attribution." [227] Leach et al.'s "8 times" figure is derived from a *single* weather forecast model using a novel approach, a limitation the authors acknowledge. [228] Furthermore, the figure is not a direct model output but a statistical extrapolation based on an incomplete simulation and an assumed scaling factor. [229] The eNGOs also omit the study's vast uncertainty range: the authors found that climate change could have made between 2 and 50 times more likely. [230] That is guesswork, not reliable evidence.

Similarly, Bartusek et al.'s conclusion that the 2021 Pacific Northwest heatwave was "virtually impossible" is an overreach. [231] The event was such an extreme statistical outlier (a "5-sigma" event) that attributing it relies entirely on the fidelity of highly uncertain climate models at the

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[224] eNGO Endangerment Comment at 100 (citing Leach et al., *supra* note 197).

[225] *Id.* at 109 (citing Bartusek et al., *2021 North American Heatwave Amplified by Climate Change-Driven Nonlinear Interactions*, 12 Nature Climate Change 1143 (2022), https://doi.org/10.1038/s41558-022-01520-4).

[226] *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 593 (1993) ("Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested.").

[227] Leach et al., *supra* note 197, at 1.

[228] Leach et al., *supra* note 197 ("our use of a single model is a limitation here").

[229] *Id.* (noting the counterfactual simulation was incomplete, requiring statistical scaling based on an assumed linear relationship).

[230] *Id.*

[231] Bartusek et al., *supra* note 225, at 1143.

extreme tails of their probability distributions.[232] The authors themselves question whether the mechanisms driving the event are "inadequately captured by climate models."[233]

Furthermore, when the eNGOs make general claims about increasing heat extremes,[234] they omit other variables. Citing the IPCC, they ignore the report's qualification that the global signal is significantly altered by local processes, including urbanization and land-use changes.[235] This omission ignores the significant confounding effects of the UHI effect on the temperature record.

Finally, the eNGOs assert that extreme heat exposure causes thousands of deaths and $100 billion in lost labor productivity annually in the United States. These claims are unsupported by reliable evidence. As an initial matter, the eNGOs misleadingly conflate the effects of extreme heat with the attributable effects of climate change on extreme heat.[236] That conflation makes their claims irrelevant: EPA is not in charge of reducing the risk of heat, but the risk of air pollution. And the risk of heat is in any event *declining* in the United States, not increasing, even despite an aging population and net migration to the Sun Belt.[237] The claims relating to U.S. worker productivity are also not reliable. "There is no credible evidence suggesting that warming will reduce the rate of growth of GDP per capita," let alone meaningfully reduce worker productivity in the United States.[238]

The eNGOs' claim that heat currently causes "thousands of deaths" in the United States is based on a single research letter drawing a dubious correlation between heat events and excess deaths.[239] U.S. vital statistics from the CDC based on far more reliable death certificates following a forensic analysis, not dubious correlations, show that coroner-verified heat-related

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[232] *Id.*

[233] *Id.*

[234] *See* eNGO Endangerment Comment at 109.

[235] IPCC AR6 WGII, at 52 (Technical Summary) (Pörtner et al.). (noting urbanization exacerbates temperature extremes in cities).

[236] *See* eNGO Endangerment Comment at 101.

[237] Sheridan et al., *Recent Trends in Heat-Related Mortality in the United States: An Update through 2018*, 13 Weather, Climate, & Society 95 (2021).

[238] Barker, *Global Non-Linear Effect of Temperature on Economic Production: Comment on Burke, Hsiang, and Miguel*, 21 Econ. J. Watch 35, 66 (2024).

[239] Howard et al., *Trends of Heat-Related Deaths in the US, 1999-2023*, 332 JAMA 1203 (2024), https://doi.org/10.1001/jama.2024.16386.

deaths number less than 1,000 per year, not "thousands."[240] From 2000 to 2024, U.S. heat-related deaths (including deaths where heat was merely listed as a contributing factor, not a cause) are documented by the CDC's data at about 2.3 per million U.S. residents, or about 800 deaths per year.[241] The rate of U.S. cold-related deaths is roughly twice as high.[242] Even if the CDC's count of heat-related deaths could be an undercount, other attempts to second-guess those numbers through epidemiological correlations between heat and excess mortality have estimated approximately 1,300 excess deaths per year, not "thousands."[243]

These epidemiological studies correlating heat with excess deaths should in any event be viewed with great skepticism. All-cause mortality is a particularly controversial endpoint in epidemiology given the significant potential for confounding bias.[244] Death is not a rare disease. All people die, for many reasons. Death certificates are far more reliable. Moreover, the eNGOs' narrative consistently ignores the benefits of warming in reducing cold-related mortality, which exceeds heat-related mortality.[245]

The eNGOs' claim of $100 billion in U.S. productivity losses is based on an unpublished consultant white paper[246] prepared for the Adrienne Arsht-Rockefeller Foundation Resilience Center, an entity funded by the Rockefeller Foundation bankrolling climate litigation.[247] The white paper assumes that worker productivity declines linearly starting at a Wet Bulb Globe

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[240] *See* Khatana et al., *Association of Extreme Heat with All-Cause Mortality in the Contiguous US, 2008-2017*, 5 JAMA Netw. Open e2212957 (2022), https://doi.org/10.1001/jamanetworkopen.2022.12957.

[241] EPA, *Climate Change Indicators: Heat-Related Deaths*, https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths (last visited Nov. 20, 2025).

[242] EPA, *Climate Change Indicators: Cold-Related Deaths*, https://www.epa.gov/climate-indicators/climate-change-indicators-cold-related-deaths (last visited Nov. 25, 2025).

[243] *Id.*

[244] *See* Weiss, *All-cause Mortality as an Outcome in Epidemiologic Studies: Proceed with Caution*, 29 Eur. J. Epidemiology 147 (2014), https://doi.org/10.1007/s10654-014-9899-y.

[245] *See, e.g.*, Zhao et al., *supra* 185 (finding that reductions in cold-related deaths have more than offset increases in heat-related deaths globally).

[246] Adrienne Arsht-Rockefeller Found. Resilience Ctr., *Extreme Heat: The Economic and Social Consequences for the United States*, Atl. Council (Aug. 2021), https://www.atlanticcouncil.org/wp-content/uploads/2021/08/Extreme-Heat-Report-2021.pdf.

[247] Press Release, Rockefeller Found., *Rockefeller Foundation Announces $30 Million Grant to Adrienne Arsht Center for Resilience at Atlantic Counci*l (May 4, 2021), https://www.rockefellerfoundation.org/news/rockefeller-foundation-announces-30-million-grant-adrienne-arsht-center-resilience-atlantic-council/.

Temperature (WBGT) of 25 degrees Celsius (77 °F) and *drops to zero* productivity above 36.2 degrees (97.2 °F).[248] Yes, that's right. Productivity for all external workers (as defined in the study) drops to zero at 97.2°F.

The authors barely explain the derivation of his crude (and frankly, absurd) relationship, and other analyses refute it. Empirical data shows that the relationship between WBGT and labor productivity is not linear and that productivity losses are driven by extreme temperatures, so using a linear function significantly overstates the productivity losses experienced at more typical hot temperatures.[249]

Further, these relationships are far too imprecise to be useful. Worker heat stress depends upon both the worker's acclimatization to local climate conditions and the metabolic rate that the job demands, as well as the available means of mitigating heat stress on the job, none of which is captured in this incredibly crude, unscientific linear formula or otherwise accounted for in the white paper.[250] To put it concretely, the white paper predicts the same productivity losses for sugarcane cutters or movers doing heavy lifting and a street vendor swiping credit cards. Further, the study assumes high worker heat exposure rates for different economic sectors with little basis beyond wild guessing and assumes a binary of exposure to heat vs. non-exposure that is false for most U.S. workers. In short, the eNGOs' claimed $100 billion in productivity losses from heat is profoundly unreliable.

3.2.2.2. Wildfires

The eNGOs' claim that climate change has "fostered more dangerous conditions for wildfires" similarly relies on speculative attribution that minimizes confounding factors.[251] The primary citation, Abatzoglou & Williams (2016), claims climate change "nearly doubl[ed] the forest fire area."[252] But like the heat wave attribution listed above, this attribution is the result of a model-

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[248] Adrienne Arsht-Rockefeller Found. Resilience Ctr., *Methodology: Extreme Heat: The Economic and Social Consequences for the United States*, Atl. Council (Aug. 2021), https://www.atlanticcouncil.org/wp-content/uploads/2021/08/Extreme-Heat-USA-Methodology.pdf.

[249] *See, e.g.*, Dally et al., *The Impact of Heat and Impaired Kidney Function on Productivity of Guatemalan Sugarcane Workers*, 13 PLOS ONE e0205181 (2018), https://doi.org/10.1371/journal.pone.0205181.

[250] *See* Nat'l Inst. for Occupational Safety & Health, *Occupational Exposure to Heat and Hot Environments: Revised Criteria* 1–2 (2016).

[251] eNGO Endangerment Comment at 100–01.

[252] Abatzoglou & Williams, *Impact of Anthropogenic Climate Change on Wildfire Across Western US Forests*, 113 Proc. Nat'l Acad. Scis. 11,770, 11,770 (2016), https://doi.org/10.1073/pnas.1607171113.

dependent statistical exercise that creates a fictional counterfactual world by subtracting a model-derived "climate change signal" from real-world data.

This study systematically omits key variables and confounding factors, including decades of fire-suppression policies, changes in fuel loads, and insect outbreaks—all of which the authors concede "have likely added to the area burned."[253] Forest management practices are often the dominant factor in assessing changes in wildfire activity, yet they are minimized in this analysis.

The eNGOs compound this flawed attribution of harm to wildfires by touting speculative projections from Qiu et al. (2025) that wildfire smoke will cause "26,500 to 30,040 annual excess deaths by mid-century" relative to 2011-2020.[254] This figure, based upon a "high-warming scenario" (SSP3-7.0), is the product of a multi-step modeling chain with many compounding uncertainties. The high mortality number is inflated by a speculative assumption that smoke exposure continues to cause excess deaths for a full year after the event, despite the authors admission that estimating long-term impacts is "challenging."[255] And the projection assumes no improvement in human adaptation or land management for the next 30 years.[256] The claim further relies on an epidemiological correlation between ambient fine particulate matter and mortality that is subject to significant uncertainty.[257]

3.2.2.3. Precipitation, Drought, and Flooding

The eNGOs also assert that climate change is causing "more droughts, water scarcity, and floods."[258] This is a significant exaggeration that misrepresents the nuanced findings of the cited sources.

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[253] *Id.* at 11,773.

[254] eNGO Endangerment Comment at 101 (citing Qiu et al., *Wildfire Smoke Exposure and Mortality Burden in the US Under Climate Change*, Nature (2025), https://doi.org/10.1038/s41586-025-09611-w.

[255] Qiu et al., *supra* note 254.

[256] *Id.*

[257] *See* Comment of Stanley Young, EPA-HQ-OAR-2025-0194-1741; *see also* Young et al., *Air quality and Acute deaths in California*, 2000-2012, 88 Regul Toxicol Pharmacol. 173-84 (2017), https://doi.org/10.1016/j.yrtph.2017.06.003 ("Our analysis finds little evidence for an association between air quality [$PM_{2.5}$ and ozone] and acute deaths."); Richard L. Smith, *Dependence of Short-Term Mortality on Fine Particulate Matter in the Population of Elderly Medicare Beneficiaries* (2021), https://rls.sites.oasis.unc.edu/postscript/rs/Smith-Medicare-PM.pdf.

[258] eNGO Endangerment Comment at 112.

Regarding floods, the eNGOs conflate two distinct phenomena: increased heavy precipitation and river flooding. Although the IPCC finds high confidence in the attribution of increased precipitation to human influence,[259] it also says that "there is low confidence in the human influence on the changes in high river flows on the global scale."[260] In fact, Swain et al. (2025), cited by the eNGOs, labels this disconnect as an "extreme precipitation-flood paradox" and explains that despite increases in observed precipitation, "the evidence base for systematic increases in flooding is weaker."[261]

The eNGOs' claim that communities are adapting stormwater systems due to "climate-related increases in storm frequency and/or intensity."[262] But this is misleading. Although the report notes increases in tropical cyclone intensity, it explicitly concludes that for the region's dominant winter storm type, the "frequency and intensity of extra-tropical (nor'easter) storms has not changed."[263] Furthermore, the report concludes that "extra-tropical storm intensity in the 21st century is not likely to be statistically different than storm intensity for the 20th century."[264] The commenters fail to acknowledge this finding, which refutes the implication of a universal increase in storm intensity for that region.[265]

Regarding droughts, the IPCC finds only *low confidence* that human influence has affected trends in meteorological droughts in most regions, with low to no agreement on whether droughts have increased or decreased across virtually all of the United States.[266] The eNGOs' attempt to claim that the combination of heatwaves and droughts is "becoming more common" is based on

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[259] IPCC AR6 WGI, at 42, 108 (Technical Summary) (Arias et al.).

[260] IPCC AR6 WGI, at 1569 (Ch. 11: Weather and Climate Extreme Events in a Changing Climate) (Seneviratne et al.).

[261] Swain et al., *Hydroclimate Volatility on a Warming Earth*, 6 Nature Revs. Earth & Env't 35, 44 (2025) (Box 2), https://doi.org/10.1038/s43017-024-00624-z.

[262] eNGO Endangerment Comment at 113.

[263] Horsley-Witten Grp., *Assessment of Climate Change Impacts on Stormwater BMPs and Recommended BMP Design Considerations in Coastal Communities* 3 (2015) (analyzing Nor'easters and concluding their "frequency and intensity ... has not changed").

[264] *Id.* at 11.

[265] *Id.*

[266] IPCC AR6 WGI, at 109 Box TS.10 fig.1 (Technical Summary) (Arias et al.) ("Synthesis of assessed observed and attributable regional changes.").

Mukherjee & Mishra (2021).[267] That study uses a drought metric (the Thornthwaite method) that is overwhelmingly driven by temperature.[268] Consequently, finding that heatwaves (defined by high temperatures) increasingly coincide with drought (defined by a metric heavily influenced by high temperatures) is largely tautological—an artifact of metric selection rather than a robust hydrological finding.[269]

Similarly, the claim that snowpack is "declining across the western U.S."[270] is contradicted by the cited source, Musselman et al. (2021). That study found that snowpack magnitude has declined at only 12% of stations.[271] The eNGOs appear to conflate the study's findings about *earlier* melt with a decline in snowpack.

3.2.3 The eNGOs Misattribute Coastal Risks by Ignoring Non-Climatic Drivers

A recurring theme in the eNGO comments is the attribution of observed impacts entirely to climate change, while ignoring the dominant role of non-climatic, socioeconomic drivers. This causal misattribution is particularly evident in the eNGOs' discussion of coastal risks and infrastructure vulnerability.

3.2.3.1. Coastal Risks and the Role of Subsidence

The eNGOs claim that "[s]ea level rise is worsening flooding," causing relocations and necessitating billions in spending.[272] This misrepresents the cited IPCC report, Oppenheimer et al. (2019), by omitting or downplaying critical findings regarding the actual drivers of coastal risk.

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[267] eNGO Endangerment Comment at 109 (citing Mukherjee & Mishra, *Increase in Compound Drought and Heatwaves in a Warming World*, 48 Geophysical Rsch. Letters e2020GL090617 (2021), https://doi.org/10.1029/2020GL090617).

[268] *See generally* Thornthwaite, *An Approach Toward a Rational Classification of Climate*, 38 Geographical Rev. 55 (1948), https://doi.org/10.2307/210739.

[269] The Thornthwaite method is known to be overwhelmingly driven by temperature, meaning the metric will mechanically indicate increasing drought severity due to higher temperatures alone, even absent changes in precipitation or hydrology. *See* Lewis, *Global Drought May Have Changed Less Than Thought*, Sci. News (Nov. 14, 2012), https://www.sciencenews.org/article/global-drought-may-have-changed-less-thought.

[270] eNGO Endangerment Comment at 113.

[271] Musselman et al., *Winter Melt Trends Portend Widespread Declines in Snow Water Resources*, 11 Nature Climate Change 418, 423 (2021), https://doi.org/10.1038/s41558-021-01014-9 ("We show that snowpack magnitude has declined at ~12% of 634 stations with long records in western North America.").

[272] eNGO Endangerment Comment at 101–02.

The IPCC explicitly states with "very high confidence" that "[n]on-climatic anthropogenic drivers, including recent and historical demographic and settlement trends and anthropogenic subsidence, have played an important role in increasing low-lying coastal communities' exposure and vulnerability."[273] The report emphasizes that in many delta regions, subsidence caused by human activities (such as groundwater extraction) is currently *the most important* cause of relative sea-level change, and can "exceed those of climate-induced SLR by an order of magnitude."[274] By omitting this essential context, the eNGOs improperly attribute impacts driven primarily by local development and geological processes entirely to global climate change.

The eNGOs also claim that 20 million U.S. residents could be at risk of flooding by 2030.[275] That claim is based on a fundamentally flawed methodology from an older study (Curtis & Schneider (2011)) cited by the eNGOs' source. That study conflates the total population of a county with the affected population, assuming that if any part of a county is inundated, its entire population is then affected.[276] It also used a sea-level rise scenario (1 meter) that is 7 to 24 times higher than realistic projections for 2030.[277]

3.2.3.2. The Expanding Bull's-Eye Effect

The eNGOs' tendency to conflate increased exposure with increased hazard is also pervasive. As discussed *supra*, 3.1.5.3, this is known as the "expanding bull's-eye" effect: more people and assets are being placed in harm's way, leading to increased damages even if the underlying hazard has not changed.

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[273] Oppenheimer et al., *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*, in IPCC Special Report on the Ocean and Cryosphere in a Changing Climate 321 (Pörtner et al. eds., 2019), https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/.

[274] *Id.*

[275] eNGO Endangerment Comment at 114 (citing Best et al., *Demographics and Risk of Isolation Due to Sea Level Rise in the United States*, 14 Nat. Commc'ns 7904 (2023), https://doi.org/10.1038/s41467-023-43835-6).

[276] Curtis & Schneider, *Understanding the Demographic Implications of Climate Change: Estimates of Localized Population Predictions Under Future Scenarios of Sea-Level Rise*, 33 Population & Env't 28 (2011), https://doi.org/10.1007/s11111-011-0136-2.

[277] *Id.* (noting realistic 2030 SLR was 4.2 to 13.9 cm, but using 100 cm maps because they lacked maps for the smaller rise, conceding this "may introduce error.").

The eNGOs claim "[k]ey infrastructure and services ... are increasingly vulnerable to compounding climate impacts."[278] But they omit the IPCC's critical caveat that observed increases in damages are driven primarily by non-climate factors. The source explicitly states that "development patterns have driven much of these increases (high confidence)," pointing to rapid urbanization and development in areas already prone to extreme weather damage.[279]

Similarly, the eNGOs' claim that 108–116 million people will be exposed to sea-level rise in Africa by 2030.[280] Africa is not the United States, so this claim cannot inform EPA's judgment. But this also misleadingly frames accelerating sea-level rise as the primary driver. The cited source, however, explicitly contradicts this, stating that "[h]igh population growth and urbanisation in low-lying coastal zones will be the major driver" of this increased exposure.[281] Even if sea-level rise in Africa were relevant to EPA's Section 202(a) endangerment finding—and it is not—the eNGOs are conflating damages driven by a socioeconomic trend with a climate impact driven by emissions.

Last, the eNGOs highlight a "200% increase in billion-dollar disasters" as evidence of intensifying harms.[282] This statistic is frequently cited but highly misleading because it typically relies on non-normalized economic data.[283] This increase is driven overwhelmingly by socioeconomic factors—increased wealth, population, and infrastructure development in vulnerable areas.[284] When economic losses are properly normalized for these factors, the trend attributable to climate change often disappears. The "billion-dollar disaster" metric is primarily a measure of socioeconomic exposure, not an increase in climate hazards.

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[278] eNGO Endangerment Comment at 114.

[279] IPCC AR6 WGII, at 54 (Technical Summary) (Pörtner et al.).

[280] eNGO Endangerment Comment at 114.

[281] IPCC AR6 WGII, at 62 (Technical Summary) (Pörtner et al.).

[282] eNGO Endangerment Comment at 103.

[283] Pielke Jr., *Scientific Integrity and U.S. "Billion Dollar Disasters,"* 1 npj Nat. Hazards 1 (2024), https://doi.org/10.1038/s44304-024-00011-0.

[284] *Id.*

3.2.4 Assertions Regarding Health, Agriculture, and Ecosystems Are Exaggerated and Misleading

The eNGOs' assertions regarding the impacts of climate change on human health, agriculture, and ecosystems are marked by exaggeration, false certainty, and the misrepresentation of complex relationships.

3.2.4.1. Human Health

The eNGOs broadly claim that higher temperatures negatively affect a wide range of health outcomes, relying heavily upon the politicized Fifth National Climate Assessment (NCA5).[285] This assessment frequently employs definitive language that minimizes the uncertainties inherent in attributing specific health outcomes to climate change. For example, the NCA5 characterizes complex outcomes, including impacts on mental health, as an "established fact" causally linked to climate change.[286]

This stated certainty is contradicted by the report's technical document, which acknowledges the "difficulties in isolating the impact of climate change from other significant environmental and human-driven changes."[287] Furthermore, when projecting future risks, the NCA5 selectively uses extreme emissions scenarios (such as RCP 8.5 for Valley Fever projections), exaggerating potential future impacts.[288]

3.2.4.2. Glaciers, Sea Ice, and Tipping Points

The eNGOs make several claims regarding the cryosphere (the Earth's frozen water) and feedback loops: that GHGs "have led to reduction in land glaciers and Arctic sea ice";[289] that

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[285] eNGO Endangerment Comment at 104 (citing Hayden et al., *Ch. 15: Human Health*, Fifth National Climate Assessment (2023), https://cig.uw.edu/wp-content/uploads/sites/2/2025/09/NCA5_Ch15_Human-Health.pdfhttps://nca2023.globalchange.gov/chapter/15/.

[286] Hayden et al. *supra* note 285, at 15-16 ("It is an established fact that climate change is harming physical, mental, spiritual, and community health and well-being.")

[287] *Id.* at 5-22.

[288] *Id.* at 15-18.

[289] eNGO Endangerment Comment at 107.

continued emissions increase the likelihood of "irreversible changes" such as ice sheet loss;[290] and that natural carbon sinks "will become less efficient."[291]

These claims are misleading. Although there are some observed trends in glacial retreat and sea ice coverage, these trends may be attributable to natural variability and not anthropogenic climate change. The cited sources note that high confidence attribution is limited to the recent satellite era. Brennan et al. (2020), for example, highlights a large, naturally driven Arctic sea-ice decline during the early 20th century (1910-1940), well before significant GHG forcing, showing that large-scale reduction in sea ice is a feature of natural variability.[292]

Similarly, firm claims about "tipping points" or irreversible ice sheet loss are overstated. The IPCC acknowledges there is "deep uncertainty" regarding Antarctic Ice Sheet evolution and "low confidence" in modeling ice-sheet instabilities.[293] The cited projections of rapid loss (e.g., DeConto et al. (2021)) rely upon speculative mechanisms (such as Marine Ice Cliff Instability) triggered only by high-end, implausible emissions scenarios.[294]

Finally, a projected decline in the efficiency of carbon sinks in the event of increasing atmospheric carbon dioxide concentrations is heavily scenario dependent and is projected to occur only under high-emissions scenarios such as RCP 8.5.[295] The eNGOs are also wrong to imply this is already occurring. The IPCC AR6 states: "There is currently no direct evidence that the natural sinks are slowing down."[296]

3.2.4.3. Agriculture and Nutrition

The eNGOs make several claims regarding agriculture that rely on flawed modeling and the omission of adaptation.

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[290] *Id.*

[291] *Id.* at 108.

[292] Brennan et al., *Arctic Sea-Ice Variability During the Instrumental Era*, 47 Geophysical Rsch. Letters e2019GL086843 (2020), https://doi.org/10.1029/2019GL086843.

[293] IPCC AR6 WGI, at 76 (Technical Summary) (Arias et al.).

[294] DeConto et al., *supra* note 219 (projecting rapid acceleration only under high-end scenarios like RCP 8.5 and relying on the speculative "Marine Ice Cliff Instability" hypothesis).

[295] IPCC AR6 WGI, at 772 (Ch. 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks) (Canadell et al.).

[296] *Id.* at 772.

The claim that reduced nutrient levels in crops under anticipated 2050 carbon dioxide levels could cause massive deficiencies (e.g., 175 million people zinc deficient)[297] relies on Smith & Myers (2018). This study is fundamentally flawed. It is based on the extreme RCP 8.5 emissions scenario, which the authors mischaracterize as the "current trajectory."[298] Furthermore, the study explicitly omits the primary benefit of carbon dioxide—increased crop yields—to focus solely on nutrient density.[299] Crucially, the model assumes "no change in diets or caloric intake" for decades, modeling out any possibility of human adaptation, economic development, or dietary diversification.[300]

Similarly, the claim that increased ozone levels have decreased global crop yields by specific percentages (e.g., 8.5 to 14 percent for soybean)[301] relies on Avnery et al. (2011). That study is not a study of observed losses, but a modeled estimate based on a cascade of uncertain inputs. The authors concede their method "accumulate[s] the uncertainties of each step" and that their baseline ozone model "systematically overestimates O_3 exposure in the U.S." and that "the most significant overestimation of O_3 unfortunately occurs in areas of intense crop cultivation."[302]

3.2.4.4. Ocean and Ecosystem Impacts

The eNGOs' claims regarding ocean impacts also suffer from significant methodological weaknesses and overclaiming.

The assertion that ocean acidification is "reversing trends of increasing pH that have been in place over the last 50 million years"[303] is based on a methodologically invalid comparison. It grafts a high-resolution, modern instrumental record onto a low-resolution, high-uncertainty

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[297] eNGO Endangerment Comment at 112.

[298] Smith & Myers, *Impact of Anthropogenic CO2 Emissions on Global Human Nutrition*, 8 Nature Climate Change 834 (2018), https://doi.org/10.1038/s41558-018-0253-3.

[299] *Id.*

[300] *Id.*

[301] eNGO Endangerment Comment at 112.

[302] Avnery et al., *Global Crop Yield Reductions Due to Surface Ozone Exposure: Crop Production Losses and Economic Damage in 2000 and 2030 Under Two Futures Scenarios of O3 Pollution*, 45 Atmospheric Env't 2297 (2011), https://doi.org/10.1016/j.atmosenv.2011.01.002.

[303] eNGO Endangerment Comment at 106–07 (citing IPCC AR6 WGI (Ch.2: Changing State of the Climate System) (Gulev et al.)).

paleo-proxy record. These records are not comparable in their resolution or uncertainty, making the claim of a definitive reversal a statistical overreach.

Regarding coral reefs, the eNGOs state that reefs are experiencing "global declines,"[304] citing Eddy et al. (2021), which claimed a 50% decline since the 1950s.[305] This definitive claim is undermined by the study's own methodology section, which concedes "high uncertainty" about mid-20th century coral cover due to very few observations.[306] So instead of empirical field data, the baseline against which the "50% decline" is measured is derived from "expert opinion."[307]

The eNGOs claim that ocean warming has decreased sustainable fish yields by 4.1% between 1930 and 2010.[308] This fails to properly account for the primary, non-climatic drivers of declining yields during that period. The impacts of the massive global expansion of industrial fishing, pollution, and habitat destruction are far more significant and direct drivers of yield declines than the modest warming observed. Similarly, the claim that marine heatwaves led to the "collapse" of fisheries[309] is an exaggeration; the cited source (Frölicher & Laufkötter (2018)) refers to "closings" resulting in losses, not collapse, and emphasizes the "[i]mportant knowledge gaps" in understanding the drivers of these events.[310]

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In sum, the claims presented in Section VI.A of the eNGO comments present a curated narrative designed to maximize the appearance of certain catastrophic harm. This narrative consistently relies on implausible worst-case scenarios, employs speculative attribution methodologies, and systematically ignores confounding factors and non-climatic drivers of change. The arguments should not be credited.

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304 eNGO Endangerment Comment at 110–11.

305 Eddy et al., *Global Decline in Capacity of Coral Reefs to Provide Ecosystem Services*, 4 One Earth 1278 (2021), https://doi.org/10.1016/j.oneear.2021.08.016.

306 *Id.* at 1279.

307 *Id.* at 1282.

308 eNGO Endangerment Comment at 107 (citing IPCC AR6 WGII, at 48 (Technical Summary) (Pörtner et al.)).

309 *Id.* at 111.

310 Frölicher & Laufkötter, *Emerging Risks from Marine Heat Waves*, 9 Nat. Commc'ns 650 (2018), https://doi.org/10.1038/s41467-018-03163-6.

When the profound uncertainties, methodological limitations, and critical context—such as the benefits of carbon dioxide fertilization, avoided cold deaths, the role of adaptation, and the localized nature of many environmental challenges—are considered, the conclusion that the evidence 'overwhelmingly supports' the 2009 Endangerment Finding is untenable.

3.3. The eNGOs Overstate the Certainty of the Scientific Data and Ignore Significant Confounding Variables and Natural Variability

Replies to eNGO Endangerment Comment Section VI.B (pp. 118–54).

eNGO Claim: The eNGOs argue that the proposal misstates the scientific record about the damages that result from GHG emissions. They assert that the scientific data is certain, that there are minimal uncertainties regarding global temperatures, and that confounding factors such as solar irradiance and the Urban Heat Island Effect are small. They claim there are clear, attributable upward trends in the frequency and intensity of extreme weather events (including heatwaves, hurricanes, precipitation, and wildfires), and that global sea-level rise is unequivocally accelerating due to anthropogenic warming. They further contend that climate models are reliable, that attribution science can precisely link GHG emissions to individual events, that any benefits of carbon dioxide are overwhelmed by severe negative impacts, and that the high Social Cost of Carbon is a well-understood and reliable metric justifying regulation.[311]

Refutation: This portrayal is systematically flawed, overstates scientific certainty, and ignores the significant influence of natural variability and confounding factors. A critical review of the studies cited by the eNGOs reveals a pervasive pattern of mischaracterizing source material. The eNGOs' claims are frequently contradicted by the data, caveats, and explicit limitations within the studies they cite. The eNGOs repeatedly treat speculative, model-derived outputs as observed facts, dismiss data inhomogeneities (such as UHI or gauge changes), and fail to account for the dominant role of non-climatic factors (such as land management in wildfires or societal vulnerability in disaster costs). Furthermore, their most alarming projections rely overwhelmingly upon the pervasive misuse of extreme, implausible emissions scenarios (e.g., RCP 8.5) as "business-as-usual," despite audaciously proclaiming that the proposal's claims that it has been treated as such are wrong.[312] When these flaws are accounted for, the evidence for attributable trends in many extreme weather events, the reliability of climate models, and the

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[311] *See* eNGO Endangerment Comment at 118–54.

[312] *See id.* at 121 ("The proposal's criticisms based on its and the CWG's assertion that RCP8.5 has been treated as a 'business as usual' scenario are wrong.").

certainty of economic harms (such as the SCC) are far more tenuous and uncertain than the eNGOs claim.

3.3.1 Increases in Greenhouse Gas Concentrations and Global Temperatures

Replies to eNGO Endangerment Comment Section VI.B.2.a (pp. 118–22).

The eNGOs attempt to dismiss critical uncertainties regarding the drivers, rate, and future trajectory of global temperature changes. They argue that the historical context proves the danger of the current rate of change, that confounding factors such as solar irradiance and the UHI effect are negligible and perfectly understood, and that criticisms of high-end emissions scenarios are misplaced.[313] This portrayal systematically overstates scientific certainty and ignores significant ongoing debates regarding the interpretation of observational data and the reliability of climate projections.

3.3.1.1. The Historical Context is Mischaracterized and Relies on Extreme Scenarios

The eNGOs argue that the current rate of climate change is unprecedented and inherently catastrophic by drawing comparisons to past climatic events. These comparisons are often flawed by methodological issues and reliance on implausible future scenarios.

The eNGOs claim that "[r]apid climate change in the past has resulted in multiple mass extinctions."[314] The cited study (Song et al. (2021)), however, bases its comparison of modern climate change to a derived "threshold" for these past events exclusively on the extreme and implausible SSP5-8.5 scenario.[315] Furthermore, the authors acknowledge "clear resolution limitations" in applying thresholds derived from million-year geological timescales to the modern

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[313] *Id.* at 118–22.

[314] eNGO Endangerment Comment at 118 (citing Song et al., *Thresholds of Temperature Change for Mass Extinctions*, 12 Nat. Commc'ns 4694 (2021), https://doi.org/10.1038/s41467-021-25019-2).

[315] Song et al., *supra* note 314, at 5 ("Nevertheless, global mean temperatures have already risen by ~1 °C since 1850, and the heavy fossil fuel use scenario trajectory of anthropogenic carbon emissions (Shared Socioeconomic Pathway, SSP5-8.5) predicts that a temperature increase matching our geologically defined magnitude threshold for mass extinction (i.e. 5.2 °C above the pre-industrial level would be reached by ~2100.").

decadal-to-centennial timescale, yet proceed to claim a mass extinction "would likely result," minimizing this profound uncertainty.[316]

Similarly, the eNGOs assert that anthropogenic emissions are causing carbon dioxide increases "9-10 times higher" than at the onset of the Paleocene-Eocene Thermal Maximum.[317] This claim, drawn from Gingerich (2019), is based on a simple linear extrapolation of 1959–2015 emissions data centuries into the future. The study concedes this trajectory "resembles the upper bound" of RCP 8.5.[318] Framing this extrapolation as the default outcome improperly treats a worst-case scenario as a likely future and ignores any potential for changes in emissions trajectories.

The eNGOs also misleadingly claim that carbon dioxide levels during the Pleistocene were "quite stable," challenging the notion that carbon dioxide levels could fall dangerously low.[319] This is a severe distortion of the cited sources, which clearly describe a highly dynamic system during that epoch, not a stable one. The data shows carbon dioxide levels repeatedly and dramatically oscillated by over 100 ppm—from glacial lows around 180 ppm to interglacial highs around 280–300 ppm.[320] Characterizing a recurring fluctuation of over 60% (relative to the minimum) as "quite stable" is fundamentally misleading and ignores the significant natural variability inherent in the climate system. Indeed, a 100 ppm increase in carbon dioxide is on par

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[316] *Id.* ("There are clear resolution limitations of both the data and the geological record that, coupled with the potential biases noted above, complicate any attempt to apply the climate thresholds for extinction established in this study (defined on million-year timescales) to the rates of climate change and biodiversity loss observed at the present day. In particular, as noted above, maximum rates of temperature change are underestimated in the fossil record, and knowledge of the peak rates of warming during Phanerozoic mass extinctions on societally relevant (decadal to millennial) timescales is not readily recoverable from geological data.").

[317] eNGO Endangerment Comment at 119 (citing Gingerich, *Temporal Scaling of Carbon Emission and Accumulation Rates: Modern Anthropogenic Emissions Compared to Estimates of PETM Onset Accumulation*, 34 Paleoceanography & Paleoclimatology 329 (2019), https://doi.org/10.1029/2018PA003379).

[318] Gingerich, *supra* note 317, at 333, Fig. 3 .

[319] eNGO Endangerment Comment at 119.

[320] *See, e.g.*, Petit et al., *Climate and Atmospheric History of the Past 420,000 Years from the Vostok Ice Core, Antarctica*, 399 Nature 429 (1999), https://doi.org/10.1038/20859.

with changes observed in the last century—and this does not account for the inherent limitations on precision in estimating year-to-year atmospheric carbon dioxide levels two million years ago.[321]

3.3.1.2. The eNGOs Improperly Dismiss Confounding Factors

The eNGOs dismiss the potential influence of confounding factors on the temperature record, specifically Total Solar Irradiance (TSI) and the Urban Heat Island (UHI) effect.

Regarding TSI, the eNGOs claim that the magnitude of observed warming "cannot be reproduced" based only on TSI without the "dominant factor" of GHG forcing.[322] This argument misleadingly presents model-derived conclusions as definitive, observed facts. The cited studies rely on specific climate models with acknowledged limitations. Meehl et al. (2004) depends entirely on a single dated climate model (PCM) and with coarse resolution and acknowledges that "[f]orcing uncertainties ... admit a quite wide range of sensitivity possibilities."[323] More egregiously, the eNGOs cite Ziskin & Shaviv (2012) to bolster the claim that solar contributions are small, yet that study's findings directly contradict the eNGOs' position. Ziskin & Shaviv argue that standard models (like those used in Meehl et al.) systematically underestimate solar influence by ignoring the "Indirect Solar Effect."[324] When this non-thermal amplification is included, Ziskin & Shaviv find that the solar contribution to 20th-century warming is much larger, than previously thought, attributing approximately 40% of warming to solar activity. Indeed, given the study's error margins, the maximum plausible solar contribution exceeds the minimum plausible anthropogenic contribution. It is incoherent to rely on GCM-based studies (Meehl) that assume negligible solar influence while simultaneously citing a study (Ziskin) that concludes those very models are physically incomplete for failing to account for solar amplification.

Regarding UHI, the eNGOs assert that the localized warming caused by urban infrastructure and waste heat has a "relatively small global impact" and "has already been accounted for" in

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[321] Rebecca Lindsey, *Climate Change: Atmospheric Carbon Dioxide*, Climate.gov, https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide (last visited Nov. 20, 2025).

[322] eNGO Endangerment Comment at 119–20.

[323] Meehl et al., *Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate*, 17 J. Climate 3721, 3724 (2004), https://doi.org/10.1175/1520-0442(2004)017%3C3721:CONAAF%3E2.0.CO;2.

[324] Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Rsch. 762 (2012), https://doi.org/10.1016/j.asr.2011.10.009.

warming models.[325] This presents a complex, uncertain, and vigorously debated methodological process as a solved problem. The cited literature reveals that "accounting for" UHI through statistical homogenization is a primary *source* of uncertainty, not a perfected *solution*.

First, the studies demonstrate there is no universal agreement on how to adjust for UHI. Hansen et al. (2001), for example, evaluated the use of satellite data versus population data to account for UHI effects; it found that the U.S. adjustment using satellite data was 0.15 °C, more than double the 0.06 °C adjustment used in the standard USHCN dataset.[326] Second, the accounting methods themselves are questionable. Dienst et al. (2019) argues that common automated homogenization methods (such as the HOMER script) can fail to properly remove UHI bias. Comparing automated methods against detailed, metadata-based corrections for a single village, Dienst revealed "substantial differences" of > 3 K (3 °C)—an enormous disparity in a field where meaningful temperature deltas are often measured in tenths or hundredths of a degree.[327] Because more accurate methods are "laborious" and require specific sensor networks, they are not easily extensible to existing stations, suggesting that the broad, automated accounting relied upon by the eNGOs is insufficient to address UHI effects, particularly in heavily urbanized countries like the United States.

The eNGOs further attempt to dismiss UHI by arguing that the fastest warming areas (the Arctic) are remote,[328] and that the majority of the Earth's surface is ocean, where UHI has no effect.[329] These arguments are non sequiturs. The UHI effect is a specific, documented bias in *land-based* temperature measurements in developed areas. The existence of warming elsewhere (oceans or the Arctic) driven by other mechanisms (such as GHG-forcing and Arctic amplification feedbacks) does not negate the presence of bias in the land data used to calculate *global* surface average temperatures.

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[325] eNGO Endangerment Comment at 120.

[326] Hansen et al., *A Closer Look at United States and Global Surface Temperature Change*, 106 J. Geophysical Rsch.: Atmospheres 23,947 (2001), https://doi.org/10.1029/2001JD000354.

[327] Dienst et al., *Detection and Elimination of UHI Effects in Long Temperature Records from Villages–A Case Study from Tivissa, Spain*, 27 Urban Climate 372 (2019), https://doi.org/10.1016/j.uclim.2018.12.012.

[328] eNGO Endangerment Comment at 120.

[329] *Id.* at 120–21.

3.3.1.3. The eNGOs' Defense of Extreme Emissions Scenarios Is Unpersuasive

The eNGOs defend the use of high-end emissions scenarios such as RCP 8.5 and dispute the proposal's assessment of current emissions trajectories.

The eNGOs argue that the proposal's criticisms of RCP 8.5 being treated as "business as usual" are wrong because the scenario's original authors (Riahi et al., 2011) did not intend it as such.[330] This is shockingly dishonest. The eNGOs are correct: RCP8.5 should never have been used as a business-as-usual scenario. But as detailed in Section 3.1.1, *supra*, thousands of studies *have* explicitly labeled and used RCP 8.5 as the "business-as-usual" or default baseline scenario. This pervasive misuse has skewed impact assessments toward worst-case outcomes that are widely considered implausible.

Indeed, *more than a dozen* of the studies cited by the eNGOs employ this flawed framing. Examples include studies projecting effects on nutrition (Smith & Myers (2018) describing RCP 8.5 as "the scenario most consistent with our current trajectory"), carbon uptake (Green et al. (2019) describing it as "business-as-usual"), ecosystem stability (Canteri et al. (2025) calling it a "business-as-usual emission-intensive scenario"), drought (Udall & Overpeck (2017) calling it a business-as-usual scenario), permafrost (Schuur et al. (2022) calling it a business-as-usual scenario), crop losses (Deutsch et al. (2018) calling it a business-as-usual scenario), economic growth (Kalkuhl & Wenz (2020) calling it a business-as-usual scenario), and many more.[331]

The eNGOs also claim that severe impacts are projected "even on relatively low future emissions trajectories."[332] Again, this is misleading. The cited source (NCA5) notes that near-term impacts

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[330] *Id.* at 121 (citing Riahi et al., *RCP 8.5—A Scenario of Comparatively High Greenhouse Gas Emissions*, 109 Climatic Change 33 (2011), https://doi.org/10.1007/s10584-011-0149-y).

[331] Smith & Myers, *supra* note 298; Green et al., *supra* note 218; Canteri et al., *Mismatch in Reindeer Resilience to Past and Future Warming Signals Ongoing Declines*, 11 Sci. Advances eado3354 (2025), https://doi.org/10.1126/sciadv.adu0175; Udall & Overpeck, *The Twenty-First Century Colorado River Hot Drought and Implications for the Future*, 53 Water Res. Rsch. 2404 (2017), https://doi.org/10.1002/2016WR019638; Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://epic.awi.de/id/eprint/57387/1/Schuur_2022.pdf; Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466; Kalkuhl & Wenz, *The Impact of Climate Change on Economic Growth and Development*, 127 World Dev. 104749 (2020), https://econpapers.repec.org/RePEc:eee:jeeman:v:103:y:2020:i:c:s0095069620300838. For further examples, see the Appendix at A41.

[332] eNGO Endangerment Comment at 121.

are largely unavoidable because emissions scenarios take time to diverge.[333] But this conflates near-term "locked-in" impacts with long-term outcomes, minimizing the source's central finding that different long-term pathways result in profoundly different outcomes by mid-century and beyond.[334] The eNGOs' claim that we are "already experiencing serious impacts" misleadingly implies these impacts are due to climate change. The NCA5 explicitly refutes this, stating, for example, that the rising costs of disasters are also driven largely "due to increases in assets at risk" (i.e., socioeconomic factors).[335]

Finally, the eNGOs dispute the suggestion that actual emissions trajectories are tracking below the most extreme scenarios.[336] However, their own cited source, Hausfather (2025), confirms the proposal's assessment. Hausfather finds that high-emissions pathways (such as SSP5-8.5) are becoming less plausible and that current policy emissions estimates "tend to most closely match or fall slightly below the middle-of-the-road SSP2-4.5 scenario."[337] The eNGOs' arguments fail to counter the reality that the extreme scenarios driving the most alarming impact projections are increasingly disconnected from plausible futures.

3.3.2 Health Risks from Heat Waves and Other Extreme Weather Events

Replies to eNGO Endangerment Comment Section VI.B.2.b (pp. 122–31).

The eNGOs argue that the scientific evidence robustly demonstrates clear upward trends in the frequency and intensity of various extreme weather events, including heatwaves, hurricanes, extreme precipitation, and wildfires, and that these trends are clearly attributable to anthropogenic GHG emissions.[338] They contend that the proposal downplays these risks by relying on inappropriate metrics and overstating the potential for adaptation.[339]

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[333] Jay et al., Ch. 1: *Overview: Understanding Risks, Impacts, and Responses*, in Fifth National Climate Assessment (2023), https://secasc.ncsu.edu/wp-content/uploads/sites/178/2025/07/NCA5_Ch1_Overview.pdf).

[334] *Id.*

[335] *Id.*

[336] eNGO Endangerment Comment at 121–22.

[337] Hausfather, *An Assessment of Current Policy Scenarios Over the 21st Century and the Reduced Plausibility of High-Emissions Pathways*, 2 Dialogues on Climate Change 26 (2025), https://doi.org/10.1177/29768659241304854.

[338] eNGO Endangerment Comment at 122.

[339] *Id.* at 127–31.

This narrative significantly overstates the certainty of the scientific evidence. A critical review of the studies cited by the eNGOs reveals pervasive issues with data reliability, methodological assumptions, the significant influence of natural variability, and the failure to adequately account for confounding factors. The evidence linking GHG emissions to observed trends in many extreme weather phenomena remains noisy, uncertain, and far less definitive than the eNGOs claim.

3.3.2.1. Heat Waves

The eNGOs assert that since the 1950s, hot extremes have increased in frequency and intensity across North America, with GHG emissions being the "main driver."[340] These claims oversimplify the data and ignore critical limitations in the cited studies.

Long-term data shows that U.S. heat wave activity peaked during the dust bowl in the 1930s, when agricultural practices such as overplowing of greatly expanded cropland in the Great Plains enhanced natural variability.[341] Long-term trends show that although the average coldest temperatures of the year have increased since 1900, the average warmest temperatures are roughly the same as they were more than 100 years ago.[342] As a result, the U.S. climate has become *less* extreme over the past century as the gap between summer highs and winter lows has narrowed.[343]

The eNGOs' attempts to rebut this trend do not withstand scrutiny. First, the implication of a uniform increase across North America is contradicted by the cited sources. Dunn et al. (2020) explicitly identifies the "warming hole" over the southern-central United States, a region showing "reduced warming, or even cooling."[344]

Second, the certainty of the attribution to anthropogenic GHG emissions is overstated. The primary attribution study the eNGOs cite, Seong et al. (2021), reveals a mismatch between the

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[340] *Id.* at 122–23 (citing Seong et al., *Anthropogenic Greenhouse Gas and Aerosol Contributions to Extreme Temperature Changes During 1951–2015*, 34 J. Climate 857 (2021), https://doi.org/10.1175/JCLI-D-19-1023.1; Dunn et al., *Development of an Updated Global Land In Situ-Based Data Set of Temperature and Precipitation Extremes: HadEX3*, 125 J. Geophysical Rsch. Atmospheres e2019JD032263 (2020), https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019JD032263).

[341] Koonin, *supra* note 56, at 102.

[342] *Id.*

[343] *See* U.S. Glob. Change Rsch. Program, I *Climate Science Special Report: Fourth National Climate Assessment* 190–91 (D.J. Wuebbles et al. eds., 2017).

[344] Dunn et al., *supra* note 340.

models used for attribution and reality, admitting that the models "underestimate the observed warming of cold extremes."[345] It is wrong to claim definitive attribution based on models that fail to accurately replicate the observational record.

The eNGOs further highlight a study (Rogers et al. (2022)) claiming that heatwaves are now "seven times more likely than 40 years ago" and affect larger areas across the United States.[346] This misrepresents the study's findings. Rogers et al. is a Northern Hemisphere analysis, not a U.S.-focused study; the "seven times" finding applies to the entire hemisphere.[347] More importantly, this statistic is not for heatwaves generally, but for a highly specific, author-defined metric: "concurrent large heatwave days," based on an arbitrary 98th percentile size threshold.[348] The authors concede this threshold is critical; using a slightly lower (95th percentile) threshold makes the trends "unclear."[349] The "sevenfold" statistic thus appears to be an artifact of the chosen definition rather than a robust finding.

More broadly, the assertion of a clear, anthropogenically driven trend in U.S. heatwaves is confounded by natural variability and historical context. As noted above, the United States experienced heatwaves of comparable or greater intensity during the 1930s, long before the vast majority of modern GHG emissions occurred. Studies that focus only on recent decades (e.g., starting in 1979) can exaggerate a trend by selecting a relatively cool mid-20th-century starting point, making it difficult to disentangle the anthropogenic signal from natural multidecadal oscillations.

3.3.2.2. Hurricanes and Tropical Storms

The eNGOs claim there is "robust evidence" that human-caused warming has increased hurricane rainfall rates, caused more frequent rapid intensification, and slowed hurricane track speeds over the United States.[350] These claims are marked by significant misrepresentations of the cited literature and a failure to acknowledge profound data uncertainties.

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[345] Seong et al., *supra* note 340, at 862.

[346] eNGO Endangerment Comment at 123 (citing Rogers et al., *Six-Fold Increase in Historical Northern Hemisphere Concurrent Large Heatwaves Driven by Warming and Changing Atmospheric Circulations*, 34 J. Climate 715 (2021), https://par.nsf.gov/servlets/purl/10321908).

[347] Rogers et al., *supra* note 346 (evaluating trends across 20°N–80°N).

[348] *Id.* at 1065.

[349] *Id.*

[350] eNGO Endangerment Comment at 123.

The IPCC's AR6 expressed "*low confidence* in most reported long-term … trends in [tropical cyclone] frequency- or intensity" and noted that the reliable record of U.S. landfalling hurricanes since 1900 "shows no trend."[351] Although Atlantic hurricane activity has shown a significant increase since 1970, that increase is likely in part due to variations associated with the Atlantic Multidecadal Oscillation—sea surface temperature and sea-level pressure fluctuations connected to large scale ocean circulation patterns.[352] The largest numbers of landfalling hurricanes are from 2004, 2005 and 2020, but there is no statistically significant trend since 1920.[353]

Again, the eNGOs' counterarguments are unavailing. Their claims regarding rainfall rates and track speeds are directly contradicted by the very studies they cite. The eNGOs assert that these trends are "due to global warming," yet the authors explicitly disclaim making such an attribution. Hall & Kossin (2019), analyzing stalling and rainfall, explicitly state: "We make no attribution to anthropogenic climate forcing ... the trends could be due to low frequency natural variability."[354] Similarly, Kossin (2019), defending the slowing-speed trend, cautions that "[t]he analyses presented here do not constitute a detection and attribution study" and the link to anthropogenic forcing "is not yet clear."[355] Yet the eNGOs' claim these studies show attribution despite the studies' authors explicitly rejecting this conclusion.

Furthermore, the eNGOs' claim of "robust evidence" for increased intensity ignores data uncertainties. The authors cited concede that the standard observational record (IBTRACS) is "unsuitable for global trend analysis."[356] This is because their conclusions depend entirely on highly processed, statistically constructed "homogenized" datasets (like ADT-HURSAT)

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[351] IPCC AR6 WGI, at 1585 (Ch. 11: Weather and Climate Extreme Events in a Changing Climate) (Seneviratne et al.).

[352] Klotzbach & Gray, *Multidecadal Variability in North Atlantic Tropical Cyclone Activity*, 21 J. Climate 3929 (2008), https://doi.org/10.1175/2008JCLI2162.1.

[353] Klotzbach et al., *Continental U.S. Hurricane Landfall Frequency and Associated Damage: Observations and Future Risks*, 99 Bull. Am. Meteorological Soc'y 1359 (2018), https://doi.org/10.1175/BAMS-D-17-0184.1.

[354] Hall & Kossin, *Hurricane Stalling Along the North American Coast and Implications for Rainfall*, 2 npj Climate & Atmospheric Sci. 17, at 1 (2019), https://www.nature.com/articles/s41612-019-0074-8.

[355] Kossin, *Reply to: Moon, I.-J. et al.; Lanzante, J. R.*, 570 Nature E16, E16(2019), https://doi.org/10.1038/s41586-019-1224-1.

[356] Kossin et al., *Global Increase in Major Tropical Cyclone Exceedance Probability Over the Past Four Decades*, 117 Proc. Nat'l Acad. Scis. 11975, 11975 (2020), https://www.pnas.org/doi/10.1073/pnas.1920849117; *see also* Bhatia et al., *Recent Increases in Tropical Cyclone Intensification Rates*, 10 Nat. Commc'ns 635 (2019) ("any conclusions stemming from the global trend analysis must be treated with caution").

created by recalibrating satellite imagery—a process that "sacrifices some measure of absolute accuracy for homogeneity."[357] These homogenized datasets are also inconsistent. Bhatia et al. (2019) found that for global rapid intensification, the standard record and the homogenized record have virtually no correlation (i.e., the variance explained is only 1.8%).[358] This deep uncertainty led the authors to warn that "any conclusions stemming from the global trend analysis must be treated with caution."[359] This is the opposite of "robust evidence" of a global trend.

The attribution claims cited are also highly speculative, relying upon model-driven "storyline" attribution rather than observed facts.[360] These methods are model outputs, not observations, and often omit key variables such as changes in atmospheric circulation.[361]

The eNGOs also note that hurricane activity in the North Atlantic "has increased since the 1970s."[362] Although technically true, this misleadingly implies the opposite of the central conclusion of the cited study, Vecchi et al. (2021), that this increase is *not* evidence of a long-term durable increase, but merely "a recovery from a deep minimum in the 1960s-1980s."[363]

3.3.2.3. Extreme Precipitation and Drought

The eNGOs assert that the frequency and intensity of extreme precipitation events have increased across North America,[364] and that agricultural and ecological droughts have intensified globally.[365] These are exaggerations that ignore regional variability, data limitations, and the findings of the cited attribution studies.

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[357] Kossin et al., *supra* note 356, at 11976.

[358] Bhatia et al., *supra* note 356, at 2–3 (finding the variance explained between the standard record (IBTRACS) and the homogenized record (ADT-HURSAT) was only 1.8%).

[359] *Id.* at 3.

[360] *See, e.g.*, Gilford et al., *Human-Caused Ocean Warming Has Intensified Recent Hurricanes*, 3 Env't Rsch.: Climate 045019 (2024), https://iopscience.iop.org/article/10.1088/2752-5295/ad8d02.

[361] *Id.* at 15 (admitting the study "has not comprehensively assessed how nonlocal atmospheric responses ... could influence ... estimates").

[362] eNGO Endangerment Comment at 123–24.

[363] Vecchi et al., *Changes in Atlantic Major Hurricane Frequency Since the Late-19th Century*, 12 Nat. Commc'ns 4054, 1 (2021), https://doi.org/10.1175/JCLI-D-19-0892.1.

[364] eNGO Endangerment Comment at 124.

[365] *Id.* at 125.

The claim of increased extreme precipitation "across North America" is an oversimplification. Sun et al. (2020) explicitly identifies areas where extreme precipitation seems to be "weakening," such as the Canadian Prairies and parts of the western United States.[366] The authors also emphasize that trends are "very noisy with widely scattered increasing and decreasing trends" and difficult to obtain due to the "weak signal compared to background year-to-year variability."[367]

Furthermore, the studies acknowledge significant data quality concerns. Sun et al. warns that uncoordinated switches to automatic gauges (a type of instrumentation used to measure precipitation)"has no doubt induced inhomogeneities in the precipitation data we analyze that for the moment are unavoidable."[368] These non-climatic changes in instrumentation can create spurious trends.

The eNGOs' implicit suggestion that these trends are attributable to anthropogenic warming driven by GHG emissions is refuted by the cited attribution literature. Paik et al. (2020) concluded that "GHG signals are not detectable over ... [North America]," and that the observed trend cannot be statistically separated from natural variability.[369]

The eNGOs further claim "robust evidence" that human warming has contributed to heavier precipitation across "70% of the United States."[370] This statistic is unsupported; it appears to be a misreading of Diffenbaugh et al. (2018), which refers to North American grid points showing any probability increase, not a specific measure of severity across the United States.[371] The other cited study, Kirchmeier-Young & Zhang (2020), found a "slightly weaker" signal for the United

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[366] Sun et al., *A Global, Continental, and Regional Analysis of Changes in Extreme Precipitation*, 34 J. Climate 243, 247 (2021), https://doi.org/10.1175/JCLI-D-19-0892.1

[367] *Id.*

[368] *Id.* at 256.

[369] Paik et al., *Determining the Anthropogenic Greenhouse Gas Contribution to the Observed Intensification of Extreme Precipitation*, 47 Geophysical Rsch. Letters e2019GL086875, at 6 (2020), https://doi.org/10.1029/2019GL086875.

[370] eNGO Endangerment Comment at 124.

[371] Diffenbaugh et al., *Unprecedented Climate Events: Historical Changes, Aspirational Targets, and National Commitments*, 4 Sci. Advances eaao3354 (2018), https://doi.org/10.1126/sciadv.aao3354.

States specifically and relied on a model (CanESM2) that "overestimates surface warming compared to observations."[372]

The eNGOs also claim that increased rainfall frequency has contributed "to increased stream and river flooding."[373] This is partially contradicted by the most relevant study cited: Mallakpour & Villarini (2015) finds "limited evidence of significant changes in the magnitude of flood peaks" in the central U.S.[374]

Regarding drought, the eNGOs claim that intensification has occurred on "all continents."[375] That is also an exaggeration. Greve et al. (2014) found that robust dryness changes *cannot be detected* over approximately 75% of the global land area.[376] Indeed, Figure 4 of Greve et al. (2014) indicates that virtually all of the United States is either getting wetter or staying the same.[377] Other studies emphasize "substantial uncertainties" and the significant role of natural multi-decadal climate variations in driving drought trends.[378]

The eNGOs specifically highlight the southwestern United States, claiming it is experiencing the "driest soil moisture conditions in the past 1,200 years."[379] The cited studies compare current streamflow to historical megadroughts but do not support this specific claim regarding soil moisture.[380] Moreover, the future projections cited (Udall & Overpeck (2017)) rely upon high-

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[372] Kirchmeier-Young & Zhang, *Human Influence Has Intensified Extreme Precipitation in North America*, 117 Proc. Nat'l Acad. Scis. 13308, 13311–12 (2020), https://www.pnas.org/doi/10.1073/pnas.1921628117.

[373] eNGO Endangerment Comment at 124.

[374] Mallakpour & Villarini, *The Changing Nature of Flooding Across the Central United States*, 5 Nature Climate Change 250, 250 (2015), https://doi.org/10.1038/nclimate2516.

[375] eNGO Endangerment Comment at 125.

[376] Greve et al., *Global Assessment of Trends in Wetting and Drying Over Land*, 7 Nature Geoscience 716, 716 (2014), https://doi.org/10.1038/ngeo2247.

[377] *Id.* at 719.

[378] Dai & Zhao, *Uncertainties in Historical Changes and Future Projections of Drought. Part I: Estimates of Historical Drought Changes*, 144 Climatic Change 519 (2017), https://doi.org/10.1007/s10584-016-1705-2.

[379] eNGO Endangerment Comment at 125.

[380] *See* Udall & Overpeck, *supra* note 331; Milly & Dunne, *Colorado River Flow Dwindles as Warming-Driven Loss of Reflective Snow Energizes Evaporation*, 367 Science 1252 (2020), https://www.science.org/doi/10.1126/science.aay9187.

end emissions scenarios (such as RCP 8.5) which the authors mischaracterize as "business-as-usual."[381]

The eNGOs also argue that the concurrent heatwaves and droughts are becoming more likely, with "strong evidence" of human contribution.[382] This claim is undermined by the cited sources. Herrera-Estrada and Sheffield (2017) conclude the opposite, finding "large uncertainty" and "no absolute consensus on the sign of most of these changes across regions."[383] Furthermore, the future projections in all four cited studies are predicated on the implausible RCP 8.5 scenario.[384]

3.3.2.4. Fire Weather

The eNGOs claim that fire weather conditions have become more probable and that the increased wildfire severity and burned area in the western U.S. are linked to human-caused climate change.[385] This oversimplifies a complex issue by conflating "fire weather" (climatic conditions) with actual fire outcomes, which are heavily influenced by non-climatic factors.

Although warmer and drier conditions may increase the risk of fire, the dramatic increase in catastrophic wildfires in the western U.S. is heavily influenced by a century of fire suppression policies (driven in part by litigious activists and their policies) leading to dangerous fuel load accumulation, as well as human ignitions and land-use changes. The studies cited by the eNGOs systematically minimize these factors. To isolate the climate signal, they either dismiss these factors or assume they will remain static in the future.[386] These assumptions mean decades of evolving forest management and fuel accumulation are inherently excluded from being a primary driver.

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[381] Udall & Overpeck, *supra* note 380.

[382] eNGO Endangerment Comment at 126.

[383] Herrera-Estrada & Sheffield, *Uncertainties in Future Projections of Summer Droughts and Heat Waves Over the Contiguous United States*, 30 J. Climate 6225, 6234 (2017), https://doi.org/10.1175/JCLI-D-16-0491.1.

[384] *See, e.g.*, Zscheischler & Seneviratne, *Dependence of Drivers Affects Risks Associated with Compound Events*, 3 Sci. Advances e1700263 (2017), https://doi.org/10.1126/sciadv.1700263 (basing projections on "climate projections with the strongest greenhouse-gas forcing for the future (RCP 8.5)").

[385] eNGO Endangerment Comment at 125–26.

[386] *See, e.g.*, Williams et al., *Observed Impacts of Anthropogenic Climate Change on Wildfire in California*, 7 Earth's Future 892 (2019), https://doi.org/10.1029/2019EF001210 (statistically dismissing non-climatic factors); Abatzoglou et al., *Projected Increases in Western US Forest Fire Despite Growing Fuel Constraints*, 2 Commc'ns Earth & Env't 1 (2021), https://doi.org/10.1038/s43247-021-00299-0 (assuming human and management effects remain "time-invariant").

All of the key attribution claims are model-derived and not observed facts. For example, the claim that anthropogenic climate change has contributed to an additional 4.2 million hectares of forest fire area (Abatzoglou & Williams, 2016) is the result of a regression model using a counterfactual world created by subtracting the mean trend of 27 climate models.[387] Because these models do not account for changes in forest management, all of the increase is attributed to climate change.

The eNGOs also highlight an "eightfold increase" in high severity burned area in the Western U.S.[388] This statistic, from Parks & Abatzoglou (2020), is misleading. It conflates an increase in total acres burned with an increase in fire severity. The study's data reveals that the more precise metrics—annual mean fire severity and the annual proportion burned at high severity—showed *no statistically significant trend* for the Western U.S. as a whole.[389] The authors concede that the observed increases "largely reflect increases in [total annual area burned]," not a fundamental shift in fire intensity, and state that "there is not a clear scientific consensus regarding temporal trends in fire severity."[390]

The eNGOs also claim the proposal uses inappropriate metrics (e.g., large averages, global wildfire area) that "obscure" significant trends.[391] This misrepresents the use of standard, statistically robust metrics appropriate for evaluating long-term trends relevant to the national context, which avoids cherry-picking localized trends. Addressing global burned area (which is declining) provides necessary context for the regional fire trends.[392]

3.3.2.5. Compounding Impacts and Adaptation

The eNGOs argue that the proposal inadequately addresses the concepts of compounding impacts of extreme weather and adaptation. They are wrong on both counts.

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387 Abatzoglou & Williams, *supra* note 252, at 11771.

388 eNGO Endangerment Comment at 126 (citing Parks & Abatzoglou, *Warmer and Drier Fire Seasons Contribute to Increases in Area Burned at High Severity in Western US Forests From 1985 to 2017*, 47 Geophysical Rsch. Letters e2020GL089858 (2020), https://doi.org/10.1029/2020GL089858).

389 Parks & Abatzoglou, *supra* note 388, at 7.

390 *Id.* at 6, 7.

391 eNGO Endangerment Comment at 127–28.

392 *See, e.g.*, Cunningham et al., *Increasing Frequency and Intensity of the Most Extreme Wildfires on Earth*, 8 Nature Ecology & Evolution 1 (2024), https://doi.org/10.1038/s41559-024-02452-2 (cited by eNGOs, acknowledging global burned area may be declining, while focusing on a novel metric of Fire Radiative Power clusters).

The eNGOs cite speculative studies regarding cascading risks. The claim that mortality effects for hurricanes can persist for 15 years[393] is based on a purely statistical correlation using an opaque model to attribute a surprising 3.2–5.1% of all U.S. deaths to these long-lagged impulses, with no causal mechanism proposed. The authors of that study admit the "underlying mechanisms" are unknown and the finding is "surprising."[394] The claim that climate change increases cascading risks leading to infectious diseases[395] relies on a study (Semenza et al. (2022)) that misattributes the consequences of infrastructure vulnerability (e.g., compromised sanitation systems) to climate change.[396]

The eNGOs argue that EPA misunderstands temperature-related mortality.[397] This ignores the central point of the proposal's analysis: historically and globally, cold weather causes substantially more mortality than hot weather. This is supported by extensive evidence, including Gasparrini et al. (2015), which found cold killed significantly more people than heat in the United States.[398]

The eNGOs criticize the omission of a follow-up 2017 projection study (Gasparrini et al. (2017)) that found future heat deaths might outweigh cold reductions.[399] This omission is justified. The 2017 study's conclusion relies heavily on the implausible RCP 8.5 scenario; in all other scenarios, cold deaths remain more significant in North America.[400] More importantly, the study assumes *zero adaptation* to future warming.[401] This assumption is unrealistic and directly contradicted by

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[393] eNGO Endangerment Comment at 126, 130 (citing Young & Hsiang, *Mortality Caused by Tropical Cyclones in the United States*, 635 Nature 121 (2024), https://doi.org/10.1038/s41586-024-07945-5).

[394] Young & Hsiang, *supra* note 393, at 127.

[395] eNGO Endangerment Comment at 130.

[396] Semenza et al., *Climate Change and Cascading Risks from Infectious Disease*, 11 Infectious Diseases & Therapy 1371 (2022), https://doi.org/10.1007/s40121-022-00647-3.

[397] eNGO Endangerment Comment at 129.

[398] Gasparrini et al., *Mortality Risk Attributable to High and Low Ambient Temperature: A Multicountry Observational Study*, 386 Lancet 369 (2015), https://doi.org/10.1016/s0140-6736(14)62114-0.

[399] eNGO Endangerment Comment at 129 (citing Gasparrini et al., *Projections of Temperature-Related Excess Mortality Under Climate Change Scenarios*, 1 Lancet Planetary Health e360 (2017), https://doi.org/10.1016/s2542-5196(17)30156-0).

[400] Gasparrini et al., *supra* note 399.

[401] *Id.*

historical evidence showing dramatic declines in heat-related mortality risks in the United States due to adaptation (e.g., use of air conditioning).

The eNGOs assert that the proposal wrongly assumes adaptation alone will be enough, claiming evidence shows it is "not occurring fast enough."[402] This misrepresents the cited sources. The studies cited (e.g., Ebi (2024), Brown et al. (2019)) identify an "adaptation gap" to argue for *more* and accelerated adaptation, not that adaptation is futile.[403] Furthermore, the projections of future impacts in these studies are often flawed by heavy reliance on worst-case climate scenarios or by conflating climate impacts with non-climatic drivers, such as population growth.[404]

Finally, the eNGOs claim the climate will cross "hard limits" to adaptation by mid-century, citing extreme heat thresholds and island uninhabitability.[405] These claims are exaggerated. The cited study on heat thresholds (Raymond et al. (2020)) finds that these limits have already been crossed, but only for "1- to 2-hours' duration" in "highly localized" areas.[406] The study on island uninhabitability (Kane & Fletcher (2020)) bases its conclusion on an extreme sea-level rise scenario (1.91m by 2100) that it misleadingly labels as the "most likely scenario," despite it representing a low-probability (5%) tail risk.[407] Current predictions for sea-level rise by 2100 under the most-likely SSPs range from 0.38 to 0.56 m—a tiny fraction of that required for the extreme consequences the eNGOs suggest are just around the corner.

3.3.2.6. Sea-Level Rise

Replies to eNGO Endangerment Comment Section VI.B.2.c (pp. 131–33).

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[402] eNGO Endangerment Comment at 130.

[403] *See, e.g.*, Ebi, *Understanding the Risks of Compound Climate Events and Cascading Risks*, 2 Dialogues on Climate Change 33 (2024), https://doi.org/10.1177/29768659241304857 ("Coordinated transdisciplinary research and implementation are urgently needed.").

[404] Brown et al., *Adaptation to Future Water Shortages in the United States Caused by Population Growth and Climate Change*, 7 Earth's Future 219 (2019), https://doi.org/10.1029/2018EF001091 (modeling assumes U.S. population increase of 67% by 2100); Parker et al., *Extreme Heat Effects on Perennial Crops and Strategies for Sustaining Future Production*, 295 Plant Sci. 110397 (2020), https://doi.org/10.1016/j.plantsci.2019.110397 (relying on RCP 8.5).

[405] eNGO Endangerment Comment at 130–31.

[406] Raymond et al., *The Emergence of Heat and Humidity Too Severe for Human Tolerance*, 6 Sci. Advances eaaw1838 (2020), https://doi.org/10.1126/sciadv.aaw1838.

[407] Kane & Fletcher, *Rethinking Reef Island Stability in Relation to Anthropogenic Sea Level Rise*, 8 Earth's Future e2020EF001525 (2020), https://doi.org/10.1029/2020EF001525 (suggesting 1.91 m rise by 2100 is the "most likely scenario").

The eNGOs contend that the scientific record unequivocally demonstrates an acceleration in global-mean-sea-level (GMSL) rise driven by anthropogenic warming. They assert that GMSL rose faster in the 20th century than in prior millennia and has accelerated since the 1960s.[408] They criticize the proposal's conclusion that U.S. measurements do not show acceleration beyond historical rates, calling this finding "arbitrary" and based on "flawed and selective use" of data.[409]

The eNGOs oversimplify the data, minimizes significant uncertainties in the historical record, and fundamentally mischaracterizes the findings of the very studies they cite. Although GMSL is rising, the eNGOs' claim of a clear, recent acceleration uniformly attributable to anthropogenic warming is not as definitive as the eNGOs claim, particularly when examining the long-term U.S. record.

First, the comparison of the 20th century to the "last three millennia" relies on combining fundamentally different types of data. It compares modern, high-resolution instrumental data (tide gauges and satellites) with smoothed, lower-resolution, and inherently uncertain proxy data (geological reconstructions) from the pre-instrumental period. As discussed in Section 3.1.3.2, *supra*, grafting high-resolution data onto a low-resolution history can artificially manufacture the appearance of abrupt recent change. Furthermore, calculations of acceleration within the instrumental record itself are highly sensitive to the chosen start and end dates and must contend with known multi-decadal natural variability in ocean dynamics.

Second, the eNGOs' attempt to refute the analysis of U.S. historical tide gauges relies upon irrelevant comparisons. The eNGOs cite studies analyzing short-term (post-1993) *global satellite data* to contradict a finding based on long-term (100-plus years) *U.S. tide gauge records*.[410] This is an invalid comparison. A 30-year global trend derived from satellite altimetry cannot refute findings based on a century-long regional dataset, which often shows cyclical behavior where recent rates are comparable to rates observed decades ago.

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[408] eNGO Endangerment Comment at 131 (citing IPCC AR6 WGI, at 1216 (Ch. 9: Ocean, Cryosphere and Sea Level Change) (Fox-Kemper, et al.)).

[409] *Id.* at 131–33.

[410] *See, e.g.*, Guérou et al., *Current Observed Global Mean Sea Level Rise and Acceleration Estimated from Satellite Altimetry and the Associated Measurement Uncertainty*, 19 Ocean Sci. 431 (2023), https://doi.org/10.5194/os-19-431-2023; Otosaka et al., *Mass Balance of the Greenland and Antarctic Ice Sheets from 1992 to 2020*, 15 Earth Sys. Sci. Data 703 (2023), https://doi.org/10.5194/essd-15-1597-2023.

Importantly, local and regional sea-level rise trends are highly variable due to factors such as ocean dynamics, land subsidence, and glacial isostatic adjustment. The eNGOs' own cited studies documenting recent acceleration on the U.S. East and Gulf Coasts undermines their argument. Their primary source for this regional acceleration, Dangendorf et al. (2023), directly contradicts the eNGOs' implied argument that this acceleration is a clear signal of anthropogenic forcing.[411] Dangendorf et al. explicitly attribute this recent acceleration significantly to "internal climate variability," noting the resulting signal is "neither historically unprecedented nor inconsistent with internal variability."[412] This supports the conclusion that natural variability plays a dominant role, undermining the eNGOs' simple attribution to GHG-driven warming.

Similarly, the eNGOs dismiss the West Coast data (which shows less acceleration) as being due to other factors.[413] But these other factors are precisely the local, non-climatic, and natural-variability drivers that must be considered when analyzing sea-level rise trends. The cited studies attribute the suppression of relative sea-level rise on the West Coast to factors such as the Pacific Decadal Oscillation and vertical land motion (e.g., "interseismic uplift rates" causing the land to rise).[414] The eNGOs' own citations therefore confirm that U.S. regional sea level trends are a complex composite of local land motion and internal ocean variability.

3.3.3 Model Inputs and Assumptions

Replies to eNGO Endangerment Comment Section VI.B.2.d (pp. 133–34).

The eNGOs defend the reliability of climate models and dispute assessments of model performance that highlight discrepancies with observations. They argue that such assessments inappropriately suggest these discrepancies undercut the attribution of climate change to anthropogenic drivers and the reliability of future projections.[415] They contend that discrepancies, such as CMIP6 models showing larger tropospheric warming trends than

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[411] eNGO Endangerment Comment at 132.

[412] Dangendorf et al., *Acceleration of US Southeast and Gulf Coast Sea-Level Rise Amplified by Internal Climate Variability*, 14 Nat. Commc'ns 1935, 1 (2023), https://doi.org/10.1038/s41467-023-37649-9.

[413] eNGO Endangerment Comment at 132.

[414] *See, e.g.*, Harvey et al., *Ocean Mass, Sterodynamic Effects, and Vertical Land Motion Largely Explain US Coast Relative Sea Level Rise*, 2 Commc'ns Earth & Env't 233 (2021), https://doi.org/10.1038/s43247-021-00300-w; Burgette et al., *Interseismic Uplift Rates for Western Oregon and Along-Strike Variation in Locking on the Cascadia Subduction Zone*, 114 J. Geophysical Rsch.: Solid Earth B01406 (2009), https://doi.org/10.1029/2008JB005679.

[415] eNGO Endangerment Comment at 133.

observations, are fully explained by observational uncertainties, internal variability, and uncertain historical forcings.[416] Furthermore, they claim that models have "accurately forecasted" future warming and that model results are consistent with the attribution of warming to human influence.[417]

These assertions significantly overstate the certainty of climate modeling and misrepresent the cited literature, which, when reviewed critically, confirms the persistence of significant model-observation mismatches.

The eNGOs' claim that model discrepancies are fully "explained" by factors such as observational uncertainty minimizes the persistent, systemic nature of these biases. Although corrections for observational issues (such as satellite drift) reduce the mismatch, they do not eliminate it. Santer et al. (2017), cited by the eNGOs, found that even after applying corrections, CMIP5 simulated tropospheric warming trends remained systematically larger than observed trends. The authors noted these remaining differences are "sufficiently large to be of scientific concern."[418] This supports, rather than refutes, the concern regarding a persistent model warm bias. This issue is even more pronounced in the current CMIP6 ensemble, which contains many "hot models" that systematically overstate observed warming trends, as explained in Section 3.1.2.1, *supra*.

The critique of model performance is not based solely on tropospheric trends. Mismatches are documented across various domains, including surface warming, stratospheric cooling trends, and regional warming. This broader pattern suggests systemic issues that cannot be dismissed by invoking uncertainty in one specific metric.

The eNGOs also misrepresent studies cited to defend model accuracy and attribution. They conflate the high-level attribution conclusion in IPCC AR6, Chapter 3—that human influence is the "main driver" of warming—with an unsubstantiated claim that model projections are

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[416] *Id.* (citing Po-Chedley et al., *Removing Diurnal Cycle Contamination in Satellite-Derived Tropospheric Temperatures: Understanding Tropical Tropospheric Trend Discrepancies*, 28 J. Climate 2274 (2015), https://doi.org/10.1175/JCLI-D-13-00767.1; Santer et al., *Comparing Tropospheric Warming in Climate Models and Satellite Data*, 30 J. Climate 373 (2017), https://doi.org/10.1175/JCLI-D-16-0333.1; Santer et al., *Exceptional Stratospheric Contribution to Human Fingerprints on Atmospheric Temperature*, 120 Proc. Nat'l Acad. Scis. e2300758120 (2023), https://doi.org/10.1073/pnas.2300758120).

[417] *Id.* at 134.

[418] Santer et al., *supra* note 416, at 379.

"consistent" in their magnitude.[419] In fact, that chapter explicitly confirms the central model discrepancy, stating there is "medium confidence that most CMIP5 and CMIP6 models overestimate observed warming in the upper tropical troposphere."[420] Thus, the eNGOs' source validates the critique of persistent model warm biases.

Similarly, the claim that Hausfather et al. (2019) found models "accurately forecasted" future warming is an exaggeration.[421] The study's finding of consistency is based on a metric ("implied TCR") specifically designed to evaluate model physics by *correcting* for the models' incorrect (and often implausibly high) forcing assumptions.[422] This does not mean the forecasts were accurate, but that their physics were deemed plausible *after* accounting for their flawed emissions projections. In any event, Hausfather et al. analyzes obsolete models published between 1970 and 2007; its conclusions do not refute the documented performance failures of the modern CMIP6 ensemble.

The pervasive methodological flaws in climate modeling, combined with the reliance upon implausible emissions scenarios, *see* Section 3.1.1, *supra*, undermine the eNGOs' claims and make them unreliable.

3.3.4 Attribution to Anthropogenic Emissions

Replies to eNGO Endangerment Comment Section VI.B.2.e (pp. 134–37).

The eNGOs argue that the proposal misunderstands and misrepresents climate-attribution science. They contend that the link between human GHG emissions and long-term global warming is unequivocal, based on fundamental physics, and that natural factors are negligible or already accounted for.[423] They assert that attribution science can now precisely quantify the extent to which climate change exacerbates individual extreme weather events, and accuse EPA

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[419] eNGO Endangerment Comment at 134.

[420] IPCC AR6 WGI, at 425 (Ch. 3: Human Influence on the Climate System) (Eyring et al.).

[421] eNGO Endangerment Comment at 134.

[422] Hausfather et al., *Evaluating the Performance of Past Climate Model Projections*, 47 Geophysical Rsch. Letters e2019GL085378 (2020), https://doi.org/10.1029/2019GL085378 ("We use an implied TCR metric to provide a meaningful model-observation comparison even in the presence of forcing difference."); *see id.* Figure 1 (showing the rate of forcing increase among surveyed models varying between 0.12 and 0.77 watts per meter squared per decade—a six-fold difference).

[423] eNGO Endangerment Comment 134–35 (citing IPCC AR6 WGI, at 425 (Ch. 3: Human Influence on the Climate System) (Eyring et al.).).

of engaging in a logical fallacy by framing attribution as an "all or nothing" proposition.[424] This portrayal significantly overstates the certainty and precision of attribution science. Although the fundamental physics of the greenhouse effect are established, the leap from detecting long-term global trends to attributing the characteristics of a single, localized weather event to human emissions is vast and fraught with uncertainty. The eNGOs misrepresent the state of the science by omitting crucial context, ignoring methodological weaknesses, and presenting contested, model-dependent findings as established facts.

As discussed earlier, *supra* 3.1.5.4, much of what passes for attribution "science" today relies on inherently speculative methodologies.

The eNGOs contend that attribution science can now "assess with increasing precision" the human contribution to individual events, offering specific figures as evidence.[425] These claims present a facade of consensus and precision that collapses under minimal scrutiny. For example, the eNGOs claim climate change made Hurricane Harvey's rainfall "15-20% heavier."[426] This figure hides considerable uncertainty. The two sources cited provide conflicting best estimates. Van Oldenborgh et al. (2017) suggested 15% (range 8%–19%), but admitted this was merely an "extrapolation" from conflicting model data.[427] Risser & Wehner (2017), conversely, provided a best estimate of 37.7% (lower bound 19%)—far outside the eNGOs' claimed range.[428] Crucially, the eNGOs omit that Risser & Wehner explicitly cautioned that their statistical finding "cannot prove causal connections," and that their finding was only in a "Granger causality sense"—a statistical measure that suggests one data series could predict another, but not that there is a direct physical cause-and-effect relationship.

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[424] eNGO Endangerment Comment at 135–37.

[425] *Id.* at 136.

[426] *Id.* at 136 (citing Risser & Wehner, *Attributable Human-Induced Changes in the Likelihood and Magnitude of the Observed Extreme Precipitation During Hurricane Harvey*, 44 Geophysical Rsch. Letters 12,457 (2017), https://doi.org/10.1002/2017GL075888; Van Oldenborgh et al., *Attribution of Extreme Rainfall from Hurricane Harvey, August 2017*, 12 Env't Rsch. Letters 124009 (2017), https://doi.org/10.1088/1748-9326/aa9ef2).

[427] Van Oldenborgh et al., *supra* note 426.

[428] Risser & Wehner, *supra* note 426.

Similarly, the eNGOs claim the 2021 Pacific Northwest Heatwave was made "2-4°F hotter" (i.e., approx. 1-2 °C), citing Philip et al. (2022).[429] But the eNGOs ignore the study's caveats. The authors admitted the event was so extreme that it lay "far outside the range of historical temperature observations," making it "hard to state with confidence how rare the event was."[430] They conceded their statistical fit was not "fully satisfying," suggesting the event might "not belong to the 'same population'" as past events, thereby potentially invalidating the methodology used to derive the temperature attribution.[431]

Regarding the drivers of long-term warming, the eNGOs assert that the human contribution is settled, dismissing natural factors as "small." They rely on the IPCC and Ziskin & Shaviv (2012) to claim natural contributions are negligible.[432] However, the citation to Ziskin & Shaviv (2012) is a fundamental misrepresentation of that study's findings. Far from finding a "small" solar role, Ziskin & Shaviv conclude that a significant, non-thermal solar component is "necessarily present," attributing approximately 40% of 20th-century warming to solar activity.[433] The study identifies a "much larger" solar contribution (0.27 ± 0.07 °C) than standard models assume, driven by an "Indirect Solar Effect" (ISE) that amplifies the climate's response.[434] Crucially, the study's error margins reveal that the maximum plausible solar contribution (0.34 °C) exceeds the minimum plausible anthropogenic contribution (0.31 °C). By failing to acknowledge that their own source does not statistically rule out the possibility that solar contributions are comparable to anthropogenic ones, the eNGOs rely on a consensus that excludes the very amplification mechanisms their cited literature supports. Furthermore, Ziskin & Shaviv found their best fit was obtained with negligible net feedback, implying a low climate sensitivity that contradicts the high-sensitivity assumptions inherent in the IPCC models the eNGOs defend.

Finally, the eNGOs accuse the proposal of a "logical fallacy," arguing that EPA falsely frames attribution as "all or nothing" and misunderstands that climate change "exacerbates" the

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[429] eNGO Endangerment Comment at 136 (citing Philip et al., *Rapid Attribution Analysis of the Extraordinary Heat Wave on the Pacific Coast of the US and Canada in June 2021*, 13 Earth Sys. Dynamics 1689 (2022), https://doi.org/10.5194/esd-13-1689-2022).

[430] Philip et al., *supra* note 429, at 1690.

[431] *Id.* at 1692, 1695.

[432] eNGO Endangerment Comment at 134–35.

[433] Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Rsch. 762, 762 (2012), https://doi.org/10.1016/j.asr.2011.10.009.

[434] *Id.*

severity of events.[435] This mischaracterizes the proposal's critique. The issue is not whether a warmer atmosphere can influence weather. The issue is the reliability and precision with which this influence can be quantified for specific, localized extreme events. The real logical fallacy lies with the eNGOs, who engage in a fallacy of reification—treating abstract, uncertain statistical constructs derived from imperfect models as concrete physical realities. Although it is plausible that a warmer atmosphere exacerbates certain weather events—though as noted above, the trends of those events do not yet support most claims—the claim that we can precisely measure this exacerbation for a specific storm relies on methodologies that remain deeply contested and uncertain.

3.3.5 Benefits of Greenhouse Gases

Replies to eNGO Endangerment Comment Section VI.B.2.f.i–ii (pp. 137–49).

The eNGOs argue that the proposal ignores or downplays the severe negative consequences of GHG emissions while improperly inflating the benefits, particularly regarding carbon dioxide fertilization.[436] They contend that any benefits from increased carbon dioxide are limited by other environmental factors and will be overwhelmed by the negative effects of climate change, such as water stress, decreased nutritional value, pest outbreaks, and heat stress on livestock and workers.[437]

This narrative presents an unbalanced view of the scientific literature. It minimizes the significant, empirically observed benefits of increased atmospheric carbon dioxide, particularly for global greening and agricultural productivity, while maximizing speculative harms often derived from flawed methodologies and implausible scenarios. A balanced assessment recognizes that although the impacts of increased GHGs are complex and varied, the net effects in critical areas such as agriculture are far less negative, and potentially positive, than the eNGOs claim.

3.3.5.1. Direct Impacts of Carbon Dioxide on the Environment

The eNGOs attempt to dismiss the environmental benefits of carbon dioxide by arguing that the proposal fails to properly characterize overall harmful impacts and by claiming that the positive

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[435] eNGO Endangerment Comment at 137.

[436] *Id.* at 137–38.

[437] *Id.* at 138–49.

effects of carbon dioxide fertilization are slowing down or are negated by other factors.[438] These arguments rely on misrepresentations of the scientific record and the omission of critical context.

First, the eNGOs claim the proposal ignores severe environmental consequences documented by the scientific consensus, citing the Biden NCA5.[439] This mischaracterizes the scientific debate and ignores the significant scientific uncertainties and methodological debates regarding extreme weather trends, model limitations, and the plausibility of emission scenarios as discussed in Sections 3.1 and 3.2, *supra*. The proposal does not ignore potential harms; rather, it provides a critical analysis of the evidence, often finding it less robust than portrayed in politicized assessment reports such as the NCA5.

For example, the eNGOs argue the proposal focuses too narrowly on ocean acidification and fails to consider ocean warming, stratification, and deoxygenation.[440] This critique misunderstands EPA's purpose in providing a critical review of existing assessments. Moreover, the eNGOs' reliance upon the cited IPCC is misplaced. That IPCC chapter makes sweeping, "very high confidence" claims in its summary about anthropogenic effects on the ocean, yet the main text concedes that "[d]etecting changes and attributing them to specific drivers has been especially difficult" due to short observational records and confounding factors such as pollution and overfishing.[441] Furthermore, the chapter's most alarming projections rely overwhelmingly upon the implausible RCP 8.5 and SSP5-8.5 scenarios.[442]

Second, the eNGOs contend that the positive effects of carbon dioxide fertilization are significantly constrained by factors such as increasing vapor pressure deficit (VPD) or nutrient limitations.[443] They also claim that increased temperatures drive water stress by increasing evapotranspiration and drying soils, regardless of drought conditions.[444] Although these factors can impose limitations, the cited literature does not demonstrate that the constraints overwhelm the benefits. Instead, the cited studies repeatedly emphasize that the extent and interaction of

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[438] *Id.* at 138–39.

[439] *Id.* at 137–38 (citing Jay, A. K. et al. (2023). Ch. 1. Overview: Understanding Risks, Impacts, and Responses. In *Fifth National Climate Assessment*).

[440] eNGO Endangerment Comment at 141–42.

[441] IPCC AR6 WGII, at 386 (Ch. 3: Oceans and Coastal Ecosystems and Their Services) (Cooley et al.).

[442] *See, e.g., id.* at 460.

[443] eNGO Endangerment Comment at 139.

[444] *Id.* at 140.

these limitations are complex, context-dependent, and highly uncertain.[445] Indeed, some of the studies cited by the eNGOs conclude that the carbon dioxide effect is currently substantial.[446]

The eNGOs further claim there is a "scientific consensus" that a slowdown in global greening is occurring, challenging the assertion that there is "no evidence" of such a trend.[447] But the studies cited by the eNGOs to support this consensus employ methods with notable uncertainties. Several rely heavily on satellite-derived vegetation indices, which face challenges with long-term consistency and signal saturation.[448] Others rely upon Earth System Models (e.g., CMIP6) to disentangle carbon dioxide effects, but, as discussed above, these models have known limitations and biases, and studies acknowledge discrepancies between model outputs and observations.[449] Given these uncertainties in satellite proxies, statistical techniques, and model fidelity, claims of a robust, globally consistent slowdown driven by reduced carbon dioxide effects remain uncertain.

Third, the eNGOs argue that increased greenness is not unequivocally positive, citing potential downsides such as the spread of nuisance plants, increased allergen production, and negative feedbacks in the Arctic.[450]

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[445] *See, e.g.*, Fleischer & Terrer, *Estimates of Soil Nutrient Limitation on the CO2 Fertilization Effect for Tropical Vegetation*, 28 Global Change Biology 6366 (2022), https://doi.org/10.1111/gcb.16377 (emphasizing limited empirical evidence from mature tropical forests); Reich et al., *Plant Growth Enhancement by Elevated CO2 Eliminated by Joint Water and Nitrogen Limitation*, 7 Nature Geoscience 920 (2014), https://doi.org/10.1038/ngeo2284 (finding elimination of effect required simultaneous, severe limitation by multiple factors in a specific grassland experiment).

[446] Barningham, Detection of Forest Resilience to Environmental Change and Quantification of Contemporary Carbon Fluxes Over Amazonia Using Remote Sensing (2023) (Ph.D. dissertation, University of Exeter), https://hdl.handle.net/10871/136676 (modeling showing a significant positive trend in Amazonian GPP driven primarily by CO_2 fertilization).

[447] eNGO Endangerment Comment at 139.

[448] *See, e.g.*, Pan et al., *Increasing Global Vegetation Browning Hidden in Overall Vegetation Greening: Insights from Time-Varying Trends*, 214 Remote Sensing Env't 59 (2018), https://doi.org/10.1016/j.rse.2018.05.018.

[449] *See, e.g.*, Wang et al., *Recent Global Decline of CO2 Fertilization Effects on Vegetation Photosynthesis*, 370 Science 1295 (2020), https://doi.org/10.1126/science.abb7772 (noting that TRENDY models significantly underestimated the CFE decline observed in satellite data); Chen et al., *Transition from Positive to Negative Indirect CO2 Effects on the Vegetation Carbon Uptake*, 15 Nat. Commc'ns 1500 (2024), https://doi.org/10.1038/s41467-024-45957-x (noting discrepancies between model and observational estimates).

[450] eNGO Endangerment Comment at 138, 140.

Regarding allergens, the cited studies focus on specific species under experimental conditions (e.g., 800 ppm CO_2, a concentration met by 2100 only under the RCP 8.5 pathway) or acknowledge challenges in separating carbon dioxide effects from other factors.[451] Extrapolating these specific results to refute the broad benefits of global greening is a significant overreach.

The claim that Arctic greening exacerbates warming and accelerates permafrost thaw relies on flawed studies.[452] The projections of large future emissions from permafrost thaw (Schuur et al. (2022)) are predicated on the extreme RCP 8.5 scenario, which the study mischaracterizes as "business-as-usual."[453] The claim of increased ecosystem respiration (Maes et al. (2024)) is based on open-top chamber experiments that create artificial microclimates, making it impossible to disentangle the effect of temperature from confounding variables such as blocked wind.[454]

3.3.5.2. Impacts on Agriculture

The eNGOs argue that the proposal overstates the benefits of carbon dioxide fertilization on agriculture by relying on flawed data, and that these benefits will be "more than offset" by other harmful impacts of climate change, including heat, water scarcity, pests, and impacts on livestock and workers.[455] These claims rely on selective interpretations of the literature, flawed projections based on extreme scenarios, and a failure to account for adaptation.

First, the eNGOs incorrectly claim the proposal overstates carbon dioxide fertilization by relying on non-peer-reviewed sources and greenhouse experiments that do not correlate with field data.[456] This mischaracterizes the proposal, which synthesizes evidence from multiple lines of inquiry, including field experiments, controlled experiments, satellite data, and econometric analyses. The eNGOs selectively focus on warnings about non-field experiments while ignoring

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[451] Albertine et al., *Projected Carbon Dioxide to Increase Grass Pollen and Allergen Exposure Despite Higher Ozone Levels*, 9 PLoS One e111712 (2014), https://doi.org/10.1371/journal.pone.0111712; Ziska, *An Overview of Rising CO2 and Climatic Change on Aeroallergens and Allergic Diseases*, 12 Allergy, Asthma & Immunology Rsch. 771 (2020), https://doi.org/10.4168/aair.2020.12.5.771.

[452] eNGO Endangerment Comment at 140.

[453] Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://epic.awi.de/57387/1/Schuur_2022.pdf.

[454] Maes et al., *Environmental Drivers of Increased Ecosystem Respiration in a Warming Tundra*, 629 Nature 105 (2024), https://doi.org/10.1038/s41586-024-07274-7 (The study used open-top chambers which block wind and create an artificial microclimate, confounding the effects of temperature).

[455] eNGO Endangerment Comment at 144–48.

[456] *Id.* at 144.

the substantial body of peer-reviewed literature demonstrating significant benefits across various conditions.

Furthermore, the eNGOs' assertion that the carbon dioxide fertilization effect will be "more than offset" by other harmful impacts of climate change is a misrepresentation of the cited source.[457] That study explores the limitations of what we understand about carbon dioxide fertilization and other effects of atmospheric carbon dioxide. The specific phrase "more than offset" appears in that article as a description of the findings of two studies on soybeans and lentils regarding water savings: "Early season stimulation in biomass at elevated [carbon dioxide] more than offset lower stomatal conductance in crops, resulting in greater depletion of soil moisture, instead of water saving."[458] The eNGOs fail to support their claim of offset in any other way.

Second, the central contention that the harms of climate change will outweigh the benefits of carbon dioxide fertilization is speculative and contradicted by much of the observational evidence. The projections of severe harm cited by the eNGOs are frequently derived from models with known biases and rely on implausible emissions scenarios.

For example, the eNGOs cite projections anticipating significant losses in major U.S. crops (corn, soy, wheat) by 2100.[459] However, the cited study's most alarming projections (20% to 35% losses) rely on the extreme RCP 8.5 scenario.[460] Furthermore, the study's econometric model is fundamentally limited because it projects future adaptation based only on historical data. The authors concede the model cannot account for future technological innovations (e.g., genetic modification, new fertilizers) not present in the historical data, making its century-long projections highly speculative and biased toward negative impacts.[461]

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[457] *Id.* (citing Ainsworth et al., *Crops and Rising Atmospheric CO2: Friends or Foes?*, 380 Phil. Transactions Royal Soc'y B 20240230 (2025), https://doi.org/10.1098/rstb.2024.0230).

[458] Ainsworth et al., *supra* note 457, at 2.

[459] eNGO Endangerment Comment at 148.

[460] Hultgren et al., *Impacts of Climate Change on Global Agriculture Accounting for Adaptation*, 642 Nature 644 (2025), https://doi.org/10.1038/s41586-025-09085-w.

[461] *Id.* ("Future producer adaptation to climate change may differ from the historically observed patterns we recover. For example, technological breakthroughs, such as the industrial fixation of nitrogen, transformed what is understood about the limit of global productivity.... Notably, innovation has contributed positively to average yield trends in many regions which will probably continue into the future in some form. Our projected yield impacts should therefore be interpreted as deviations from a future trend in average yields that is driven by other factors, including innovation.").

Similarly, the claim that warming will cause devastating pest outbreaks, leading to major crop losses (e.g., 32% in maize in North America), is flawed.[462] These figures are derived from a study (Deutsch et al. (2018)) that explicitly relies on the RCP 8.5 scenario, which it mischaracterizes as "business-as-usual."[463]

Likewise, the eNGOs' claim that climate change will lead to agricultural water scarcity due to increased water stress and evapotranspiration is an oversimplification.[464] The studies cited for this proposition predicate their most alarming conclusions on extreme scenarios (RCP 8.5 or SSP5-8.5).[465] Furthermore, the eNGOs selectively highlight findings regarding increased water demand while ignoring the primary conclusions of the same studies, which often frame irrigation as a successful and expanding adaptation strategy that will mitigate yield losses or even increase yields.[466]

Lastly, the eNGOs highlight the potential for decreased nutritional value in crops due to elevated carbon dioxide.[467] However, the proposal explicitly discusses this potential issue and notes potential adaptation strategies, such as selective breeding, fortification, and dietary supplements—strategies acknowledged even in sources cited by the eNGOs.[468]

The eNGOs' claims regarding livestock and farm workers are also marked by misrepresentation of the cited literature and reliance on flawed methodologies. The eNGOs claim climate change

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[462] eNGO Endangerment Comment at 147–48.

[463] Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466.

[464] eNGO Endangerment Comment at 138, 145–46.

[465] *See, e.g.*, Overpeck & Udall, *Climate Change and the Aridification of North America*, 117 Proc. Nat'l Acad. Scis. 11,856 (2020), https://doi.org/10.1073/pnas.2006323117 (relying on RCP 8.5); Qin et al., *Agricultural Risks from Changing Snowmelt*, 10 Nature Climate Change 459 (2020), https://doi.org/10.1038/s41558-020-0746-8 (relying on RCP 8.5).

[466] *See, e.g.*, Partridge et al., *Irrigation benefits outweigh costs in more US croplands by mid-century*, 4 Comm. Earth Envir. 274 (2023), https://doi.org/10.1038/s43247-023-00889-0 (projecting "significant increases in mid-century irrigated and rainfed yields throughout most of the Corn Belt"); Zhang et al., *Increased Irrigation Could Mitigate Future Warming-Induced Maize Yield Losses*, 362 Agric. & Forest Meteorology 110,531 (2025), https://doi.org/10.1038/s43247-025-02459-y.

[467] eNGO Endangerment Comment at 138.

[468] *See, e.g.*, Kellie Schmitt, *Less Nutritious Crops: Another Result of Rising CO2*, Hopkins Bloomberg Pub. Health (Sept. 27, 2024), https://magazine.publichealth.jhu.edu/2024/less-nutritious-crops-another-result-rising-co2 (acknowledging adaptation strategies like fortification).

exacerbates management challenges and productivity losses for livestock producers.[469] But claims of future losses due to heat stress (e.g., $39.94 billion annually) rely entirely on the extreme SSP5-8.5 scenario and fail to account for any adaptation (e.g., breed switching to heat-tolerant cattle) by modeling 2100 climate impacts on the 2005 industry structure.[470] The eNGOs also claim a specific dairy sector loss ($1.2 billion) between 2000 and 2018 due to warming.[471] This is based on a fundamental misreading of Wankar et al. (2021); the cited figure refers to older estimates of *total* annual losses due to heat stress generally, not losses attributable to recent climate change. [472]

The eNGOs assert that farm workers are "increasingly suffering" adverse health outcomes due to increased incidence and intensity of heatwaves.[473] This claim is unsupported by the source the eNGOs cite: Jackson & Rosenberg (2010) is an occupational safety review documenting existing hazards; it does not analyze climate trends or demonstrate that workers are "increasingly suffering" due to climate change.[474] The eNGOs also severely misrepresent another study (Parsons et al. (2022)) to claim a "90%" global increase in health-related impacts since 1990 and "$90 billion" in annual U.S. losses.[475] The cited study actually found a global increase of "at least 9%" (a tenfold exaggeration by the eNGOs), and the $90 billion figure represents estimated *total* heat-related losses, not losses due to climate change.[476] Moreover, the study's methodology is highly questionable, as its economic loss figures are generated by applying a damage function

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[469] eNGO Endangerment Comment at 146.

[470] Thornton et al., *Impacts of Heat Stress on Global Cattle Production During the 21st Century: A Modelling Study*, 6 Lancet Planetary Health e192 (2022), https://doi.org/10.1016/s2542-5196(22)00002-x.

[471] eNGO Endangerment Comment at 146–47.

[472] Wankar et al., *Heat Stress in Dairy Animals and Current Milk Production Trends, Economics, and Future Perspectives: The Global Scenario*, 5 Tropical Animal Health & Production 21 (2021), https://doi.org/10.1007/s11250-020-02541-x.. (The $1.2 billion figure cited in this review article refers to older studies estimating total annual heat stress losses, not losses attributable to climate change between 2000-2018).

[473] eNGO Endangerment Comment 147.

[474] Jackson & Rosenberg, *Preventing Heat-Related Illness Among Agricultural Workers*, 15 J. Agromedicine 200 (2010), https://doi.org/10.1080/1059924x.2010.487021.

[475] eNGO Endangerment Comment at 147 (citing Parsons et al., *Global Labor Loss Due to Humid Heat Exposure Underestimated for Outdoor Workers*, 17 Env't Rsch. Letters 014050 (2022), https://iopscience.iop.org/article/10.1088/1748-9326/ac3dae).

[476] Parsons et al., *supra* note 475.

derived from "British participants who were not acclimatized to heat" to the entire global outdoor workforce, virtually guaranteeing an exaggeration of real-world impacts.[477]

3.3.6 Overall Assessment of the Costs of Climate Change

Replies to eNGO Endangerment Comment Section VI.B.2.f.i–ii (pp. 149–54).

The eNGOs contend that the economic impacts of climate change are severe, well-understood, and justify stringent regulation. They argue that the proposal fails to comprehensively assess these impacts, overlooking an extensive body of literature underpinning the SCC.[478] They assert that recent studies quantify macroeconomic damages as significantly larger than previously estimated, that diverse methodologies converge on consistent SCC values, and that these values are likely lower-bound estimates.[479] Furthermore, they argue that the possibility of catastrophic outcomes ("fat tail" risks) requires aggressive action.[480]

This portrayal of the economic literature is fundamentally flawed. The economic assessment of climate change, particularly the SCC, is not an empirical fact but a highly contested, speculative, and easily manipulated modeling output. While the use of IAM-based analyses creates "a perception of knowledge and precision, [] that perception is illusory and misleading."[481] Due to the arbitrary nature of inputs and lack of empirical footing for damage estimates, these models are "close to useless as tools for policy analysis."[482] It is extremely sensitive to subjective assumptions, prone to significant upward biases, and characterized by profound uncertainty rather than convergence. The recent inflation of SCC estimates appears driven more by political necessity and controversial methodological choices than by robust empirical evidence of escalating damages. And regardless, speculative "fat tails" by definition are not "reasonably anticipated."

3.3.6.1. The Social Cost of Carbon Is a Manipulable and Unreliable Metric

The SCC is intended to estimate the monetized damages associated with an incremental increase in carbon dioxide emissions across the Earth. As an initial matter, the SCC is inappropriate for

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[477] *Id.*

[478] eNGO Endangerment Comment at 150.

[479] *Id.* at 150, 151–52.

[480] *Id.* at 153.

[481] Pindyck, *supra* note 188, at 860.

[482] *Id.*

use in an endangerment finding because it represents *global damages*, which are outside of scope of the Clean Air Act. EPA's assigned role is not to dispense foreign aid, but to protect the health and welfare of the United States.

But apart from that fatal flaw, the SCC is also perhaps the clearest example of how speculative assumptions and political imperatives can distort the policymaking process. The models used to calculate the SCC (Integrated Assessment Models, or IAMs) require projecting economic growth, emissions, climate sensitivity, and resulting damages centuries into the future, and then discounting those damages back to the present. Each step involves profound uncertainty, and the final value is overwhelmingly determined by subjective assumptions rather than empirical data.

One of the most influential variables in the SCC calculation is the discount rate. Because money today is worth more than the same amount in the future (due to investment potential and time preference), future costs must be discounted. The choice of discount rate is not a scientific question but a normative and economic one, involving judgments about how much we value the welfare of future generations (the pure rate of time preference) and how we expect consumption to change over time.[483]

A low discount rate (e.g., 1–3%) places a high value on future impacts, while a higher, market-based rate (e.g., 5–7%), reflecting real-world investment returns and opportunity costs, results in a much lower present value of damages.

The eNGOs favor the recent trend toward much lower discount rates. Although the Obama and Trump administrations used central discount rates between 3% and 7%, the Biden Administration adopted a central rate of 2%.[484] The impact of this seemingly small change is massive because damages are projected centuries into the future. EPA's 2023 SCC estimates show that a shift from a 2.5% to a 1.5% discount rate nearly triples the SCC, from $120 to $340 per metric ton of CO_2.[485] The high SCC values touted by the eNGOs are a direct, mechanical result of this assumption, not a robust scientific finding.

There are significant reasons to be skeptical of these very low discount rates. First, research shows that these low rates do not reflect the preferences of the global population. As Dong et al.

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483 Dong et al., *Towards a Social Cost of Carbon with National Characteristics*, 244 Econ. Letters 111977, 1 (2024), https://doi.org/10.1016/j.econlet.2024.111977.

484 EPA, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* (Nov. 2023), Dkt. ID EPA-HQ-OAR-2021-0317.

485 *Id.*

explain, "[t]he welfare parameters assumed by Western experts systematically deviate from the world population so that published estimates of the social cost of carbon are unrepresentative and too high." [486]

Their research found that while the expert-averaged SCC was $34.8/tC, the population-weighted average was much lower, at $12.2/tC, because "more populous nations tend to be more impatient." [487] The unit $/tC refers to the social cost per metric ton of elemental carbon, while $/t$CO_2$ refers to the cost per ton of carbon dioxide. Because one ton of carbon corresponds to approximately 3.67 tons of CO_2, values expressed in $/tC must be divided by 3.67 to be comparable to standard $/t$CO_2$ figures. Therefore, the study's estimates of $34.8/tC and $12.2/tC are equivalent to roughly $9.50/t$CO_2$ and $3.30/t$CO_2$, respectively. For comparison, the US EPA's 2023 updated central estimate for the social cost of carbon is $190/t$CO_2$ (equivalent to ~$697/tC), reflecting significantly different discount rate assumptions. Because the most financially vulnerable almost always express higher rates of time preference (preferring consumption today), the use of an artificially low discount rate (reflecting the preferences of the affluent) is most likely to justify costly near-term regulations that harm those with lower incomes.

Second, the timing and magnitude of recent SCC increases strongly suggest that the choice of discount rate was political, serving to justify pre-determined regulatory outcomes. During the period EPA was developing its updated SCC estimates, it was also developing several extremely costly rules, most notably the stringent tailpipe emissions standards finalized in March 2024 that the proposal would rescind here.

As discussed at length below, these regulations effectively mandate a transition to electric vehicles, imposing an estimated $870 billion in increased vehicle costs on consumers, plus infrastructure costs. To offset these enormous costs, EPA needed equally enormous benefits. The November 2023 SCC estimate of $190 per ton provided the necessary justification, resulting in $1.6 trillion in claimed climate benefits—a quadrupling of the benefits estimated in the proposed rule.

This outcome was predictable. During a 2023 forum, *New York Times* reporter Coral Davenport explained how EPA could justify its upcoming electric-vehicle mandates, which were designed to "essentially end sales of the internal combustion engine":

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[486] Dong et al., *supra* note 483, at 4.

[487] *Id.* at 3.

> How do you economically justify that? One way you do that is you come in with the social cost of carbon at $192 per ton. … [I]f you say the cost of every ton of carbon dioxide that comes out of that tailpipe is $192 … boom, you basically have your economic justification for this powerful rulemaking.[488]

Ms. Davenport was prescient; EPA's unrounded SCC was $193.[489] In setting the SCC in this manner, EPA was effectively printing its own regulatory currency. That the number reflects politics more than science is obvious.

3.3.6.2. The eNGOs Misrepresent the Economic Literature on Climate Damages

The eNGOs' portrayal of the broader economic literature systematically exaggerates the certainty and magnitude of projected damages while ignoring critical limitations and confounding factors.

First, the eNGOs fundamentally mischaracterize the literature by claiming that diverse methodologies "converge on consistent SCC values."[490] In fact, the cited sources explicitly demonstrate the opposite. The meta-analysis by Moore et al. (2024), cited by the eNGOs, concludes that the distribution of published SCC values is "wide and substantially right-skewed," with a 5th to 95th percentile range spanning $32 to $874.[491] Similarly, Rennert et al. (2022) presents a preferred range of $44 to $413.[492] This is not convergence.

Furthermore, the high central estimates relied upon by the eNGOs (e.g., $185 in Rennert et al.) are driven primarily by the adoption of the exceptionally low 2.0% discount rate. Rennert et al. (2022) show that simply increasing the discount rate to 3.0% cuts their mean SCC estimate by more than half, from $185 to $80.[493]

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[488] Social Cost of Carbon, Brookings Inst. (Apr. 3, 2023), https://www.brookings.edu/events/social-cost-of-carbon-what-it-is-why-it-matters-and-why-the-biden-administration-seeks-to-raise-it/.

[489] EPA, Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances (Nov. 2023) (SCC for the year 2020).

[490] eNGO Endangerment Comment at 151–52.

[491] Moore et al., *Synthesis of Evidence Yields High Social Cost of Carbon Due to Structural Model Variation and Uncertainties*, 121 Proc. Nat'l Acad. Scis. e2410733121, 1 (2024), https://doi.org/10.1073/pnas.2410733121.

[492] Rennert et al., *Comprehensive Evidence on the Social Cost of Carbon*, 610 Nature 687 (2022), https://doi.org/10.1038/s41586-022-05224-9.

[493] *Id.* at 689.

Second, the eNGOs highlight a recent study claiming macroeconomic damages are "approximately six times larger than previously estimated."[494] This claim relies on Bilal & Känzig (2024), a significant outlier that contradicts the established literature by using a novel, flawed methodology.[495] The authors of that study reject the standard methodology (using local temperature changes) in favor of a model based on "global temperature" shocks. They concede that when they use the established methodology, their results are small and statistically insignificant.[496] Their "global temperature" variable appears to be a proxy for naturally occurring global cycles (such as El Niño). Mainstream research uses controls (time-fixed effects) to remove the confounding influence of these cycles. Bilal & Känzig's novel method removes this standard control, allowing it to improperly attribute damages from natural cycles to long-term climate change, thereby manufacturing its order-of-magnitude larger result.

Third, the eNGOs assert that SCC values are "generally understood to be lower-bound estimates" because many climate impacts remain unquantified.[497] This is an analytical fallacy. Although models omit certain impacts, this does not automatically render the estimate a lower bound. This conclusion requires the unsubstantiated assumptions that all omitted impacts are negative (ignoring potential benefits) and that the most significant damages have yet to be quantified. As Tol (2024) noted, this argument assumes "over 40 years of impact research has somehow missed the most important effects of climate change."[498]

Crucially, this argument ignores significant upward biases in current SCC methodologies, which likely outweigh omitted damages. These include the systematic underestimation of future adaptation and technological innovation, the use of arbitrarily low discount rates, and reliance on speculative damage functions often derived from extreme emission scenarios (see, *supra* 3.1.5.1).

Fourth, the eNGOs assert that evidence demonstrates robust temperature-damage relationships across sectors, with mortality as a key driver, and that adaptation is proving only a partial solution.[499] This is misleading. The claim that adaptation is "proving only a partial" solution

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[494] eNGO Endangerment Comment at 150.

[495] Bilal & Känzig, *The Macroeconomic Impact of Climate Change: Global vs. Local Temperature* (NBER Working Paper No. 32450, 2024), https://www.nber.org/papers/w32450.

[496] *Id.* at 7.

[497] eNGO Endangerment Comment at 152.

[498] Tol, *Meta-Analysis of Climate Damages and Policy Implications*, 129 Energy Econ. 106901, 5 (2024), https://ideas.repec.org/a/eee/enepol/v185y2024ics0301421523005074.html.

[499] eNGO Endangerment Comment at 151.

relies on Burke et al. (2024), which found "limited systematic evidence of adaptation to date."[500] The eNGOs mischaracterize a study documenting an absence of effective aggregate adaptation as evidence that adaptation *cannot* be effective in the future.

The claim of large health losses with "mortality as a key driver" is also misrepresented. The eNGOs cite Gould et al. (2025) but omit that study's central finding regarding the net impact of warming in California: "mortality will decrease due to fewer cold extremes."[501] Citing this study to support generalized mortality losses ignores the crucial finding that warming may reduce net mortality by mitigating cold risks.

Furthermore, the high economic damage projections cited by the eNGOs are derived from studies predicated on the implausible RCP 8.5 scenario. Kalkuhl and Wenz (2020) explicitly characterize RCP 8.5 as the "business-as-usual scenario" to generate their headline findings.[502]

Finally, the eNGOs argue that even a small chance of extreme warming ("fat tail" uncertainty) justifies strong climate action, claiming that this could make SCC estimates "6 to 200 times higher."[503] This fundamentally misrepresents the source of the multiplier. The study cited for these figures, Dong et al. (2025), explicitly attributes this increase entirely to "preference heterogeneity" regarding the discount rate, *not* to catastrophic physical climate damages.[504] It is a mathematical result of averaging diverse public opinions on how to value the distant future, using a methodology that gives disproportionate weight to individuals who favor near-zero discount rates.

The eNGOs drastically overstate the findings of the study that modeled climate tipping points, Dietz et al. (2021). That study found that tipping points increase the SCC by approximately 25% in their main specification—orders of magnitude lower than the eNGOs suggest.[505]

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[500] Burke et al., *Climate and Labor Market Impacts* (NBER Working Paper No. 32985, 2024),https://www.nber.org/papers/w32985 (quote in Abstract)

[501] Gould et al., *Temperature Extremes Impact Mortality and Morbidity Differently*, 11 Sci. Advances eadr3070, 1 (2025), https://doi.org/10.1126/sciadv.adr3070.

[502] Kalkuhl & Wenz, *supra* note 331.

[503] eNGO Endangerment Comment 153.

[504] Dong et al., *The Weitzman Premium on the Social Cost of Carbon* (2025) (unpublished preprint), https://arxiv.org/pdf/2502.01394.

[505] Dietz et al., *Economic Impacts of Tipping Points in the Climate System*, 118 Proc. Nat'l Acad. Scis. e2103081118 (2021), https://doi.org/10.1073/pnas.2103081118.

The eNGOs also cite the theoretical work of Weitzman (2014).[506] They omit that Weitzman himself explicitly rejected his theoretical result (that the SCC could be infinite) as an empirical guide for policy, calling it an "absurd result" and a "reductio ad absurdum" because "we know hardly anything about extreme tail probabilities."[507]

The economic assessments relied upon by the eNGOs are highly speculative, sensitive to subjective and politically motivated assumptions, and often biased toward exaggerating costs while minimizing adaptation. They do not provide a basis for an endangerment finding.

* * *

The eNGOs' attempted rebuttal of the proposal in Section VI.B of their comments reveals a consistent pattern of misrepresentation. The eNGOs systematically misread their own cited sources and present conclusions that are directly contradicted by the authors' stated findings, limitations, and caveats. Their flawed approach relies pervasively on implausible, high-end emissions scenarios; treats speculative, model-derived outputs as observed facts; and deliberately ignores the dominant roles of natural variability, data inhomogeneities, and critical non-climatic confounding factors.

The eNGOs' assertion that the proposal is "inaccurate" or "misleading" is baseless. When the eNGOs' citations are actually read, they repeatedly undermine the eNGOs' arguments—confirming the proposal's claims that model-observation mismatches are real, that natural variability is a primary driver of regional sea-level and hurricane trends, and that the economic case for endangerment rests on politically motivated assumptions. The eNGOs have not offered a substantive defense of their position, but have instead merely restated their conclusions while demonstrating a profound unwillingness to engage honestly with the limitations, uncertainties, and contradictory findings in the literature they cite.

3.4. The Causal Links Between GHG Emissions and Specific Harms to Public Health Are More Tenuous and Speculative Than the eNGOs Allege

Replies to eNGO Endangerment Comment Section VI.D (pp. 166–170).

eNGO Claim: In Section VI.D of their comments, the eNGOs attempt to draw direct, definitive causal lines between GHG emissions and a host of specific public health harms, ranging from air

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[506] eNGO Endangerment Comment at 153.

[507] Weitzman, *Fat Tails and the Social Cost of Carbon*, 104 Am. Econ. Rev. 544, 545, 548 (2014), https://ideas.repec.org/a/aea/aecrev/v104y2014i5p544-46.html.

quality degradation and extreme weather impacts to the spread of infectious diseases. They assert these links are robust and scientifically established, thereby justifying the 2009 Endangerment Finding.[508]

Refutation: The eNGOs' portrayal relies on a systematically flawed and oversimplified interpretation of the scientific and economic literature. A close examination of the studies cited by the eNGOs reveals pervasive methodological weaknesses, the frequent misrepresentation of source material, and a failure to account for the complex, real-world factors that dominate public health outcomes. The eNGOs consistently confuse correlation with causation, attributing multifaceted problems entirely to climate change while ignoring the dominant roles of local factors, socioeconomic conditions, and human adaptation. Furthermore, the eNGOs repeatedly cite irrelevant sources—including legal conference reports and economic studies that merely assume climate impacts—to substantiate empirical scientific claims.

When these flaws are accounted for, the causal links between GHG emissions and the specific harms alleged by the eNGOs are far more tenuous, uncertain, and speculative than the eNGOs claim.

3.4.1 Repeated Citation of an Irrelevant Source

To support many different claims throughout this section, the eNGOs cite the Wentz (2025) Conference Report.[509] But this document is not a scientific study. It is a report from Columbia Law School summarizing panel discussions on the legal applications of attribution science for climate litigation. The specific pages cited by the eNGOs have nothing to do with the various claims they are making but are instead summaries of legal panel discussions on litigation strategies. The study contains no scientific data or analysis regarding air quality, wildfires, extreme weather health, disease, or any of the specific outcomes the eNGOs claim it supports. And the various other sources the eNGOs claim this study cites are nowhere mentioned in it. Nonetheless, in the analysis below we address the other sources.

3.4.2 Air Quality Impacts Are Overstated and Misattributed.

The eNGOs assert that GHG emissions worsen air quality by increasing wildfire smoke, ground-level ozone, and aeroallergens, leading to significant negative health impacts.[510] These claims rely

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[508] *See* eNGO Endangerment Comment at 166–70.

[509] *See id.* at 166–68 (repeatedly citing J. Wentz, Conference Report: Attribution Science and Climate Law 17 (March 2025), https://perma.cc/4M4X-J3FZ).

[510] *Id.* at 166–71.

on simplified causal chains and, in several key instances, are supported by citations to documents entirely irrelevant to the scientific propositions being advanced.

3.4.2.1. Wildfire Smoke and General Air Pollutants

The eNGOs claim that worsening air quality due to GHG emissions causes significant health impacts, specifically asserting that pollution generated by wildfires (including particulate matter and carbon monoxide) contributes to "death, respiratory disease, cardiac events, and negative birth outcomes."[511] They further claim that wildfire pollution, particulate matter, and aeroallergens are all produced in "heightened quantities with warmer ambient temperatures that result from greenhouse gas emissions."[512]

As mentioned above, the eNGOs' claims are largely supported with citations to the Wentz Conference Report, which is not empirical evidence of anything. And when the eNGOs do cite a relevant scientific study regarding aeroallergens, Singh & Kumar (2022), they misrepresent its findings.[513] The eNGOs suggest that increased GHG emissions directly and monotonically cause "heightened quantities" of allergens. But the cited study does not support this. Instead, it discusses complex and sometimes contradictory interactions. For example, the study discusses the effects of criteria pollutants—not GHGs—noting studies where these pollutants may actually damage pollen or decrease its protein content.[514] And the study's language regarding the link between GHGs and pollen production is speculative, using qualified terms such as "may boost plant growth" and "may affect pollen dispersal."[515] The eNGOs exaggerate these complex and qualified findings to present a misleading claim of direct causation.

3.4.2.2. Ground-Level Ozone

The eNGOs assert that increased ground-level ozone (smog) is associated with increased ambient temperatures and causes a litany of severe health effects, including respiratory disease,

[511] *Id.* at 166.

[512] *Id.* at 166.

[513] *Id.* at 166 (citing Singh & Kumar, *Climate Change and Allergic Diseases: An Overview*, 3 Front. Allergy 964987 (2022), https://doi.org/10.3389/falgy.2022.964987).

[514] Singh & Kumar, *supra* note 513, at 04.

[515] *Id.*

cancer, harms to brain health, and premature death.[516] This claim suffers from both exaggeration and reliance on fundamentally flawed modeling.

First, the eNGOs exaggerate the health impacts listed in their own sources. Neither the primary study cited (Orru et al. (2013)) nor the cited EPA fact sheet mentions "cancer" or "harms to brain health" as established effects of ground-level ozone.[517]

Second, the reliance on Orru et al. (2013) to project future harms is misplaced because the study is not a realistic forecast of harm to the United States.[518] Ground-level ozone is formed by chemical reactions between precursors (nitrogen oxides and reactive volatile organic compounds) in the presence of sunlight and heat. The study's projections (which models European countries with worse air quality than the United States) used an emissions inventory of year "2000 levels for all simulated years."[519] The study is thus predicated on the unrealistic assumption that these air pollutants remain constant at year 2000 levels through 2060. The authors explicitly state that "the possible decrease of ozone precursor emissions ... were not taken into account."[520] By ignoring decades of emissions-reduction policies implemented after 2000, the study ensures an exaggerated projection of future ozone concentrations in Europe and, consequently, of future health impacts. Furthermore, the study relies on unrealistically high GHG emissions scenarios (SRES A2 and A1B) developed for the IPCC's 2001 report, both of which overpredict likely future warming compared to current trajectories.[521] The use of European countries, the exaggerated precursor emissions, and exaggerated warming renders the study's conclusions unreliable for assessing the actual causal link between GHG emissions and future harms from ozone in the United States.

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[516] eNGO Endangerment Comment 166.

[517] *See* Orru et al., *Impact of Climate Change on Ozone-Related Mortality and Morbidity in Europe*, 41 Eur. Respiratory J. 285 (2013), https://doi.org/10.1183/09031936.00210411; *Health Effects of Ozone Pollution*, U.S. Env't Prot. Agency, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution (last updated Mar. 13, 2025).

[518] Orru et al., *supra* note 517.

[519] *Id.* at 286.

[520] *Id.* at 292.

[521] *Id.* at 286.

3.4.3 The Link Between GHGs and Extreme Weather Harms is Speculative and Confounded

The eNGOs claim that GHG emissions increase the frequency and severity of extreme weather events—including heat, precipitation, flooding, storms, and wildfires—which directly cause mortality, morbidity, and economic loss.[522] These assertions significantly overstate the certainty of the scientific evidence and consistently fail to account for the dominant role of non-climatic factors and human adaptation.

3.4.3.1. The Misleading Narrative of Universal Intensification

The eNGOs assert generally that GHG emissions "heighten the frequency and severity of extreme weather events, including extreme heat, precipitation, and flooding."[523]

First, this sweeping assertion is not properly supported by the evidence provided. The eNGOs cite pages 8 and 11 of the "IPCCC, AR6" [sic]. It is unclear which portion of that report they mean. In any event, the claim that emissions universally "heighten the frequency and severity" of these events ignores significant contrary evidence within the U.S. historical record and oversimplifies complex phenomena. As detailed in Section 3.3.2, *supra*, the frequency of intense heatwaves in the United States was significantly higher during the 1930s than today. Similarly, observational data show no clear evidence of an increasing trend in flood magnitude or frequency across the United States. The eNGOs exaggerate the observed impacts by generalizing global assessments and disregarding the specific U.S. historical record that contradicts their premise.

3.4.3.2. Extreme Heat and Mortality

The eNGOs assert that "[e]xtreme heat attributable to greenhouse gases … contribut[es] to more mortality than any other climatic hazard."[524] This superlative claim is wholly unsupported by the cited materials and ignores critical confounding factors and adaptation.

The eNGOs again cite the irrelevant Wentz (2025) legal conference report and exaggerate the findings of the cited studies. While these reports document modeled increases in heat-related mortality, they do not conduct the comparative analysis required to rank heat as the deadliest climatic hazard globally.

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[522] eNGO Endangerment Comment at 167–68.

[523] *Id.* at 167.

[524] *Id.* at 167.

The primary study cited, Romanello et al. (2023), documents increases in heat-related mortality but does not conduct the comparative analysis required to rank heat as the deadliest climatic hazard globally compared to others such as flooding or, importantly, cold.[525] As mentioned above, Gasparrini et al. (2015), found cold killed significantly more people than heat in the United States.[526] And a study by the same author cited approvingly by the eNGOs, Gasparrini et al. (2017), found that a decrease in cold-related deaths will outweigh an increase in heat-related deaths under all scenarios except the very implausible RCP 8.5.[527] And importantly, that study explicitly assumes *zero adaptation* to future warming, meaning it almost certainly overestimates heat-related mortality.

In any event, the analysis in Romanello et al. likely overstates the role of climate change by failing to adequately isolate the climate signal from dominant confounding factors. The report claims an 85% increase in global heat-related deaths among adults above age 65 compared to 1991–2000 based on a statistical attribution study that uses a questionable damages function, and questionable data sources, including maximum daily dry bulb temperatures that unlike WGBT don't accurately predict heat stress.[528] Although the authors acknowledge aging accounts for 38% of this, they attribute the rest to temperature. This fails to account for critical factors such as increased urbanization (the Urban Heat Island effect) and wildfire management, both of which independently increase heat and fire vulnerability. Further, since it purports to measure *global* deaths, it is outside the scope of EPA's analysis. Other studies by country predict that U.S. heat-related deaths will decline, which is what matters for EPA's judgment.[529] Finally, Romanello et al is unreliable for regulatory use as it is explicitly predicated on the assumption of "no substantial progress on adaptation."[530]

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[525] Romanello et al., *The 2023 Report of the Lancet Countdown on Health and Climate Change: The Imperative for a Health-Centred Response in a World Facing Irreversible Harms*, 402 Lancet 2346 (2023), https://doi.org/10.1016/s0140-6736(23)01859-7.

[526] Gasparrini et al., *supra* note 398.

[527] eNGO Endangerment Comment at 129 (citing Gasparrini et al., *supra* note 399).

[528] Romanello et al., *supra* note 525, at 15.

[529] Ritchie, *How many people die from extreme temperatures, and how this could change in the future: Part two*, Our World in Data (July 1, 2024), https://ourworldindata.org/part-two-how-many-people-die-from-extreme-temperatures-and-how-could-this-change-in-the-future.

[530] Romanello et al, *supra* note 525, at 3.

Projecting public health impacts decades into the future while assuming that societies will remain static—failing to adopt new technologies (such as air conditioning) or behaviors—is contrary to historical evidence of human adaptation and systematically inflates the modeled harms.

3.4.3.3. Flooding, Storms, and Economic Costs

The eNGOs claim that climatic impacts increase severe precipitation, storms, and flooding, resulting in "high public and private costs."[531] This argument improperly attributes rising economic losses to climate change while ignoring the dominant role of socio-economic factors, a flaw known as the "expanding bull's-eye effect," as discussed in Section 3.2.3.2, *supra*.

In support of their claims, the eNGOs rely on an economic report, Oxera (2024), that explicitly disclaims any investigation into the physical drivers of these events.[532] The authors state: "Importantly, this study does not seek to evaluate the validity of the causal relationship between climate change and these extreme weather events; instead, we take this link as given."[533] The eNGOs improperly rely on a report that merely assumes the climate link to substantiate the existence of that link.

Furthermore, the study's methodology for assessing costs is flawed because it fails to normalize the economic loss data. The analysis relies on raw damage figures and does not account for the significant increases in population, wealth, and infrastructure development in hazard-prone areas over time. Without normalization, it is impossible to distinguish whether rising costs are due to changes in the climate hazard or simply because there is more economic value exposed to risk. The study thus conflates economic growth with climate impact.

Additionally, the study's observed trends are unreliable due to reliance on the EM-DAT database, which suffers from evolving reporting biases. The authors admit a recent spike in calculated human impact costs is "largely a result of the increased reporting and quantification of excess mortality in Europe." A review of the data confirms this distortion. The study attributes approximately $80 billion in losses during 2022 and 2023 to these newly quantified deaths. When this reporting artifact is removed, the average annual economic loss for those years falls to approximately $185.5 billion—actually *lower* than the $190 billion average of the preceding eight

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[531] eNGO Endangerment Comment at 168.

[532] Oxera, *New Report: Extreme Weather Events Cost Economy $2 Trillion Over the Last Decade*, Int'l Chamber of Com. (Nov. 11, 2024), https://iccwbo.org/news-publications/policies-reports/new-report-extreme-weather-events-cost-economy-2-trillion-over-the-last-decade/.

[533] *Id.* at 7.

years. The observed trends are driven by changes in data collection, not an increase in the underlying weather events.

3.4.3.4. Wildfires

The eNGOs also claim that "[e]missions-induced climate change also increases the occurrence of fire weather, which heightens the risk and potential severity of wildfires."[534] This oversimplifies a complex issue by minimizing the dominant role of non-climatic factors and relying on flawed attribution studies. As explained above, decades of fire methodology suppression policies, changes in fuel loads, and insect outbreaks all play a large role in wildfires.

The studies cited by the eNGOs, such as Turco et al. (2023) and Goss et al. (2020), significantly overstate the attribution of wildfire trends to climate change by ignoring critical confounding variables, most notably the accumulation of hazardous fuel loads due to a century of fire suppression policies.[535] Turco et al. conclude that "nearly all the observed increase in [Burned Area] is due to anthropogenic climate change."[536] This is methodologically unsound because the study's statistical model links burned area almost exclusively to temperature, explicitly excluding the impact of land management and fuel density. By attributing the increase solely to temperature changes, the study improperly ignores that the observed increase is the result of increased aridity acting upon an unnaturally flammable landscape created by management choices. Similarly, Goss et al. focus strictly on meteorological factors and explicitly state their investigation is "irrespective of changes in ... management strategies."[537]

Furthermore, these studies are geographically and seasonally narrow—limited to summer or autumn fires in California—and cannot support a general conclusion about emissions and wildfires nationally. Finally, their most alarming future projections rely on high-end, worst-case emissions scenarios (RCP 8.5 or SSP5-8.5), which systematically exaggerate the projected impacts.[538]

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[534] eNGO Endangerment Comment at 168.

[535] Turco et al., *Anthropogenic Climate Change Impacts Exacerbate Summer Forest Fires in California*, 120 Proc. Nat'l Acad. Scis. e2213815120 (2023), https://doi.org/10.1073/pnas.2213815120; Goss et al., *Climate Change Is Increasing the Likelihood of Extreme Autumn Wildfire Conditions Across California*, 15 Env't Rsch. Letters 094016 (2020), https://doi.org/10.1088/1748-9326/ab83a7.

[536] Turco et al., *supra* note 535.

[537] Goss et al., *supra* note 535.

[538] *Id.* (relying on RCP 8.5); Turco et al., *supra* note 535 (relying on SSP5-8.5).

3.4.4 Claims Regarding Disease and Water Resources Lack Causal Foundation

The eNGOs attribute complex public health and resource management challenges—including the spread of infectious diseases and degradation of water quality—directly to GHG emissions.[539] These claims rely on outdated studies, irrelevant citations, and a failure to acknowledge that socio-economic development and public health infrastructure, not climate suitability, are the primary drivers of these outcomes.

3.4.4.1. Infectious Diseases

The eNGOs claim that ambient warming caused by GHGs increases the instances of infectious diseases, including malaria and diarrheal disease.[540] The spread of these diseases is overwhelmingly a function of public health infrastructure, sanitation, and poverty. Although temperature can affect the geographic range of a vector, it is rarely the primary driver of disease transmission in human populations.

The evidence cited by the eNGOs is deficient. Again, their specific citation to the "IPCCC AR6" [sic] is unclear. It is unclear which portion of that report they mean. The other study cited, McMichael et al. (2004), is obsolete and methodologically flawed chapter in a book comparing global health risks. It relies on climate models and emissions scenarios from the 1990s (HadCM2 and IS92a) that have long been superseded and are known to overestimate emissions growth.[541] Furthermore, the study estimates the global impact on diarrheal disease is by extrapolating a global impact from statistical relationships derived from only two specific locations (Lima, Peru, and Fiji).[542] The authors acknowledge the "substantial uncertainty" resulting from this "very small number" of underlying studies.[543] Finally, the McMichael study fails to realistically account for the dominant role of socio-economic development and adaptation. For example, it explicitly assumes *no* socioeconomic adaptation when modeling malaria risk.[544] This is contrary to observed reality. The study effectively concedes this point, assuming that richer countries (defined as GDP > $6,000 per year) "suffer little or no additional risk of diarrhoea," confirming that vulnerability

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[539] See eNGO Endangerment Comment at 168–69.

[540] *Id.* at 168.

[541] McMichael et al., *Global Climate Change*, *in* Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors 1550–51 (2004), https://www.who.int/publications/i/item/9241580313.

[542] *Id.* at 1570.

[543] *Id.* at 1574.

[544] *Id.* at 1567.

is driven by poverty and lack of infrastructure, not climate.[545] Because the U.S. far exceeds that per capita GDP threshold, the results are irrelevant for the Endangerment Finding.

3.4.4.2. Water Quality and Quantity

The eNGOs also claim that higher temperatures degrade water quality, strain water supply, undermine food production, and increase saltwater intrusion.[546] But water quality and quantity are primarily determined by local land use, human management of water resources (e.g., dams, irrigation, groundwater extraction), and regional precipitation patterns subject to high natural variability. Attributing these localized challenges directly to global GHG concentrations is highly speculative. The eNGOs' citation for these sweeping claims is an archived government webpage that provides assertions without supporting citations to independent research and thus should not be credited as scientific evidence of a causal link.[547]

3.4.5 Claims Regarding Regulatory Co-Benefits Are Misleading and Speculative

The eNGOs argue that regulations decreasing GHG emissions are a "cost-effective way to avert premature climate-related morbidity and mortality" and that there are "significant health co-benefits" due to the reduction of co-emitted pollutants such as particulate matter.[548] These claims fundamentally mischaracterize the cited literature by conflating the benefits of air pollution control with the benefits of climate regulation, and rely upon speculative economic modeling.

The eNGOs claim the cited studies demonstrate cost-effectiveness in averting "climate-related" harms.[549] The studies cited by the eNGOs derive their claims of cost-effectiveness almost exclusively from ancillary "co-benefits"—specifically, the near-term improvements in air quality resulting from reductions in conventional pollutants (such as particulate matter and smog) that can be co-emitted with GHGs.

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[545] *Id.* at 1544.

[546] eNGO Endangerment Comment at 169.

[547] *See* EPA, *Climate Adaptation and Source Water Impacts*, https://www.epa.gov/arc-x/climate-adaptation-and-source-water-impacts (last updated Jan. 10, 2025).

[548] eNGO Endangerment Comment at 169.

[549] *Id.* at 169 (citing, apart from Wentz, Thurston & Bell, *The Human Health Co-Benefits of Air Quality Improvements Associated with Climate Change Mitigation*, *in* Climate Change and Global Public Health 181 (K.E. Pinkerton & W.N. Rom eds., 2020), https://doi.org/10.1007/978-1-4614-8417-2_8.).

Gao et al. (2018), for example, explicitly defines these co-benefits as improvements in human health independent of the effects on climate change. West et al. (2013) found that 89% of the ozone-related health benefits they calculated were due to reductions in co-emitted pollutants, with only 11% attributable to changes in the climate.[550] Perhaps this is the point of the eNGOs claim, but these benefits are in no way "climate related."

Furthermore, the eNGOs selectively cite Shindell et al. (2016) while omitting a critical finding: reducing co-pollutant emissions includes reducing sulfate aerosols, which exert a cooling effect. Consequently, Shindell et al. concluded that the clean energy policies actually produce near-term national climate *disbenefits*, including "warmer summers."[551] The eNGOs ignore evidence that GHG regulations may exacerbate, rather than avert, certain climate-related harms in the short-to-medium term.

The eNGOs' claims of "cost-effectiveness" and "significant" co-benefits are not empirical observations but the output of models that make controversial, non-obvious assumptions. For example, the modeled mortality benefits are highly sensitive to assumptions regarding the lethality of fine particulate matter and discount rates, which the Gao et. al (2018) acknowledge involve "controversial aspects." Likewise, to draw their conclusions Shindell et al. (2016) inflated their modeled mortality by incorporating concentration-response functions that were "80% higher" than standard estimates, justifying this based on "expert elicitation," and relied on RCP 8.5 as a baseline. Shindell et al. also significantly underestimated costs, assuming their "clean transportation" scenario would cost the economy only $100–210 billion, a fraction of the actual cost of EPA's regulations[552]. The claimed cost-effectiveness is predetermined by subjective modeling choices.

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The arguments presented in Section VI.D of the eNGO comments fail to establish robust causal links between GHG emissions and specific public health harms. The eNGOs consistently rely on irrelevant sources, misrepresent the findings of the literature, and utilize flawed methodologies

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[550] West et al., *Co-Benefits of Mitigating Global Greenhouse Gas Emissions for Future Air Quality and Human Health*, 3 Nature Climate Change 885 (2013), https://doi.org/10.1038/nclimate2009.

[551] Shindell et al., *Climate and Health Impacts of US Emissions Reductions Consistent with 2°C*, 6 Nature Climate Change 503, 503 (2016), http://dx.doi.org/10.1038/nclimate2935.

[552] *Id.*

that ignore confounding factors and adaptation. The evidence linking GHG emissions to these specific health outcomes remains far more tenuous and speculative than the eNGOs allege.

RESPONSE TO eNGO GHG VEHICLE STANDARDS COMMENT

This part provides a refutation of the legal, scientific, and policy arguments submitted by the eNGOs' comments concerning the proposed repeal of the GHG vehicle standards. This section will demonstrate that the eNGOs' comments are based on flawed statutory interpretations of the Clean Air Act, a selective and incomplete assessment of a complex scientific record, and a series of unsupported economic assertions. A thorough and objective analysis reveals that the eNGOs' position is an insufficient basis for rejecting the proposed rule, which represents a lawful and necessary course correction grounded in sound legal reasoning and a comprehensive review of the available evidence.

1. EPA Possesses Broad Authority and Discretion to Repeal the GHG Standards for Motor Vehicles

Replies to eNGO Vehicle Standards Comment Section VI.A and B, and VII.E (pp. 78–90, 185–87).

The D.C. Circuit has recognized that Section 202(a) confers upon the Administrator "extraordinarily broad" discretion in making judgments regarding emission standards. In *California v. EPA*, the court interpreted nearly identical language in Section 231 of the Clean Air Act and confirmed that the statute does not specify the substantive content of standards or mandate a "technology-forcing approach," leaving the stringency of such standards to the agency's reasonable discretion.[553] Section 202(a) is not a one-way ratchet requiring ever-tightening regulations; rather, it includes the inherent authority to reconsider and rescind prior standards when the agency determines they are no longer appropriate, provided the agency supplies a reasoned explanation. EPA is exercising this congressionally delegated authority to correct past regulatory overreach, ensuring that motor vehicle standards align with statutory limits and do not mandate transformative economic changes without clear authorization.

As detailed below, EPA is within its authority to repeal the GHG standards. However, consistent with this broad discretion, we urge EPA to adopt a "belt-and-suspenders" approach to ensure regulatory certainty in the face of judicial review. As a severable alternative to a full repeal of the GHG standards, EPA should exercise its authority to freeze carbon dioxide standards at model year 2026 levels or set backup standards that align with NHTSA's. Because the best reading of Section 202(a) precludes mandating a fuel-switching technology shift, EPA should finalize standards that are achievable by the existing fleet of internal-combustion engine vehicles without reliance on electric vehicles. EPA, for example, could simply adopt the forthcoming proposed

[553] 72 F.4th 308, 314 (D.C. Cir. 2023).

NHTSA standards as its own to re-align the standards. Adopting this alternative would provide a legally sound fallback should the repeal of the Endangerment Finding be vacated by the courts, protecting the automotive industry from the uncertainty and economic dislocation caused by the infeasible Biden-era mandates.

1.1. EPA Has Inherent Authority to Reconsider and Rescind Prior Rulemakings

Replies to eNGO Vehicle Standards Comment Section VI.A and VI.E (pp. 78–81, 185–87).

eNGO Claim: The eNGOs assert that EPA lacks the legal authority to retroactively revise standards for model years that have already been completed or are currently in effect (e.g., model year 2012–2026). Citing the Supreme Court's holding in *Bowen v. Georgetown University Hospital*, they argue there is a strong presumption against retroactive rulemaking that prohibits the Agency from altering the legal consequences of past vehicle production.[554] They contend that because manufacturers have already produced motor vehicles and generated compliance credits or deficits based on these standards, any revision constitutes an impermissible retroactive action that upsets settled reliance interests and violates the Administrative Procedure Act.[555]

Refutation: The eNGOs' reliance on *Bowen* is misplaced, and their characterization of the proposed repeal as impermissibly "retroactive" conflates the imposition of new liabilities with the relief of future burdens. It is a fundamental principle of administrative law that federal agencies possess the inherent authority to reconsider and rescind prior regulations, particularly when those regulations are founded upon erroneous legal interpretations or factual predicates that no longer hold. As the Supreme Court affirmed in *Motor Vehicle Manufacturers Association v. State Farm Mutual Automobile Insurance Co.*, "regulatory agencies do not establish rules of conduct to last forever," and an agency "must be given ample latitude to adapt their rules and policies to the demands of changing circumstances."[556] The eNGOs' rigid view would effectively lock unlawful or bad policy into perpetuity the moment a model year begins, a result that Congress never intended and that the Clean Air Act's text explicitly rejects.

First, the Agency's proposed action is prospective, not retroactive. The eNGOs confuse a rule that alters the *future* legal consequences of past actions—which is permissible—with a rule that penalizes past conduct that was lawful when performed—which is prohibited. The Supreme

[554] *See* eNGO Vehicle Standards Comment at 78–80.

[555] *Id.* at 185–87.

[556] *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 42 (1983).

Court clarified this distinction in *Lewis v. Fidelity & Deposit Co. of Maryland*, noting that a statute or regulation "is not retroactive merely because it draws upon antecedent facts for its operation." [557] True retroactivity, of the sort prohibited by *Bowen*, occurs when a rule "takes away or impairs vested rights acquired under existing laws, or creates a new obligation, imposes a new duty, or attaches a new disability, in respect to transactions or considerations already past.[558]"

The proposed repeal does none of these things. It does not seek to penalize manufacturers for vehicles they have already built and certified for compliance; rather, it seeks to relieve them of *future* liabilities associated with those motor vehicles. For example, under the existing regulatory regime, a manufacturer carrying a credit deficit faces a future obligation to remedy that deficit or face enforcement actions. By rescinding the standards, EPA is removing that future obligation. This is a form of regulatory relief, not the imposition of a new penalty. As the D.C. Circuit has recognized, "retroactivity" is a concern primarily when the government seeks to impose new burdens on past conduct, not when it seeks to alleviate burdens that were arguably unlawful ab initio.[559] The repeal operates prospectively to ensure that the agency does not continue to enforce standards that it has determined are beyond its statutory authority or factually unjustified.

Second, the Clean Air Act expressly grants the Administrator the authority to revise standards. Section 202(a)(1) directs the Administrator to "prescribe (and from time to time revise) … standards applicable to the emission of any air pollutant." [560] The parenthetical "from time to time revise" is a broad grant of discretion. It contains no temporal limitation restricting revisions only to future model years, nor does it act as a ratchet that only permits EPA to make standards more stringent. Congress understood that the automotive industry and the scientific understanding of air pollution are dynamic. By authorizing EPA to make revisions "from time to time," Congress empowered EPA to correct course when previous standards prove to be technologically infeasible, economically ruinous, or legally unsound. To argue that the agency is powerless to correct a legal error regarding past model years—thereby forcing the agency to persist in an unlawful course of action—is to read EPA's discretion out of the statute.

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[557] 292 U.S. 559, 571 (1934).

[558] *Landgraf v. USI Film Prods.*, 511 U.S. 244, 269 (1994) (quoting *Society for Propagation of the Gospel v. Wheeler*, 22 F. Cas. 756, 767 (No. 13,156) (C.C.N.H. 1814) (Story, J.)).

[559] *See Nat'l Petrochemical & Refiners Ass'n v. EPA*, 630 F.3d 145, 158–62 (D.C. Cir. 2010).

[560] 42 U.S.C. § 7521(a)(1).

Third, the eNGOs' argument ignores the distinction between primary and secondary retroactivity. Even if the repeal affects the value of banked compliance credits—a "reliance interest" the eNGOs heavily emphasize—this constitutes, at most, "secondary retroactivity."[561] Secondary retroactivity occurs when a new rule upsets expectations about the future legal consequences of past actions. Unlike primary retroactivity, secondary retroactivity is not categorically forbidden; rather, it is subject to a reasonableness test under the APA. EPA must simply balance the benefits of the rule change against the disturbance to settled expectations.[562]

Here, the balance weighs heavily in favor of repeal. The "expectations" the eNGOs seek to protect are based on regulations that the agency has now determined were *ultra vires*. There can be no valid reliance interest in an unlawful regulatory scheme. As the Supreme Court held in *West Virginia v. EPA*, when an agency claims "unheralded" power to restructure the economy without clear congressional authorization, that action is invalid.[563] As detailed in the proposal and below, the underlying GHG standards mandated a transition to electric vehicles in violation of the major-questions doctrine and the Clean Air Act. Furthermore, if the Agency lacks authority to regulate GHG emissions under Section 202(a) for the reasons detailed in the proposed rule and the above rebuttal, it necessarily lacks the authority to enforce rules created pursuant to that *ultra vires* finding. A refusal to rescind these standards would compel the agency to knowingly violate its statutory mandate by continuing to implement a program it has deemed unlawful.

Finally, any reliance arguments are factually weak. As noted by the Buckeye Institute, manufacturers are already retreating from electric-vehicle production targets due to flagging consumer demand, suggesting that the market is responding to economic realities rather than relying on the permanence of EPA's mandates.[564]

In sum, EPA possesses ample authority to rescind the GHG standards for motor vehicles. This authority derives from the plain text of the Clean Air Act, the inherent power of agencies to reconsider their decisions, and the necessity of correcting legal errors. The proposed repeal is a prospective action that relieves future burdens and restores the regulatory landscape to a lawful state. It does not impose retroactive penalties, and any disruption to expectation interests is a necessary and reasonable consequence of returning the Agency to its statutory bounds.

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[561] *Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 220 (1988) (Scalia, J., concurring).

[562] *Nat'l Cable & Telecomms. Ass'n v. FCC*, 567 F.3d 659, 670 (D.C. Cir. 2009).

[563] *West Virginia*, 597 U.S. at 724.

[564] *See* Buckeye Institute Comment 6, Dkt ID EPA-HQ-OAR-2025-0194-1294.

1.2. The Clean Air Act Does Not Authorize Electric-Vehicle Forcing Standards

Replies to eNGO Vehicle Standards Comment Section VI.B (pp. 81–90).

eNGO Claim: The eNGOs assert that the previous standards are authorized because *Massachusetts v. EPA* and subsequent congressional enactments have already authorized the regulation of GHGs.[565] They contend that the previous standards were permissible under the major-questions doctrine because any required shift to electric vehicles is permissible "fuel-switching" rather than the "generation shifting" rejected in *West Virginia v. EPA*.[566] And they argue that any concerns about an electric-vehicle mandate are misplaced because the standards "did not mandate any specific pollution control technology."[567]

Refutation: EPA lacks the authority to mandate a transition to electric vehicles, either directly or through fleet-averaging mechanisms that include non-emitting vehicles. Under the major-questions doctrine, EPA's attempt to force a shift from liquid fuels to electricity represents a transformative assertion of unheralded power without clear congressional authorization. This mandate involves questions of vast economic and political significance—projected to cost nearly a trillion dollars and restructure the national energy grid—forcing the agency to act as a central planner in areas beyond its expertise while effectively nullifying statutory constraints placed on NHTSA under the Energy Policy and Conservation Act. Even if the standards did not pose a major question, the plain text of Section 202(a) prohibits the administrative architecture required for an electric-vehicle mandate. The statute requires standards achievable by individual vehicles rather than fleet-wide averages; it precludes the inclusion of non-emitting electric vehicles that do not "cause or contribute" to the regulated pollution; and it defines "requisite technology" as emission controls applied to internal combustion engines, not the elimination of the engine itself.

1.2.1 The Major-Questions Doctrine Precludes an Electric-Vehicle Mandate

In its proposal, EPA reasonably concluded that it lacks authority under Section 202(a) to mandate a transition from liquid-fuel powered vehicles to electric vehicles in the U.S. transportation sector.[568] That conclusion follows from *West Virginia v. EPA*, where the Supreme Court reaffirmed that there are "extraordinary cases" in which the "history and the breadth of the authority that [the agency] has asserted," and the "economic and political significance" of

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[565] *See* eNGO Vehicle Standards Comment at 77, 81–90.

[566] *Id.* at 85.

[567] *Id.* at 85.

[568] 90 Fed. Reg. at 36,312.

that assertion, provide a "reason to hesitate before concluding that Congress" meant to confer such power.[569]

The prior regulations EPA has proposed to repeal are just such a case. The Biden EPA claimed to have discovered in the long-extant text of Section 202(a)—a provision designed to control tailpipe emissions from engines—the unheralded power to effectively ban the internal combustion engine and restructure the entire United States transportation and energy sectors. This claim of transformative power is legally indistinguishable from the "generation shifting" scheme rejected in *West Virginia*. Just as EPA lacked the authority to force power plants to shift from coal to wind and solar, it lacks the authority to force automakers and consumers to shift from gasoline and diesel to electricity. Because Congress has not provided "clear congressional authorization" for this electric-vehicle mandate, EPA's interpretation of Section 202(a) must be rejected.[570]

1.2.1.1. An Electric-Vehicle Mandate Asserts Highly Consequential Power Beyond EPA's Expertise

The Supreme Court scrutinizes agency claims of power that allow them to make fundamental revisions to the statute, changing their role from a regulator of specific sources to a central planner of the national economy. In *West Virginia*, the Court rejected EPA's attempt to compel a shift in the energy mix of the power sector because it allowed the agency to assume the role of an energy planning authority, a role Congress never assigned to it.

Here, EPA has arrogated to itself an even more expansive role: central planner of the U.S. automotive market and the national electric grid. By setting standards so stringent that they can only be met through the mass production of electric vehicles—projected by the agency to reach nearly 70% of the market by 2032[571]—EPA is not merely regulating emissions; it is dictating the fundamental technology of transportation.

This assertion of authority forces EPA to make judgments far beyond its statutory expertise and jurisdiction. To justify its de facto electric-vehicle mandate, the agency has been forced to assess:

1. The capacity of the U.S. electric grid to handle a massive surge in demand;

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[569] *West Virginia*, 597 U.S. at 721.

[570] *Id.* at 723.

[571] 89 Fed. Reg. 27,842, 28,057 (Apr. 18, 2024).

2. The availability and security of global supply chains for critical minerals such as lithium, cobalt, and graphite;
3. The national security implications of reliance on foreign adversaries for battery components; and
4. The feasibility of a nationwide charging infrastructure buildout.[572]

These are not questions of air pollution control; they are questions of energy policy, foreign policy, and industrial policy. As the American Fuel & Petrochemical Manufacturers (AFPM) noted in comments, EPA's previous feasibility assessments failed to properly consider factors critical to the widespread adoption of electric vehicles, including the "national security impact of relying on adversarial nations for critical mineral supplies" and the "adequacy of national electric grids."[573] When an agency must make "judgments" in areas where it has "no comparative expertise," it is a strong signal that it has exceeded its statutory lane.[574]

1.2.1.2. The Mandate Involves Questions of Vast Economic Significance

The economic impact of EPA's assertion of authority is staggering, easily clearing the threshold of "vast economic significance" established by the Supreme Court. In *Alabama Association of Realtors*, the Court found an impact of $50 billion sufficient to trigger the doctrine.[575] In *West Virginia*, the projected costs were billions of dollars in compliance costs and higher electricity rates.[576]

The costs of EPA's electric-vehicle mandate dwarf those figures. At the time of promulgation, EPA projected that its multipollutant rule for model years 2027 and beyond would cost manufacturers approximately *$870 billion* through 2055.[577] This figure is more than 17 times the projected cost of the eviction moratorium that triggered the major-questions doctrine in *Alabama Association of Realtors*, more than four times the projected $200 billion cost of the Clean Power

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[572] *See* Comment of American Fuel & Petrochemical Manufacturers at 20–22 (AFPM Comment), EPA-HQ-OAR-2025-0194-3083 (detailing grid reliability concerns); *id.* at 12–15 (detailing critical mineral shortages and Chinese dominance of the supply chain).

[573] *Id.* at 15–20.

[574] *West Virginia*, 573 U.S. at 729.

[575] *Ala. Ass'n of Realtors v. Dep't of Health & Hum. Servs.*, 594 U.S. 758, 764 (2021).

[576] *West Virginia*, 573 U.S. at 714–15.

[577] 89 Fed. Reg. at 28,105, 28,108 (2% discount rate).

Plan, and nearly double the cost of the student debt cancellation program rejected in *Biden v. Nebraska*.[578]

The real costs are likely far higher. EPA obscured the true cost of its GHG standards for model year 2027 and later heavy-duty vehicles by attributing most of the relevant costs to California's Advanced Clean Trucks program, which has since been repealed by federal law.[579] But the heavy-duty vehicle GHG standards, too, portend significant costs for the American trucking industry—and as a result, on U.S. consumers, who will share the burden of the increased cost to transport goods—especially now that most of the tax incentives incorporated into EPA's estimates have been repealed.

Further, these direct compliance costs are merely the tip of the iceberg. The forced electrification of the vehicle fleet will "substantially restructure" the light-, medium-, and heavy-duty vehicle markets and induce cascading economic effects throughout the American economy.[580] The domestic automobile industry "supports a total of 9.6 million American jobs and generates more than $1 trillion of economic activity each year."[581] The Biden EPA's electric-vehicle mandate threatens to destroy tens of thousands of jobs in the traditional automotive sector, as electric vehicles require 30% to 40% less labor than internal-combustion vehicles.[582] It will wreak havoc on the liquid fuels industry—a cornerstone of the U.S. economy that supports nearly 11 million jobs and accounts for approximately 8% of U.S. GDP.[583] EPA projected its light and medium-duty rules would result in a reduction of 780 billion gallons of gasoline consumption and an increase of 6,100 Terawatt hours of electricity consumption.[584] It projected its heavy-duty standards would "result in a reduction of 135 billion gallons of diesel and gasoline consumption and an increase of 2,300 TWh [terawatt-hours] of electricity consumption" through 2055.[585] Such a massive, government-mandated transfer of wealth and market share from one sector (liquid fuels) to

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[578] *Biden v. Nebraska*, 600 U.S. 477, 2362 (2023) (program estimated to cost between $469 billion and $519 billion).

[579] *See* 89 Fed. Reg. at 29,454–55 (EPA "lowered the overall costs" by making "updates to our reference scenario").

[580] *West Virginia*, 597 U.S. at 724.

[581] Comment of U.S. Chamber of Commerce 2 (July 5, 2023), Dkt. ID EPA-HQ-OAR-2022-0829-0604.

[582] Comment of America First Policy Institute 3 (June 30, 2023), Dkt. ID EPA-HQ-OAR-2022-0829-0699.

[583] Comment of American Petroleum Institute 1 (July 5, 2023), Dkt. ID EPA-HQ-OAR-2022-0829-0641.

[584] 89 Fed. Reg. at 28,105.

[585] *Id.* at 29,735.

another (electricity) is precisely the kind of "unprecedented power over American industry" that requires explicit congressional approval.[586]

Given these projected impacts, there can be "no serious dispute" that by using GHG emissions standards to force a transition to electric vehicles, EPA would be claiming "authority to exercise control over 'a significant portion of the American economy.'"[587]

1.2.1.3. The Mandate Involves Questions of Vast Political Significance

The transition to electric vehicles is the subject of "earnest and profound debate across the country," making it a matter of vast political significance.[588] Congress has not remained silent on this issue; rather, it has actively debated and frequently rejected mandates of the sort EPA seeks to impose.

Most notably, Congress has recently moved to curtail electric-vehicle mandates. Earlier this year, a bipartisan Congress passed and the President signed three joint resolutions of disapproval under the Congressional Review Act to rescind EPA waivers that allowed California to impose its own electric-vehicle mandates (Advanced Clean Cars II, Advanced Clean Trucks, and the Omnibus Low NOx rule).[589] And Congress also acted to remove federal tax credits for electric-vehicle purchases—like the New Clean Vehicle Credit (up to $7,500 per vehicle) and the Used Clean Vehicle Credit (up to $4,000 per vehicle)—through the One, Big, Beautiful Bill Act.[590]

Furthermore, the enactment of the Inflation Reduction Act demonstrates that when Congress intends to address GHG emissions and electric vehicles, it does so through incentives, not mandates. The Act provided tax credits to encourage electric-vehicle adoption, but it notably *did not* authorize EPA to mandate the phase-out of internal-combustion engines. As the Supreme Court noted in *West Virginia*, an agency cannot adopt a regulatory scheme that Congress has "conspicuously and repeatedly declined to enact itself." By attempting to force a transition that Congress has refused to mandate, EPA is usurping the legislative function. The Clean Air Act

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[586] *West Virginia*, 597 U.S. 728.

[587] *Nebraska*, 600 U.S. at 503 (quoting *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 324 (2014)).

[588] *West Virginia*, 597 U.S. at 732.

[589] *See* Pub. L. No. 119-15, 139 Stat. 65 (2025); Pub. L. No. 119-16, 139 Stat. 66 (2025); Pub. L. No. 119-17, 139 Stat. 67 (2025).

[590] Pub. L. No. 119-21, 139 Stat. 72.

cannot be read to authorize EPA to "'enact a program' that Congress has chosen not to enact itself," and has, instead, moved to curtail.[591]

1.2.1.4. The Claim of Authority is "Unheralded" and Transformative

EPA's recent discovery of newfound regulatory authority to mandate electric vehicle technology in the decades-old text of the Clean Air Act should be "greet[ed] … with a measure of skepticism."[592] In the decades following the enactment of the Clean Air Act, EPA consistently treated electric vehicles as—at most—a compliance "option" or "flexibility."[593] That changed only four years ago, when EPA first sought to set light-duty vehicle emission standards that would effectively require electrification.[594] Last year, EPA first did the same for the heavy-duty sector.[595] That sudden assertion of newfound power—claiming the authority not just to "reduce pollution by causing the regulated source to operate more cleanly," but to "'shift[]'" the "polluting activity" from internal-combustion-engine vehicles to electric vehicles strongly suggests that EPA is exceeding any congressional authorization.[596]

1.2.1.5. The Mandate Conflicts with the Nation's Fuel Economy Laws

The conclusion that Section 202(a) does not authorize an electric-vehicle mandate is reinforced by the "structural" major questions analysis: EPA's interpretation creates an irreconcilable conflict with EPCA. *See supra* 1.1.

1.2.2 The Plain Text of the Clean Air Act Precludes an Electric Vehicle Mandate

Even beyond consideration of the "major questions doctrine" and *West Virginia*, the plain text of the Clean Air Act makes clear that EPA cannot premise emissions standards on fleet average values that require electric vehicle technology. EPA's current regulatory scheme relies on a specific administrative architecture: determining compliance based on fleet-wide averages rather

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[591] *Nebraska*, 600 U.S. at 503.

[592] *West Virginia*, 597 U.S. at 701–02.

[593] *See, e.g.*, 89 Fed. Reg. at 29,483 (previous heavy-duty emission standards "were not premised on the application of ZEV technologies"); 77 Fed. Reg. at 62,624, 62,917 (Oct. 15, 2012) ("[E]lectrification is an option for compliance but is not required under this rule.").

[594] 86 Fed. Reg. 74,434 (Dec. 30, 2021).

[595] 89 Fed. Reg. 29,440.

[596] *West Virginia*, 597 U.S. at 725.

than individual vehicle performance, and including non-emitting vehicles (i.e., electric vehicles) in those averages to offset the emissions of internal-combustion engines. This is unlawful.

1.2.2.1. Section 202(a) Requires Standards Achievable by Individual Vehicles, Prohibiting Fleet-Wide Averaging

First, EPA lacks the authority to set vehicle-emission standards that can be met only through fleet-wide averaging. The statutory text, structure, and enforcement mechanisms of Title II require that emission standards under Section 202(a) be achievable by vehicles *individually*.

Section 202(a) authorizes the Administrator to prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles." [597] It says nothing about averaging across fleets. This stands in stark contrast to EPCA, where Congress explicitly directed the Department of Transportation to set "*average* fuel economy standards." [598] As the Supreme Court has recognized, the "broader context of the statute as a whole" must guide interpretation. [599] That Congress used the word "average" in a related statute governing the same industry, but omitted it from Section 202(a), is strong evidence that Congress did not intend to authorize averaging under the Clean Air Act.

Indeed, EPA acknowledged this textual limitation when it first considered the issue decades ago, admitting that Title II of the Clean Air Act "assumes individual vehicle compliance with the applicable standards." [600] Despite this admission, the agency invented an averaging regime to provide flexibility. Under *Loper Bright*, the agency is no longer entitled to deference for such atextual inventions; the "best reading" of the statute controls. [601] The best reading of Section 202(a)—reinforced by "the design and structure of [Title II] as a whole"—is that compliance is an individual vehicle obligation. [602]

The impossibility of reconciling fleet-wide averaging with the statute is most evident in Title II's comprehensive enforcement scheme. Congress established a rigorous system for testing, certification, warranties, remediation, and penalties, all of which are "designed to apply to"

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[597] 42 U.S.C. § 7521(a)(1).

[598] 49 U.S.C. § 32902(a).

[599] *Robinson v. Shell Oil Co.*, 519 U.S. 337, 341 (1997).

[600] 45 Fed. Reg. 14,496, 14,502 (Mar. 5, 1980).

[601] *Loper Bright Enters. v. Raimondo*, 144 S. Ct. 2244, 2266 (2024).

[602] *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 321 (2014).

individual vehicles and "cannot rationally be extended" to fleets under an averaging approach.[603] For example, Section 206 requires EPA to test "*any* new motor vehicle" to determine if "*such* vehicle" conforms with regulations.[604] If the vehicle conforms, EPA issues a certificate of conformity. If a vehicle fails, EPA may suspend or revoke the certificate "insofar as it applies to *such vehicle*."[605] In an averaging regime, testing an individual vehicle cannot determine conformity, because compliance depends on the performance of the manufacturer's entire fleet at the end of the year. The statute's singular focus on the vehicle itself confirms that the standard must be met by the hardware of that specific vehicle.[606] Similar vehicle focused language appears in the warranties and penalties sections.[607]

1.2.2.2. Electric Vehicles Do Not "Cause or Contribute" to Pollution Under Section 202(a) and Cannot Be Included in the Standard

Second, even if averaging were permissible for emitting vehicles, the plain text of the Clean Air Act precludes EPA from incorporating electric vehicles into its fleetwide average GHG standards. Under EPA's own treatment in recent rulemakings, these vehicles do not emit GHGs from the tailpipe. Consequently, they do not belong in a regulatory class defined by its contribution to air pollution.

Section 202(a)(1) provides that EPA shall prescribe "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[608] Applying the rule of the last antecedent, this requires that the "new motor vehicles or new motor vehicle engines," and not just "classes" of those vehicles or engines, must "cause, or contribute to," potentially dangerous air pollution.[609] A vehicle that emits zero grams of the relevant pollutant per mile cannot "cause, or contribute to" air pollution

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[603] *Id.* at 322.

[604] 42 U.S.C. § 7525(a)(1).

[605] *Id.* § (b)(2)(A)(ii).

[606] *Id.* 7525(a)(1) (emphasis added).

[607] *See, e.g.*, *id.* §§ 7525(b)(2)(A)(ii), 7541(a)(1).

[608] 42 U.S.C. § 7521(a)(1).

[609] *See Barnhart v. Thomas*, 540 U.S. 20, 26 (2003) (The rule of the last antecedent provides that a "limiting clause or phrase … should ordinarily be read as modifying only the noun or phrase that it immediately follows.").

via its tailpipe. Indeed, several courts of appeals have concluded as much.[610] Therefore, electric vehicles cannot be included in a class of vehicles subject to tailpipe emission standards for that pollutant.

Including electric vehicles in the standard-setting baseline allows EPA to mathematically manipulate the stringency of the rule. By averaging in zeroes, EPA sets a standard that is stringent on paper but achievable only by producing vehicles that are not subject to the standard's physical constraints. This effectively mandates the production of electric vehicles, not the improvement of internal-combustion vehicles. As AFPM correctly notes in their comments, this is "fuel switching," not emissions control.[611] Just as the Supreme Court held in *West Virginia* that EPA could not force power plants to shift from coal to solar, EPA cannot force automakers to shift from gasoline to electricity under the guise of an "emission standard."

If electric vehicles are truly "zero-emission" vehicles, as EPA assumes for compliance purposes, they are legally distinct from the class of vehicles that "cause or contribute" to pollution. If they are *not* zero-emission vehicles (because of upstream emissions from electricity generation), then EPA's entire compliance framework—which credits them as zero—is arbitrary and capricious. The agency cannot have it both ways. It cannot claim electric vehicles contribute to pollution to regulate them, but then count them as zero to force the market toward them.

1.2.2.3. "Requisite Technology" Means Improvements to the Regulated Engine, Not Its Replacement

Third, the statutory structure and context of Section 202(a)(2) confirm that Congress focused on technologically feasible standards for vehicles that actually emit the relevant pollutant. Section 202(a)(2) requires EPA to provide manufacturers with lead time to comply with standards "to permit the development and application of the requisite technology."[612]

The phrase "requisite technology" must be read in the context of the object being regulated: the internal combustion engine. The statute contemplates the application of technology *to* the vehicle to reduce its emissions, not the replacement of the vehicle with a fundamentally different

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[610] *See, e.g.*, *Truck Trailer Mfrs. Ass'n v. EPA,* 17 F.4th 1198, 1201 (D.C. Cir. 2021) (Section 202(a) "requires the EPA to set emissions standards for *new motor vehicles and their engines if they emit harmful air pollutants*" (emphasis added)); *NRDC v. EPA*, 954 F.3d 150, 152 (2d Cir. 2020) (Section 202(a) "requires EPA to regulate emissions from new motor vehicles *if EPA determines that the vehicles 'cause, or contribute to,' [potentially dangerous] air pollution*" (emphasis added)).

[611] AFPM Comment at 9–10.

[612] 42 U.S.C. § 7521(a)(2).

technology that eliminates the engine entirely. As AFPM argues, "[electric vehicles] or any of their constituent parts are no more an emission control device than an iPod would be a device or system to prevent record skips."[613] An electric vehicle is not a "device" to clean up an engine; it is a different mode of transportation.

Other provisions of Title II reinforce that "technology" refers to systems applied to combustion engines. Section 202(m), for example, requires "diagnostic systems" on "all" new light-duty vehicles to identify "emission-related systems deterioration or malfunction."[614] The statute explicitly mandates monitoring of "the catalytic converter and oxygen sensor"—components unique to internal-combustion engines. This statutory specificity underscores Congress's view that the vehicles subject to Section 202(a) are those that combust fuel and emit pollutants, and that "compliance" involves maintaining the integrity of emission control systems, not swapping the powertrain for a battery.

If "requisite technology" included the replacement of the engine, EPA would have boundless authority to ban any class of vehicle by identifying a cleaner alternative. EPA could, for example, mandate that all trucks be replaced by bicycles, arguing that the bicycle is the "requisite technology" for zero emissions. Congress did not hide such a massive power to restructure the transportation sector in the phrase "requisite technology." Rather, Section 202(a) authorizes technology-forcing standards to improve the *efficiency* and *cleanliness* of the internal-combustion engine—a task that becomes legally impossible if the standard is set based on the performance of electric vehicles.

By interpreting Section 202(a) to allow fleet-wide averaging and the inclusion of non-emitting vehicles, the Biden-era EPA unmoored the statute from its text. It converted a provision designed to clean up cars into a tool to eliminate them. Restoring the integrity of the Clean Air Act requires a return to the plain text: standards must apply to individual vehicles that emit pollutants, based on technology that improves those vehicles.

1.3. EPA Reasonably Interprets "Requisite Technology" to Require a Measurable Impact

Replies to eNGO Vehicle Standards Comment Section VI.B (pp. 81–90).

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[613] AFPM Comment at 10.

[614] 42 U.S.C. § 7521(m)(1).

eNGO Claim: The eNGOs claim that EPA's interpretation of the "requisite technology" provision in Section 202(a)(2) is contrary to the statute's plain text, structure, and decades of judicial precedent.[615] Section 202(a)(2) requires that standards take effect after a period necessary "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance."[616] The eNGOs contend that "requisite technology" unambiguously refers only to the technology needed to meet the specific numerical emission standard set by the Administrator, not technology capable of measurably ameliorating the underlying environmental problem.[617] They assert that EPA's proposal to repeal the GHG standards because they would have no measurable impact on global climate change conflates the standard-setting criteria with an unauthorized "futility" analysis, which they argue was foreclosed by the Supreme Court in *Massachusetts v. EPA*.[618] Furthermore, the eNGOs claim this interpretation contradicts the technology-forcing purpose of the CAA, arguing that the Act mandates incremental progress, and that this interpretation would hamstring EPA's ability to regulate criteria pollutants, which are also addressed incrementally.[619]

Refutation: The eNGOs' arguments rely on a cramped and isolated reading of the phrase "requisite technology" that divorces it from the broader statutory context and the fundamental requirements of reasoned decisionmaking. EPA reasonably interprets Section 202(a)(2) to require that the technology being forced upon the regulated sector must be "requisite"—that is, necessary or appropriate—for achieving the statutory objective of mitigating the endangerment identified under Section 202(a)(1). When the application of technology to a specific sector yields an impact so trivial that it provides no measurable environmental benefit, that technology cannot be deemed "requisite" to addressing the identified danger.

The interpretation advanced by the eNGOs and the Alliance for Automotive Innovation—that "requisite technology" means only the technology needed to meet whatever standard the Administrator chooses, regardless of the standard's efficacy—ignores the integrated nature of

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[615] *See* eNGO Vehicle Standards Comment at 81–90.

[616] 42 U.S.C. § 7521(a)(2).

[617] eNGO Vehicle Standards Comment at 81–85; *see also* Auto Innovators Comment at 30 ("We believe the term 'requisite technology' refers to the technology required to meet the specific motor vehicle and engine emission standards set by EPA that are at issue, not that a technology must be able to fully address the specific issues identified in an endangerment finding.").

[618] eNGO Vehicle Standards Comment at 86–87.

[619] *Id.* at 87–90.

Section 202(a). The authority to set standards under Section 202(a)(1) is triggered by a finding that emissions contribute to air pollution that endangers public health or welfare.[620] The lead time provision in Section 202(a)(2) operationalizes that authority. The entire regulatory framework is thus oriented toward mitigating the identified danger. It follows logically that the technology deemed "requisite" must be requisite for that purpose. A technology cannot be considered "necessary" or "indispensable" if its application yields no measurable progress toward mitigating that endangerment. The narrow focus on mere feasibility decouples the means (the technology) from the statutory ends (addressing endangerment), reducing the inquiry to a technical exercise devoid of environmental relevance.

This interpretation is essential when considering the statutory mandate that the Administrator give "appropriate consideration to the cost of compliance."[621] This provision inherently requires EPA to balance the feasibility and cost of technology against the expected benefits of the standards. The Supreme Court has emphasized that agencies must exercise their discretion reasonably, and that "[n]o regulation is 'appropriate' if it does significantly more harm than good."[622] It is definitionally unreasonable to impose billions of dollars in compliance costs if the regulation provides zero measurable environmental benefit.

The existing GHG standards impose immense costs and unprecedented feasibility challenges. As the Alliance for Automotive Innovation explained in its comments, the standards finalized under the prior administration require annual improvement rates far exceeding historical achievements—reaching up to 10% in certain model years, compared to a historical average improvement rate of 2.5% per year.[623] Manufacturers have testified that these standards are creating "significant compliance challenges" and are "simply not achievable" in the timeframe provided.[624] These extraordinary burdens demand a commensurate environmental justification. When the benefits are negligible or non-existent, the technology required to meet those standards cannot be deemed "requisite" under a reasonable, cost-conscious interpretation of the statute.

The eNGOs fundamentally misconstrue EPA's position about "futility." In *Massachusetts v. EPA*, the Court rejected the notion that EPA could refuse to regulate simply because its actions

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[620] 42 U.S.C. § 7521(a)(1).

[621] *Id.* § 7521(a)(2).

[622] *Michigan v. EPA*, 576 U.S. 743, 752 (2015).

[623] Auto Innovators Comment at 8.

[624] *Id.* at 2, 8.

alone would not solve the *entirety* of the global climate change problem, noting that a "first step" or incremental progress may be justified.[625] EPA is not arguing that it must solve climate change entirely. Rather, EPA is asserting that the statute does not compel regulation when the action would have *no measurable effect whatsoever* on the identified problem.

As explained above, see Response to eNGO Endangerment Comments, *supra*, 2.2.2. there is a critical distinction between making incremental progress and taking an action whose impact is so trivial that it is scientifically undetectable. The projected impact of the stringent multipollutant rule on global temperatures is functionally zero—estimated at merely 0.00182 degrees Celsius by 2050, and 0.00906 degrees Celsius by 2100.[626] This impact is orders of magnitude smaller than the inherent uncertainty of climate modeling and natural climate variability. When the "signal" (the regulatory impact) is completely lost in the "noise" (system uncertainty), the regulation provides no measurable benefit. A step that is so small as to be unmeasurable is not an "incremental step" toward a solution; it is a nullity. This is consistent with the fundamental legal principle that agencies are not required to regulate *de minimis* matters, avoiding situations where "the burdens of regulation yield a gain of trivial or no value."[627]

Furthermore, the eNGOs' attempt to analogize GHG regulation to the regulation of criteria pollutants fails because it ignores the fundamental differences between localized air pollution and globally well-mixed GHGs. Criteria pollutants cause localized harms through direct exposure. Consequently, any reduction in these pollutants generally yields a measurable improvement in local air quality and a corresponding reduction in the identified danger in U.S. airsheds.

By contrast, the danger identified in the Endangerment Finding stems from the cumulative *global* concentration of GHGs. Because GHGs are well-mixed globally, the impact of domestic GHG reductions is dependent on the actions of all other global emitters and the physical reality of the global climate system. Given this reality, it is reasonable for the Administrator to conclude that technology which cannot measurably affect global concentrations is not "requisite" to addressing the global danger.

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[625] *Massachusetts*, 549 U.S. at 524.

[626] Response to Endangerment Comments, *supra* 2.2(analyzing impacts using the MAGICC model under the SSP2-4.5 scenario).

[627] *Ala. Power Co. v. Costle*, 636 F.2d 323, 360–61 (D.C. Cir. 1979).

Finally, the eNGOs' reliance on the CAA's "technology-forcing" nature is misplaced. Section 202(a) is not a technology-forcing provision.[628]

2. The Factual Record and Reasoned Decisionmaking Support Repeal of the Existing Standards

Repealing the infeasible standards protects American consumers, jobs, and the auto industry from costly, disruptive mandates, ensuring continued innovation, consumer choice, and economic stability without sacrificing measurable environmental benefits. In considering its separate bases for repealing the emissions standards, EPA reasonably weighed the statutory factors in Section 202(a)(2) and other relevant considerations.

2.1. EPA Reasonably Determined the Standards Are Not Technologically Feasible

Replies to eNGO Vehicle Standards Comment Section VII.C.i (pp. 100–125).

eNGO Claim: The eNGOs contend that the existing GHG standards for light-, medium-, and heavy-duty vehicles for model year 2027 and later are technologically feasible and provide adequate lead time, consistent with the requirements of Section 202(a)(2).[629] They argue that EPA prior analyses robustly demonstrated the achievability of the standards based on an extensive technical record.[630] The eNGOs argue that the requisite technology—primarily battery-electric vehicles and plug-in hybrid-electric vehicles—is well-established, rapidly improving, and already being deployed at scale by manufacturers.[631] Furthermore, they claim that significant automaker investments and public commitments toward electrification underscore the industry's capability to meet the stringent standards.[632] The eNGOs dismiss concerns regarding the pace of consumer adoption, critical mineral availability, supply chain constraints, and infrastructure limitations as overstated or manageable through ongoing investment, arguing that technology-forcing standards are necessary to drive the innovation required to overcome these challenges.[633] They conclude that the agency's reversal on feasibility is arbitrary, disregards the

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[628] 72 F.4th at 308.

[629] eNGO Vehicle Standards Comment at 115–18.

[630] *Id.* at 117.

[631] *Id.* at 119.

[632] *Id.*

[633] *Id.* at 120–21.

established record, and fails to recognize the demonstrated trajectory of the automotive market toward electrification.[634]

Refutation: EPA reasonably determined that the existing GHG standards for model year 2027 and later are not technologically feasible within the timeframe provided. This determination is supported by a comprehensive review of current market data, supply chain realities, infrastructure limitations, and extensive comments from the regulated industry itself. The eNGOs' defense of the prior administration's feasibility analysis ignores the profound disconnect between the optimistic modeling assumptions used to promulgate the model year 2027 and later standards and the real-world conditions necessary to achieve them. The prior analysis relied upon theoretical projections of electric-vehicle adoption rates that have proven wildly inaccurate, underestimated the immense logistical and physical constraints of the critical mineral supply chain, and dismissed credible warnings from automakers that the standards demanded a transformation far exceeding historical precedent and practical capability. The agency now appropriately recognizes that the standards constitute *de facto* electric-vehicle mandates whose compliance pathways are illusory, rendering the standards unachievable and contrary to the requirements of Section 202(a)(2).

A core flaw in the prior administration's analysis, echoed by the eNGOs, is the pretense that the standards are technologically neutral. In reality, the stringency of the model year 2027–2032 standards effectively mandates a shift to electric vehicles. EPA previously abandoned its approach of setting standards achievable largely through improvements in efficiency and instead used Section 202(a) to order a nationwide transition to electric vehicles. The standards were set so stringently that fleets made up solely of well-controlled internal combustion engine vehicles cannot feasibly meet them, forcing manufacturers to produce electric vehicles to offset the deficits generated by their internal-combustion vehicles.[635]

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[634] *Id.* at 115.

[635] In a one sentence throwaway argument, the eNGOs claim that the proposal unfairly neglects another way to get zero-emissions vehicles—carbon capture and storage (CCS). *See* eNGO Vehicle Standards Comment at 114. They claim "EPA ignores the carbon dioxide removal technologies in which the US and US companies have made significant investments, and their potential application in motor vehicles." *Id.* This is a preposterous claim that fundamentally misrepresents both the technology and the cited sources. CCS, as detailed by the IEA and implemented globally, is designed exclusively for large-scale, stationary industrial sources—such as power plants and heavy industry. These applications involve capturing highly concentrated streams of carbon dioxide using large, complex industrial equipment that requires significant

(footnote continued on next page)

As established in Section 1.2, *supra*, EPA lacks the authority to mandate electric vehicles or include them in averaging. Even if it could, EPA should reasonably conclude that nationwide standards premised on widespread adoption of electric-vehicle technology are not technologically feasible at present.

The scale of this required transition is staggering and unprecedented. EPA's "model" compliance pathway required 68% electrification of the light-duty fleet by model year 2032.[636] The heavy-duty rules effectively require 43% of medium-duty vehicles and 45% of heavy-duty vehicles to be electric by the same year.[637] Consequently, the feasibility of the standards rests entirely on the feasibility of achieving these electrification levels, a prospect that is demonstrably impossible given current constraints.

2.1.1.1. Unprecedented and Unrealistic Pace of Change

The required pace of improvement mandated by the existing regulations far exceeds the historical rate of technological advancement in the automotive sector. The comments of Auto Innovators, representing the vast majority of U.S. automakers, highlighted this stark disparity. The historical rate of improvement in GHG performance for all automakers, on average, between 2013 and 2023, was 2.5% per year.[638] For automakers that sell internal-combustion vehicles

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energy inputs and access to carbon dioxide transport and storage infrastructure. The eNGOs' cited sources do not discuss, analyze, or imply the feasibility of miniaturizing this technology for mobile sources. The commenters improperly conflate the existence of industrial-scale carbon capture with the vastly different technical challenges, severe energy penalties, and physical constraints inherent in mobile applications.

The commenters' assertion that the requisite technology exists for motor vehicles to remove GHGs from the air rests entirely on a single student-built prototype vehicle, the "Zem." As the cited sources explains, the Zem prototype is merely a "proof-of-concept" intended to "tickle the industry," not a commercially viable, scalable, or technically feasible technology. And the data presented for the prototype, rather than proving feasibility, demonstrates the profound impracticality and negligible impact of mobile carbon capture. According to the source, the prototype captures 2 kilograms of carbon dioxide over 20,000 miles. For context, burning a single gallon of gasoline emits approximately 8.9 kilograms of carbon dioxide. The system also presents impossible operational constraints: the capture filter is full after only 320 kilometers (200 miles) of driving. The notion that a national fleet might operate by requiring drivers to stop every 200 miles to empty a carbon dioxide filter—containing an impressive 0.02 kg of carbon dioxide—is entirely unrealistic. The analysis also fails to account for the way in which added weight and the significant energy consumption required to operate such a system would drastically reduce vehicle efficiency, likely negating the minimal amount of carbon dioxide captured.

[636] 89 Fed. Reg. at 27,842, 28,087.

[637] *Id.* at 29,440, 29,567.

[638] Auto Innovators Comment, App. I at 8.

(excluding electric-vehicle only manufacturers), the rate was even lower, at 1.9% per year.[639] Yet, the standards demand rates of improvement significantly higher, including 10% annual stringency increases in certain model years.[640] These required rates are wildly inconsistent with the industry-demonstrated practical rates of GHG improvement.

The industry's struggle to meet even the current, less stringent standards further undermines the claim that the model year 2027+ standards are feasible. As Auto Innovators noted, "Full Line Automakers" have trailed annual GHG standards since 2016.[641] In model year 2023, the first year of the standards revised in 2021, 15 of 23 automakers generated deficits. Of the eight that generated credits, four were electric-only manufacturers and two were small-volume manufacturers. Critically, "only two of the 16 manufacturers that build internal combustion engine ('ICE') vehicles and that are subject to the primary standards produced fleets compliant with the MY 2023 standard."[642] This reliance on credits—a dwindling resource—masks the underlying technological infeasibility of the standards themselves. If the industry cannot meet the model year 2023 standards organically, it is unreasonable to suggest they can meet the vastly more stringent model year 2027–2032 standards.

2.1.1.2. Disconnect Between Mandated Adoption and Market Realities

The eNGOs' assertion that this transition is feasible hinges entirely on the assumption that consumer demand for electric vehicles will surge dramatically in the coming years. But current market data clearly shows electric vehicle adoption is lagging far behind the pace required by the model year 2027 and later standards. The prior administration projected new electric-vehicle market share reaching nearly 70% for new light-duty vehicles and 45% for new heavy-duty vehicles by 2032.[643] Even EPA's previous "no action" scenario estimated 47% electrification by 2032, a projection that has proven overly optimistic.[644]

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[639] *Id.* at 9.

[640] *Id.* at 8 (noting 10% stringency increases required in MY 2023 and MY 2026).

[641] *Id.* at 9.

[642] *Id.* at 10.

[643] 89 Fed. Reg. at 27,842, 28,057; 89 Fed. Reg. 29,440, 29,443, 29,455.

[644] *Id.*

The reality is that U.S. light-duty electric vehicle market growth is flattening. As of the first quarter of 2025, electric vehicles accounted for just 9.6% of new passenger car and light-truck sales.[645] This is roughly one seventh of what the current standards demand in just a few years.

This disconnect is even more pronounced in the heavy-duty sector, where the technological and operational challenges are significantly greater. The existing Phase 3 rule requires a rapid transition starting in model year 2027, yet market penetration is negligible. In 2024, new Class 4 through 6 electric vehicles amounted to only 0.24% of total truck registrations in those classes, while new Class 7 through 8 electric vehicles accounted for only 0.40%.[646]

This lag is unsurprising as EPA's feasibility analysis in its Phase 3 standards contained several glaring flaws, most notably in the "payback" model it used to conclude that widespread adoption of electric heavy-duty trucks was not only feasible by 2032, but would happen even in the absence of federal standards.[647] EPA's reliance on "payback" to determine adoption ignored numerous relevant factors that critically influence technology adoption, such as vehicle performance, refueling convenience, and resale value. The model was also flawed on its own terms, misapplying data from a different model built by the National Renewable Energy Laboratory and ultimately generating adoption rates that even EPA admitted had no basis "in the real-world."[648] Rather than discard the model, EPA applied arbitrary "caps" with no discernible basis in technology, economics, or anything other than EPA's own wishcasting. EPA's payback model, which assumed market participants consider operating costs out to ten years in the future, was also inconsistent with its cost-benefit analysis, which claimed that market participants do not "adopt technologies that are expected to reduce operating costs" even though those technologies would "repay buyers' initial investments rapidly."[649]

Furthermore, the prior administration's feasibility analysis was predicated on the continuation of policies designed to force electric vehicle adoption, policies which have since been reversed. The prior EPA heavily relied on the assumption that extensive federal tax credits (under the IRA) and

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[645] All. for Auto. Innovation, Get Connected, Electric Vehicle Quarterly Report (First Quarter 2025).

[646] Fadhil & Xie, *Race to Zero: Zero-Emission Bus and Truck Market in the United States*, Int'l Council on Clean Transp. (June 24, 2025), https://theicct.org/publication/r2z-zero-emission-bus-and-truck-market-us-2024-jun25/.

[647] *See* PMI Comment at 45–51.

[648] EPA, Regulatory Impact Analysis: Phase 3 Greenhouse Gas Standards for Heavy-Duty Vehicles 344, Dkt. ID EPA-HQ-OAR-2022-0985-3858 (Mar. 2024) (hereinafter Phase 3 RIA).

[649] *Id.* 730-31.

state-level electric vehicle mandates would remain in place.[650] With those incentives removed (via the One Big Beautiful Bill Act) and state mandates disapproved by Congress, the landscape has fundamentally changed.[651] The removal of these foundational supports renders the prior administration's feasibility conclusions obsolete.

The standards, therefore, place manufacturers in an impossible position. As we noted in our initial comment, given the flagging demand for electric vehicles, manufacturers would be forced to "reduce sales of new internal-combustion motor vehicles, leading to shortages and price hikes" to attempt compliance.[652] This is not a feasible regulatory framework; it is a coercive mandate that ignores technological and economic realities. The automakers themselves have unequivocally stated that the standards are unachievable. Auto Innovators concluded that the model year 2027 and later standards "are simply not achievable in light of significant market, charging infrastructure, supply chain, affordability, and other challenges as well as recent policy changes enacted since they were finalized."[653]

2.1.1.3. Insurmountable Constraints on Critical Mineral Supply

The most significant barrier to the feasibility of these electric vehicle mandates, which the eNGOs attempt to downplay, is the insurmountable constraint posed by the critical mineral supply chain. The electrification levels required by the standards necessitate a massive increase in the production of minerals such as lithium, cobalt, nickel, and graphite. Electric vehicles require significantly higher mineral inputs compared to ICE vehicles—an electric car requires approximately six times the mineral inputs of a conventional car.[654]

The prior administration's assessment of mineral availability was inadequate and relied on assumptions that have been contradicted by independent experts and recent developments. The scale of the demand increase required to meet EPA's previous targets is staggering. Benchmark Minerals Intelligence (BMI) projects a 500% increase in global battery demand by 2035,

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[650] PMI Comment at 5–6.

[651] Auto Innovators Comment, App. I at 20.

[652] PMI Comment at 6.

[653] Auto Innovators Comment at 2.

[654] AFPM Comment at 13 (citing Int'l Energy Agency, *The Role of Critical Minerals in Clean Energy Transitions*, World Energy Outlook Special Report (Mar. 2022), https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions).

estimating that "more than 300 new graphite, lithium, nickel, and cobalt mines would be needed" globally to satisfy this demand.[655]

The eNGOs fail to grapple with the severe constraints on the industry's ability to respond to this demand surge. The development of new mines is a lengthy and complex process. As AFPM emphasized, "the long lead time for the development of new mines constrains the industry's ability to respond to rapid increases in mineral demand."[656] BMI notes that "lead times for new critical mineral supply extend[ing] 5-15 years in many jurisdictions," with an average delay between discovery and development of 12.4 years.[657] This inherent inelasticity in the upstream supply chain renders the rapid ramp-up mandated by the model year 2027–2032 standards technologically infeasible within the provided lead time. The lead time required by the statute must account for the development of the entire supply chain, not just the final assembly of the vehicle.

The BMI study commissioned by Auto Innovators provides a stark assessment of this shortfall in the U.S. context. BMI concluded that EPA-projected demand for Li-ion battery cells in 2032 would be nearly double what BMI considered possible.[658] Specifically concerning anode-active material (AAM), BMI concluded that constraints could limit U.S. electric-vehicle penetration to just 15% by 2030, far below the levels required by the standards.[659]

Recent independent research further validates these concerns. A study published in *Nature Communications* in August 2024 specifically assessed the critical mineral production capacity of the U.S. and its allies relative to the requirements of EPA's tailpipe emissions standards.[660] The researchers found a massive shortfall, estimating that the U.S. and its free trade partners can produce enough critical minerals for just over 5 million vehicles between 2027 and 2032.[661]This is far fewer than the 10.21 million light-duty electric vehicles that the study estimates must be sold

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[655] *Id.* at 15 (citing Benchmark Source, *More than 300 new mines required to meet battery demand by 2035* (Sep. 6, 2022)).

[656] *Id.* at 14.

[657] *Id.* at 15 (citing Benchmark Minerals Intelligence, U.S. Electric Vehicle Feasibility Study for Alliance for Automotive Innovation (2023) (hereinafter BMI Study)).

[658] *Id.* at 16.

[659] *Id*. at 14 (citing BMI Study at 2).

[660] *Id*. at 16 (citing Woodley et al., *Climate Impacts of Critical Mineral Supply Chain Bottlenecks for Electric Vehicle Deployment*, 15 Nat. Commc'ns 6813 (2024)))).

[661] *Id.*

during those years to comply with EPA's standards.[662] This independent analysis confirms that the physical supply of necessary materials simply does not exist within secure supply chains to meet the mandated production levels.

These constraints are even more acute for heavy-duty vehicles, which require significantly greater quantities of critical minerals than light-duty vehicles.[663] Despite accounting for a small percentage of the total road fleet, battery-related critical minerals used in heavy-duty electric vehicles are expected to account for 62% of the critical metal demand in the decades ahead.[664] EPA previously failed to give this disproportionate demand adequate consideration.

Furthermore, the geopolitical realities of the supply chain render the standards infeasible and pose significant risks that EPA must consider. China dominates the global supply chain for electric vehicles, particularly in the processing and manufacturing stages. In 2023, China accounted for 58% of interregional trade of battery materials, packs, and components.[665] As of 2024, China manufactures nearly 80% of the world's lithium-ion batteries for electric vehicles.[666] BMI projects that "Chinese supply could account for almost 90% of the global total" of AAM capacity by 2030.[667] The reliance on foreign adversaries for the fundamental components required to comply with the standards makes the entire regulatory scheme precarious and threatens national security. The prior administration's assertion that the standards were "appropriate with respect to supply chain, critical minerals, and mineral security"[668] was demonstrably false and ignored the profound vulnerabilities created by the rules.

2.1.1.4. Inadequate Infrastructure and Grid Capacity

The feasibility of the standards is further undermined by the lack of adequate infrastructure to support the mandated level of electrification. This includes both the availability of charging infrastructure and the capacity of the U.S. electrical generation, transmission, and distribution

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[662] *Id.*

[663] *Id*. at 15.

[664] *Id*. (citing Zhang et al., *Trade-off Between Critical Metal Requirement and Transportation Decarbonization in Automotive Electrification*, 14 Nat. Commc'ns 1503 (2023), https://doi.org/10.1038/s41467-023-37373-4).

[665] *Id.* at 16 (citing *China Dominates Global Trade of Battery Minerals*, U.S. Energy Info. Admin. (May 21, 2024)).

[666] *Id*. at 16.

[667] *Id*. at 14 (citing BMI Study at 52).

[668] EPA, Response to Comments 2,568, EPA-420-R-24-005 (Mar. 2024).

(GT&D) system. The explosive demand the 2024 Rules would place on the U.S. electrical grid "was not adequately considered in any of the GHG vehicle rules."[669] The scale of investment and the lead time required to upgrade the grid to support widespread electrification—particularly for heavy-duty vehicles, which require significantly more power—present formidable challenges that render the standards' timelines unrealistic. Similarly, Auto Innovators emphasizes that "EV Charging Infrastructure Growth Is Also Needed" to support the adoption rates required for compliance.[670] The technological feasibility of electric vehicles as a compliance mechanism is inextricably linked to the availability of the infrastructure required to operate them.

2.1.1.5. Automaker Commitments Are Poor Evidence of Feasibility

Finally, the eNGOs' reliance on automaker investments and public announcements as proof of feasibility is misplaced.[671] Although manufacturers have invested in electrification, these investments were often made under regulatory duress or based on projections that assumed continued government support and rapidly increasing consumer demand.

Automobile and truck manufacturers have already responded to the shifting landscape, rapidly reversing their previous "commitments" to electrification—ending plans to introduce new electric models, halting production of current electric vehicles, and cancelling planned investments in electric vehicle and battery factories.[672] This retreat isn't limited to the United States, but has been occurring worldwide.[673]

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[669] AFPM Comment at 20.

[670] Auto Innovators Comment, App. I at 23.

[671] *See* eNGO Vehicle Standards Comment at 118–120.

[672] *See, e.g.,* AFPM Comment at 37–43 (cataloging reversals). Indeed, the pull-back from EVs has continued through the last months of calendar year 2025, as well. *See e.g.*, Tom Carter, *Automakers Are Tapping The Brakes On The EV Revolution*, Bus. Insider (Sept. 25, 2025), https://www.businessinsider.com/automakers-rolling-back-electric-car-plans-porsche-honda-jeep-ford-2025-9; David Shepardson & Nora Eckert, *GM to Cut EV, Battery Production and 1,200 Jobs at Detroit Plant*, Reuters (Oct. 29, 2025), https://www.reuters.com/business/world-at-work/gm-cut-over-1200-jobs-ev-plant-detroit-news-reports-2025-10-29/; Sharon Terlep, *Ford Considers Scrapping Electric Version of F-150 Truck*, Wall St. J. (Nov. 6, 2025), https://www.wsj.com/business/autos/ford-150-lightning-ev-decision-89dc0d84..

[673] *See, e.g.,* Sharon Terlep & Stephen Wilmot, *The Rest of the World is Following America's Retreat on EVs*, Wall St. J. (Oct. 14, 2025), https://www.wsj.com/business/autos/the-rest-of-the-world-is-following-americas-retreat-on-evs-e46b4f6b; Sarah Young & Janaki Venugopalan, *Britain to Relax EV Targets as Automakers Reel From Tariffs*, Reuters (Apr. 7, 2025), https://www.reuters.com/business/autos-transportation/britain-eases-electric-vehicle-sales-targets-automakers-2025-04-06/.

In conclusion, the proposal reasonably determined that the existing GHG standards are not technologically feasible. The standards function as electric vehicle mandates, requiring a pace of market transformation that is contradicted by market realities, historical precedent, and the industry's own compliance data. Furthermore, the overwhelming evidence regarding insurmountable constraints in the critical mineral supply chain, inadequate infrastructure, and the impact of recent policy changes confirms that the electrification levels required for compliance cannot be achieved within the regulatory timeframe.

2.2. EPA Reasonably Weighed the Costs, Economic Impacts, and Consumer Harm

Replies to eNGO Vehicle Standards Comment Sections III (pp. 18–22), VII.C.i (pp. 118–124), and VII.C.ii (pp. 125–144).

eNGO Claim: The eNGOs argue that EPA failed to reasonably consider the statutory factors regarding the costs of compliance in its proposal to repeal the GHG vehicle emissions standards. Specifically, these commenters assert that EPA ignored its own prior findings from the 2024 Rulemakings, which concluded that compliance costs were reasonable—estimated at approximately $1,200 per vehicle for light-duty models—and that the standards would yield massive net societal benefits.[674] They contend that EPA has provided no new data to contradict these prior findings and has failed to quantify or monetize the alleged compliance costs associated with the repeal.[675] Finally, they assert that any increase in upfront vehicle costs is offset by total cost of ownership savings from fuel and maintenance, rendering the standards economically beneficial for consumers.[676]

Refutation: No cost consideration could overcome EPA's conclusion that there was no "requisite technology" within its authority to command that could meaningfully address the risks identified in the 2009 Endangerment Finding.[677] Nonetheless, EPA reasonably concluded that the significant increase in the cost of new vehicles would harm, rather than promote, public welfare.[678]

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[674] eNGO Vehicle Standards Comment at 100–101, 124.

[675] *Id.* at 100.

[676] *Id.* at 127.

[677] 90 Fed. Reg. at 36,311–12.

[678] *Id.* at 36,312–13.

EPA's prior rulemakings show that electrification at the scale mandated by EPA's light- and medium-duty vehicle GHG standards, alone, would impose hundreds of billions of dollars in vehicle technology costs on manufacturers, consumers, and commercial vehicle owners.[679] Even considering speculative decreases in maintenance and repair costs, which haven't borne out to date, EPA's light- and medium- duty vehicle standards alone would cost approximately $590 billion through 2055.[680] Moreover, there are good reasons to believe that EPA's prior rulemakings substantially underestimated the costs that GHG emissions standards would impose today.

2.2.1.1. EPA's 2024 Cost Estimates Were Inconsistent with Real-World Data

EPA claimed that its light- and medium-duty GHG emissions standards would increase light-duty vehicle costs by only about $1,200 per vehicle through 2032.[681] And EPA's model suggested that some manufacturers' technology costs, including Ford's, would decline, at least in the near term, as a result of the rule.[682] But data available at the time suggests that replacing internal-combustion cars with electric ones costs much more than that. For example, in the first quarter of 2023, Ford spent an average of $119,083 per electric vehicle it sold, compared to only $31,871 per internal-combustion vehicle. EPA's rosy cost calculations are therefore irreconcilable with the on-the-ground experience of manufacturers.[683]

EPA's estimates for the heavy-duty vehicle GHG emissions standards are even harder to square with reality. EPA estimated that, through 2055, manufacturers would realize a cost *savings* under the federal standards.[684] But if true, there would be no need for EPA (or California, for that matter) to mandate electric trucks—economic incentives would already be driving the industry in that direction. They are not.[685]

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[679] *See supra* Section 1.2.1.

[680] 89 Fed. Reg. at 28,108 tbl. 211 (2% discount rate).

[681] 89 Fed. Reg. at 27,861.

[682] EPA, Regulatory Impact Analysis: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles at 12-25 tbl.12-42, EPA-HQ-OAR-2022-0829-5738 (Mar. 2024) (hereinafter Multipollutant Rule RIA).

[683] Comment of Clean Fuels Development Coalition 17, Dkt. ID EPA-HQ-OAR-2022-0829-0630 (July 5, 2023); *see also* AmFree Comment at 12–13.

[684] 89 Fed. Reg. at 29,457 tbl. ES-8.

[685] *See* AFPM Comment at 41–43 (discussing heavy-duty vehicle manufacturers' retreat from electric powertrains).

This massive disparity demonstrates that EPA's prior models substantially underestimated the capital and production costs involved in a forced transition to electrification. As noted by commenters, manufacturers are not realizing the "cost savings" predicted by EPA's previous models; instead, they are facing substantial losses on electric vehicle product lines, necessitating cross-subsidization where the prices of conventional motor vehicles are artificially inflated to cover electric vehicle losses.[686] This "hidden tax" on traditional vehicles represents a significant cost of compliance that EPA properly weighed in its reconsideration.

2.2.1.2. The eNGOs' TCO Analysis Relies on Idealized Assumptions and Misrepresents Consumer Preferences

The eNGOs' argument that disparities in upfront costs disappear when considering total cost of ownership (TCO) savings is flawed because it relies on idealized conditions that do not exist for the majority of American consumers and depends on studies that misrepresent consumer preferences and omit critical costs.

First, the claim that lower fuel costs offset higher upfront prices assumes universal access to low-cost home charging and stable electricity rates. However, commenters have highlighted that residential electricity rates are projected to rise significantly—potentially 15 to 40 percent by 2030—due to the unprecedented demand placed on the grid by electrification and other sectors.[687] Furthermore, recent data indicates that rising electricity prices and falling gasoline prices have already eroded the theoretical operating cost advantage of electric vehicles.[688] Critically, for the many urban drivers and renters who rely on public charging, the costs are often significantly higher than home charging, destroying the TCO math for non-homeowners.

The commenters rely on studies such as Slowik et al. (2022) to assert significant maintenance savings (e.g., $2,650) for battery-electric vehicles.[689] However, this projection is unreliable because the study explicitly excludes known and significant drivers of battery-electric vehicle maintenance costs related to their increased mass. The authors acknowledge they omitted analysis of "electric vehicle weight-related modifications to brake rotors/calipers/pads,

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[686] AFPM Comment at 53.

[687] *Id.* at 21.

[688] *Id.* at 51.

[689] eNGO Vehicle Standards Comment 137.

suspension system, [and] tires... due to higher mass of electric vehicles," dismissing these substantial factors based only on an unsubstantiated "presumed small impact."[690]

This presumption is unfounded. The significant weight and high instant torque of battery-electric vehicles are known to accelerate tire wear substantially compared to gasoline vehicles. This requires more frequent replacement, often with specialized, more expensive tires designed to handle the excess weight. By explicitly ignoring the physical and financial consequences of increased mass on critical wear items, the study's projected savings are materially overstated.

Furthermore, the study performs no independent analysis of maintenance costs. Instead, it imports flat, cents-per-mile estimates from an external model (Burnham et al., 2021), assuming battery-electric vehicles cost 3.6 cents/mile and gasoline vehicles cost 7.0 cents/mile.[691] This approach is flawed for two reasons. First, it relies on idealized modeling based on "maintenance service schedules."[692] This emphasizes avoided scheduled maintenance (like oil changes) while ignoring unscheduled repairs, failing to account for the higher repair severity costs typically associated with battery-electric vehicles due to specialized components and labor. This is confirmed by insurance and collision repair data showing electric vehicles are significantly more expensive to repair after accidents, and these TCO calculations often exclude long-term battery replacement costs. Second, the study unrealistically assumes these costs will remain static, applying the exact same cents-per-mile figures for 2022, 2025, and 2030, thereby ignoring inflation and rising labor costs.[693]

The commenters fundamentally misrepresent Forsythe et al. (2023) by claiming the study found that consumers "accept or prefer BEVs" when "basic demands for vehicle attributes are met."[694] This is directly contradicted by the study's actual findings. The study explicitly concludes that when all vehicle attributes are identical, "consumers prefer conventional gasoline

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[690] Slowik et al., *Assessment of Light-Duty Electric Vehicle Costs And Consumer Benefits In The United States In the 2022–35 Time Frame*, Int'l Council on Clean Transp. 24 (2022), https://theicct.org/wp-content/uploads/2022/10/ev-cost-benefits-2035-oct22.pdf.

[691] *Id.* at Table 7 (citing Andrew Burnham et al., *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains*, Argonne National Laboratory (2021)).

[692] Burnham et al. (2021).

[693] Slowick et al. (2022), at Table 7.

[694] eNGO Vehicle Standards Comment at 133–36.

vehicles over BEVs and PHEVs, on average."[695] The authors quantified this preference, finding that consumers are willing to pay, on average, $4,160 (cars) to $8,700 (SUVs) more for a gasoline vehicle than a comparable battery-electric vehicle.[696] Therefore, meeting "basic demands" is insufficient; the study suggests battery-electric vehicles must offer superior attributes (e.g., significantly lower operating costs, faster acceleration) to merely compensate for the baseline consumer preference for gasoline vehicles. Furthermore, the commenters exaggerate the study's optimism by presenting a highly conditional future projection as a current fact. The study's suggestion that battery-electric vehicle valuation might exceed gasoline counterparts is entirely contingent on aggressive assumptions for 2030, including universal 300-mile ranges and, critically, a "0% price premium"—conditions that do not currently exist.[697]

The study's core premise is contradicted by market trends observed since its publication. The assumed trajectory toward price parity is not materializing. According to the Alliance for Automotive Innovation, the average transaction price for new electric vehicles in March 2025 was $59,205, increasing the electric vehicle price premium over gasoline and diesel vehicles to $12,229, the highest gap in several years.[698] Furthermore, the seamless adoption suggested by the study is inconsistent with the significant deceleration in the battery-electric vehicle adoption growth rate. The "revealed preference" of the market—where electric-vehicle sales have stagnated at approximately 9-10 percent of market share despite aggressive push from regulators—demonstrates that consumers do not perceive the TCO benefits touted by the eNGOs to be real or sufficient to justify the premium of electric-vehicle ownership.[699]

2.2.1.3. The Factual Predicates for the 2024 Rulemakings' Cost Estimates No Longer Exist

The eNGOs' reliance on the cost estimates from the Biden EPA are misplaced because the factual predicates for those estimates no longer exist, as the economic and regulatory landscapes

[695] Forsythe et al., *Technology Advancement is Driving Electric Vehicle Adoption* 5 (2023), https://doi.org/10.1073/pnas.2219396120.

[696] *Id.*

[697] *Id.*

[698] All. for Auto. Innovation,, *Get Connected: Electric Vehicle Quarterly Report, First Quarter, 2025* at 7, https://www.autosinnovate.org/posts/papers-reports/Get%20Connected%20EV%20Quarterly%20Report%202025%20Q1.pdf.

[699]AFPM Comment at 10.

have changed substantially since EPA issued those standards in ways that will increase the costs of those vehicles.

Two developments merit particular mention. First, several of the California programs that EPA relied on to drive demand for electric vehicles have been repealed by Congress. In its estimates, EPA attributed many of the relevant costs to these programs; without them, the costs attributable to federal GHG standards will rise substantially.[700] Second, many of the tax incentives and credits EPA relied upon have been repealed or terminated. This includes vehicle purchase and battery tax credits that EPA assumed would significantly reduce the costs of electric vehicles for manufacturers and consumers.[701] As noted in the proposal and supported by the record, the One Big Beautiful Bill Act (OBBBA) repealed the tax credits for new clean vehicles (Section 30D), used clean vehicles (Section 25E), commercial clean vehicles (Section 45W), and changes that curtail the advanced manufacturing production credit (Section 45X).[702] The 2024 Rulemakings relied on these credits to drive down the costs of electric vehicles and to support the assertion that compliance costs were reasonable. Without these subsidies, the direct cost of compliance for manufacturers rises dramatically, as does the purchase price for consumers. The eNGOs' assertion that compliance remains affordable ignores the fundamental shift in the baseline: the federal government is no longer subsidizing the artificial market distortion required to meet the prior standards.

2.2.1.4. The Proposal's Other Economic Conclusions Are Reasonable

EPA properly concluded that the substantially higher vehicle costs that accompany its electric vehicle mandates could negatively impact public health and welfare.[703]

The eNGOs argue that Section 302(h)'s definition of "public welfare" excludes consideration of consumer costs or market behavior.[704] This interpretation is impermissibly narrow. Section 302(h) defines welfare to include effects on "economic values" and "personal comfort and well-

[700] *See, e.g.*, 89 Fed. Reg. at 29,455 (EPA "lowered the overall costs" of the heavy-duty greenhouse gas standards by making "updates to our reference scenario," i.e., including electric truck sales attributable to California's ACT program in the baseline).

[701] *See, e.g.,* AFPM Comment at 31–32.

[702] AFPM Comment at 31–32.

[703] 90 Fed. Reg. at 36,312–13.

[704] eNGO Vehicle Standards Comment at 90–91.

being."[705] High vehicle prices that force families to delay replacing unsafe, older vehicles with newer, cleaner ones undeniably impact economic values and personal well-being. This is a well-documented phenomenon.[706] The relationship between regulatory stringency, vehicle price, and fleet turnover is well-documented in economic literature. Research cited in the record demonstrates a "scrappage elasticity" of approximately -0.7, meaning that for every 10 percent increase in new car prices, the scrappage rate of older cars declines by 7 percent.[707] With the average transaction price of a new vehicle approaching $49,000—well over half the median household income—affordability has become a critical barrier to fleet modernization.[708] By keeping older, higher-emitting vehicles on the road longer, the prior standards effectively undermined the very air quality goals they sought to achieve. EPA therefore reasonably raised "serious concerns that its GHG standards," which would significantly increase the purchase cost of vehicles across classes, could "harm[] air quality by … reducing fleet turnover."[709]

EPA has a sound reason for departing from its prior conclusions that its electric vehicle mandates did not affect fleet turnover to an appreciable degree: those conclusions were predicated on tax credits and purchase incentives that softened the purchase price increases that would otherwise result from its mandates.[710] But with those tax credits now repealed, the purchase costs of electric vehicles of all types will be (significantly) higher than previously projected, increasing fleet turnover effects.[711]

2.3. EPA Reasonably Determined the Environmental and Health Benefits Are Negligible

Replies to eNGO Vehicle Standards Comment Section II (pp. 10–18) and VII.C.i (pp. 104–113).

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[705] 42 U.S.C. § 7602(h).

[706] *See, e.g.,* Buckeye Institute Comment 4–5.

[707] *Id.*

[708] *Id.*

[709] 90 Fed. Reg. at 36,313.

[710] 89 Fed. Reg. at 29,698–99 (explaining that "Federal vehicle and battery tax credits, and EVSE tax credits" would "mitigate" any potential shift in heavy-duty vehicle purchaser behavior); EPA, Multipollutant Rule Response to Comments 145–46, EPA-HQ-OAR-2022-0829-5738 (modeling shows minimal impact on turnover when including purchase "incentives available by the IRA").

[711] *See* Buckeye Institute Economic Comment at 4 (observing that new vehicle affordability "levels remain historically elevated" and consumers "are responding by holding onto vehicles longer," with the "average age of U.S. cars and light trucks on the road hit[ting] a record 12.6 years in 2024 and r[ising] further to 12.8 years in 2025").

eNGO Claim: The eNGOs challenge EPA's determination regarding environmental and health benefits on several fronts. Primarily, they argue that EPA is required to "quantify or monetize GHG emissions impacts,"[712] and assert that the projected increase in emissions resulting from the repeal is "truly massive."[713] Furthermore, they contend that EPA improperly "gives dispositive weight to the percentage of US vehicles emissions relative to global energy-use emissions,"[714] and that EPA failed to account for health benefits from co-reductions in criteria pollutants.[715]

Refutation: These arguments are unpersuasive. First, the eNGOs are wrong to suggest that EPA is required to "quantify or monetize GHG emissions impacts."[716] Section 202(a) contains no directive to monetize the climate impact of emissions, and EPA reasonably retreated from its prior misguided reliance on such values in light of the substantial inherent uncertainty in those calculations.

Monetizing the impact of changes in global GHG emissions is an inherently uncertain and highly speculative endeavor. Efforts to do so generally rely on the SCC, which purports to estimate the economic cost of emitting an extra ton of carbon dioxide discounted to the present across the world as a whole. But as explained in the Response to Endangerment Finding Comments, *supra*, 3.3.6.1, the SCC is a highly unstable metric that varies by orders of magnitude based on the assumptions incorporated and often appears more politically driven than scientifically based. Indeed, meta-analyses find published SCC values ranging from $10's per ton to nearly $900 per ton.[717] This variation is to a certain extent unavoidable, as SCC estimates depend on very uncertain inputs, making calculations of benefit (or harm) from projected changes in GHG emissions inherently unreliable. These uncertain inputs include difficulties in projecting GHG emissions worldwide 50, 100, or more years in the future; determining the effect of a marginal ton of GHG emissions on the complex global climate system; weighing the uneven geographic

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[712] eNGO Vehicle Standards Comment at 100.

[713] *Id.* at 102.

[714] *Id.* at 106.

[715] *Id.* at 111–13.

[716] *Id.* at 100.

[717] *See supra* Response to Endangerment Finding Comments, Sec. 3.3.6.2; *see also* Buckeye Institute Economic Comment at 6–7 (citing Tol, *Social Cost of Carbon Estimates Have Increased Over Time*, 6 Nature Climate Change 13 (June 2023), as finding "SCC values ranging from under $10/ton to over $500/ton depending on model structure and assumptions").

distribution of any effects from changes to the global climate; and accounting for the mitigation (or cost) of any adaptation. And these costs are global, not costs to the United States, so they are not informative to EPA's standards. The cost to the United States is only a small fraction of the SCC, as the SCC is inflating by predicting heat-related mortality in tropical countries.

Moreover, EPA's own past attempts to quantify the benefits of GHG regulations have been riddled with errors and based on incorrect assumptions. For example, EPA's Framework for Evaluating Damages and Impacts (FrEDI)—invoked by EPA when setting its prior light-, medium-, and heavy-duty GHG standards—is based on the implausible RCP8.5 temperature scenario and fails to appropriately account for adaptation, among other errors.[718] Any monetization of the climate impacts of EPA's GHG emission standards would be conjectural at best and grossly misleading at worst. EPA therefore wisely did not resort to speculative monetary equivalencies to attempt to justify its repeal.

Second, contrary to the eNGOs' suggestions, EPA *did* quantify climate impacts and correctly concluded that even the most extreme standards—zeroing-out GHG emissions of the entire U.S. motor vehicle sector—would have a *de minimis* effect on the global climate. EPA explained that eliminating GHG emissions from light- and medium-duty vehicles in the United States altogether would only "result in a 1.8 percent decrease in global GHG emissions," which in turn would result in "an approximate 3 percent reduction in predicted warming trends … well below the scientific threshold for measurability."[719] Eliminating emissions from all U.S. heavy-duty vehicles would have even less of an effect.[720] New motor vehicles that would be subject to continuing standards make up a small fraction of those emissions, so that these estimates are an extreme upper bound for the impact of any standards. It was therefore reasonable for EPA to conclude that regulation of GHG emissions from new U.S. motor vehicles would have no "meaningful[]" impact on the global climate system.[721]

Regarding the specific emissions data, the eNGOs point out that EPA quantified the potential change in GHG emissions due to its repeal, estimating emission of an additional approximately

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[718] *See, e.g.*, Comment of Center for Environmental Accountability, Dkt. ID EPA-HQ-OAR-2025-0194-1330 (discussing FrEDI's flaws).

[719] 90 Fed. Reg. at 36,311.

[720] *Id.* at 36,312 (estimating "a decrease of 0.7 percent of all worldwide GHG emissions").

[721] 90 Fed. Reg. at 36,311.

7,700 million metric tons CO_2eq through 2055.[722] Far from being "truly massive,"[723] these estimated emissions are miniscule in proportion to projected global emissions over that time frame. EPA's estimate amounts to approximately 265 million metric tons per year averaged over the 29-year forecast, which is approximately 0.45% of the 59 *billion* metric tons CO2eq estimated to have been emitted globally in 2019 alone. EPA has already reasonably concluded that changes in emissions many times larger "would not reliably and meaningfully" affect global GHG concentrations or the risks of climate change, so that any effect from its repeal is *de minimis*.[724] As described at length in the Response to eNGO Endangerment Comments, *supra* 2.2, this conclusion is legally and technically correct.

The eNGOs' focus on absolute tons of GHG emissions—and complaint that EPA "gives dispositive weight to the percentage of US vehicles emissions *relative to global energy-use emissions*"—shows how deeply they misconstrue the problem.[725] Climate risks are premised entirely on *global* GHG concentrations, and so the effect of any U.S. regulation on climate risk can only be assessed in the context of *global* emissions. The eNGOs' approach, on the other hand, would require EPA to regulate GHG emissions from new motor vehicles merely for regulation's sake.[726] But that would not be reasoned decisionmaking.[727]

Finally, EPA also appropriately cabined its analysis to the effects of regulation on global GHG concentrations and the risk of climate system effects, not considering effects derived from a co-reduction in criteria or other emissions. As explained elsewhere, any co-benefits are highly uncertain.[728] And in any event, effects of criteria or other emissions on public health or welfare is better—and already—addressed through direct regulation of those emissions.[729]

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[722] EPA, Draft Regulatory Impact Analysis at 7, EPA-HQ-OAR-2025-0194-0047; see eNGO Vehicle Standards Comment at 102.

[723] eNGO Vehicle Standards Comment at 102.

[724] 90 Fed. Reg. at 36,312.

[725] *See* eNGO Vehicle Standards Comment at 106 (emphasis added).

[726] *Id.* at 106 (arguing that standards' impact on global climate change is immaterial as long as they reduce greenhouse gas emissions).

[727] *Michigan v. EPA*, 576 U.S. 743, 752 (2015) ("One would not say that it is … rational … to impose billions of dollars in economic costs in return for a few dollars in health or environmental benefits.").

[728] *See supra* Response to Endangerment Finding Comments Sec. 3.4.5.

[729] eNGO Vehicle Standards Comment at 111–13.

2.4. EPA Adequately Considered Reliance Interests and Justified the Policy Change

Replies to eNGO Vehicle Standards Comment Section VII.A (pp. 92-95), VII.C (pp. 144–58), and VII.D (pp. 167–85).

eNGO Claim: The eNGOs argue that EPA's repeal is arbitrary and capricious because the agency failed to provide a reasoned explanation for its departure from prior factual findings and legal interpretations, ignoring principles of *stare decisis* and the standards articulated in *Loper Bright*.[730] They further contend that EPA failed to rationally weigh the statutory factors and ignored other relevant considerations, including global competitiveness, employment impacts, energy security, grid reliability, and environmental justice.[731] Finally, they assert that EPA failed to adequately consider the significant reliance interests created by the existing standards, claiming manufacturers, states, and private companies have invested billions based on the regulatory certainty of the rules.[732]

Refutation: The agency has provided a detailed and reasoned justification for this necessary policy change based on a thorough re-evaluation of the legal landscape, the factual record, and economic realities. EPA reasonably weighed the statutory factors, concluding the massive costs and technological infeasibility of the prior electric-vehicle-forcing standards overwhelmingly outweigh their negligible benefits. Furthermore, the agency fully considered potential reliance interests and reasonably concluded they do not outweigh the imperative to repeal the unlawful, infeasible, and economically damaging standards.

2.4.1 EPA Provided a Reasoned Justification for the Policy Change

EPA has offered multiple, independently sufficient bases for the repeal. EPA's repeal of the Endangerment Finding is reasonable and forms a sufficient basis for the repeal of the standards.[733] If the Endangerment Finding is repealed, EPA lacks authority to retain the standards. Nonetheless, EPA also set out independently sufficient separate bases, concluding that the standards should be repealed based on a reasonable weighing of the statutory factors.[734]

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[730] *Id.* at 92–95.

[731] *Id.* at 125–67.

[732] *Id.* at 167–85.

[733] *See supra* Response to Endangerment Finding Comments.

[734] 90 Fed. Reg. at 36,311–13; *see also supra* Section 2.1–2.3.

The eNGOs mistake the obligations of federal courts for obligations of federal agencies when arguing that EPA failed to consider the *stare decisis* factors and considerations raised in *Loper Bright*.[735] In any event, EPA did consider the relevant factors that demonstrate reasoned decisionmaking when changing an agency interpretation or policy. The Supreme Court considers factors including the quality of a prior decision's reasoning, the decision's workability, changed legal or factual circumstances, and reliance interests.[736] The persuasive value of an agency's interpretation depends on similar factors.[737] EPA addressed these factors.

First, EPA comprehensively explained its rationale for repealing the 2009 Endangerment Finding, identifying the legal flaws in the 2009 decision's reasoning.[738] EPA explained it was "return[ing] … to its longstanding practice prior to 2009."[739] EPA also explained why, even accepting the Endangerment Finding, it would depart from its 2024 conclusions.[740]

Second, EPA explained that the proposed repeal is far more workable than current standards because it "would increase flexibility" and would not "mandate any particular technology response."[741] As a result, manufacturers are "free to produce a range of technologies, including gasoline, diesel, alternative fuels, and plug-in electric vehicles," giving consumers greater choice in selecting the vehicle that meets their particular needs and circumstances.[742] Indeed, the eNGOs have not identified any aspect of EPA's proposed repeal that is unworkable.

Third, EPA identified changed legal and factual circumstances. These include the Supreme Court's decisions in *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302 (2014), *West Virginia v. EPA*, 597 U.S. 697 (2022), and *Loper Bright*, which bear on EPA's authority under Section 202(a);[743]

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[735] eNGO Vehicle Standard Comment at 93–94.

[736] *Janus v. Am. Fed'n of State, Cnty., & Mun. Emps., Council 31*, 585 U.S. 878, 917–28 (2018).

[737] *Loper Bright Enters. v. Raimondo*, 603 U.S. 357, 370 (2024).

[738] 90 Fed. Reg. at 36,299–36,311.

[739] *Id.* at 36,301; *see Loper Bright*, 603 U.S. at 388.

[740] 90 Fed. Reg. at 36,311–13.

[741] *Id.* at 36,314.

[742] *Id.*

[743] 90 Fed. Reg. at 36,300–07.

developments in climate science;[744] and changes in economic and regulatory conditions affecting the feasibility and cost appropriateness of electric-vehicle-forcing standards.[745]

2.4.2 EPA Reasonably Weighed Relevant Factors

The eNGOs argue EPA failed to rationally consider several other relevant factors.[746] However, these factors were reasonably considered by EPA, are not relevant, or also weigh in favor of repeal.

2.4.2.1. Consumer Impacts and Choice

EPA reasonably concluded that purchaser-related factors—such as significantly increased consumer costs—and the resultant delayed fleet turnover weigh in favor of repeal.[747] EPA's departure from its cost and fleet turnover conclusions in its 2024 rules is reasonable in light of the flaws in the 2024 cost-models, as well as the changed regulatory and economic landscapes.[748]

EPA also reasonably focused on consumer choice rather than consumer acceptance, an amorphous, unvetted concept created by EPA to justify its 2024 electric-vehicle mandates.[749] According to EPA, consumer "acceptance [is] a multifaceted, nonlinear process consisting of awareness, access, approval, and adoption," and "is not the same thing as 'purchase of a given vehicle technology.'"[750] This nebulous concept (and the related parameterized model developed by EPA) is of little use to EPA's task under Section 202(a)—assessing technological feasibility and cost appropriateness of particular emissions standards. That is because "consumer acceptance," at least as defined by EPA, has no predictive value,[751] is independent of any particular standard,[752] and cannot be verified against any measurable metric.

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[744] *Id*. at 36,307–10.

[745] *Id*. at 36,312, 36,326.

[746] eNGO Vehicle Standards Comment at 125–67.

[747] *See* 90 Fed. Reg. at 36,312–13.

[748] *See supra* Section 2.2.

[749] *See* 89 Fed. Reg. at 28,026–28.

[750] *Id.* at 28,026.

[751] *Id*. at 28,026 (a "high relative acceptance of [electric vehicles] may or may not result in [electric-vehicle] purchase[s]").

[752] *See* Multipollutant Rule RIA at 4-13 (the model "parameters [are] exogeneous to the standards").

Not only does the concept have no utility in determining the feasibility or cost appropriateness of any standards, EPA's qualitative conclusions and quantitative model are outdated and irreconcilable with recent consumer trends.

In 2024, EPA provided a qualitative assessment of "consumer acceptance via a conceptual, non-numerical lens," which concluded that electric-vehicle "[a]cceptance and adoption will continue to grow and expand," and likely rapidly.[753] But key assumptions underlying that conclusion have proven to be inaccurate, including that electric vehicle light-duty "market share will continue to grow rapidly"; that manufacturers will continue "to expand [electric-vehicle] production"; that the price difference between electric vehicles and internal-combustion cars "is likely to narrow or become insignificant" by the mid-2020s; and that the IRA's purchase incentive of $7,500 will "increase consumer uptake" of electric vehicles.[754] These foundational assumptions have not stood the test of time. [755]

EPA's quantitative assessment fares no better. To quantify consumer acceptance, EPA developed a parameterized model implementing "shareweights" that represent "non-cost elements of the consumer purchase decision" including "internal and external characteristics of individuals and households (e.g., attitudes, demographics), vehicle attributes not included in generalized cost, and conditions of the physical, social, economic and governmental systems (e.g., charging stations, neighborhood effects)."[756] The model assigned a shareweight value to three classes of electric vehicles (sedans, SUVs, and pickups), one class of plug-in electric vehicles (all body types), and one class of internal-combustion vehicles (all body types) for each year through 2050, representing consumer acceptance relative to internal-combustion vehicles.[757] Although EPA didn't explain how it determined the shareweights, the agency claims to have

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[753] 89 Fed. Reg. at 28,026–27.

[754] *Id*. at 28,027.

[755] *See, e.g.,* All. for Auto. Innovation, *Get Connected: Electric Vehicle Quarterly Report, Second Quarter, 2025* (Alliance 2025 Q2 EV Report) at 3, https://www.autosinnovate.org/posts/papers-reports/Get%20Connected%20EV%20Quarterly%20Report%202025%20Q2.pdf (electric vehicle light-duty market share decreased in 2025 relative to 2024 and is close to 2023 levels), 10 (average transaction price of new electric vehicles in 2025 remains nearly $9,000, despite significant electric vehicle purchase incentives); AFPM Comment 37–43 (cataloging manufacturer reversals of planned electric vehicle expansion); see also DRIA at 5–7 (discussing change in consumer sentiment).

[756] Multipollutant Rule RIA at 4-12.

[757] *Id*. at 4-13, 4-14, tbl. 4-2.

calibrated the model against third-party estimates that "include effects of the IRA."[758] Setting aside the inconsistency of calibrating a model that represents "non-cost elements of the consumer purchase decision" against predictions that include cost effects, the repeal of the IRA incentives means that EPA's 2024 model cannot now reliably represent current consumer sentiment.

Even accepting there may not be a one-to-one relationship between consumer acceptance and vehicle purchases,[759] the significant divergence between EPA's model and recent consumer trends also counsels against reliance on it. EPA's model suggests that by 2026, consumers will nearly equally prefer an electric sedan to an internal-combustion one.[760] The start of 2026 is less than two months away and purchases of internal-combustion cars continue to far outpace purchases of electric sedans, even during months when IRA credits were available, suggesting a disconnect between EPA's "consumer acceptance" construct and actual consumer behavior.[761]

For these reasons, EPA reasonably elected to abandon any reliance on its flawed consumer acceptance concept and model.

2.4.2.2. Economic, Strategic, and Security Impacts

The eNGOs raise concerns regarding global competitiveness, employment, energy security, and grid reliability. These considerations strongly weigh in favor of EPA's repeal.

Global Competitiveness and Industrial Policy. The eNGOs argue EPA must maintain standards to ensure U.S. competitiveness with China.[762] This is backward. Forcing a transition to a supply chain that China already dominates (batteries and critical minerals) surrenders competitiveness, rather than enhancing it.[763] Acknowledging China's dominance refutes the idea that U.S. mandates will magically create domestic supremacy.

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[758] *Id.* at 4-16.

[759] 89 Fed. Reg. at 28,026.

[760] Multipollutant Rule RIA at 4-14, Table 4-2 (electric sedan consumer acceptance of 0.92 relative to an internal-combustion car acceptance of 1.0).

[761] *See* Alliance 2025 Q2 EV Report at 3 (electric vehicles represented only 9.55% of U.S. light-duty vehicle sales in the first half of 2025).

[762] eNGO Vehicle Standards Comment at 144–47.

[763] See *supra* Section 2.1.

Furthermore, Section 202(a) does not license EPA to set industrial policy for the U.S. transportation sector, but merely to set emissions standards.[764] There is no reason for EPA to consider the purported non-emissions benefits of electric vehicles or the asserted need for regulatory certainty to support investments in electric vehicles. Under EPA's repeal, transportation policy is returned to the people's elected representatives in Congress.

Employment Impacts. Analyses generally show that when considering overall employment—not just employment in electric-vehicle-related sectors—electric-vehicle mandates result in a net decrease in employment. In 2024, EPA estimated net gains in the automotive sector, but unreasonably declined to quantify acknowledged job losses in other sectors—like fossil fuels and automotive repair—making EPA's analysis incomplete.[765]

Moreover, independent analyses call into question EPA's optimistic estimates given that electric vehicles require 30% less labor to manufacture than internal-combustion cars.[766] For example, using data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages, one study concluded that EPA's light-duty electric-vehicle mandate would result in 123,000 fewer auto-manufacturing jobs overall.[767] And EPA has acknowledged in prior analyses that California's ACC II rule—which similarly mandates for electric vehicles in the state of California—would result in "a small decrease … of baseline California employment … across all industries in [California] through 2040."[768]

Even the studies cited by the eNGOs acknowledge that electric-vehicle mandates such as EPA's 2024 standards decrease *net* employment, whether considering the automotive sector as a whole, or the American economy more broadly. The study that the eNGOs cite as concluding that "California's clean car policies" create "over 7.3 million full-time equivalent job-years of employment … through 2045,"[769] found that those same policies lead to significant decreases in industries related to internal-combustion vehicles, resulting in an overall "*contraction* in the

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764 42 U.S.C. § 7521(a).

765 Multipollutant Rule RIA 4-81–84.

766 *See, e.g.*, Sherk & Sagert, *Proposed EV Mandate Would Eliminate 117,000 Auto Manufacturing Jobs* 5, Ctr. for Am. Freedom (Sept. 2024), https://www.americafirstpolicy.com/issues/ban-on-gas-powered-cars-would-eliminate-nearly-200000-auto-manufacturing-jobs.

767 *Id.*

768 Multipollutant Rule RIA at 4-67.

769 eNGO Vehicle Standards Comment at 148–49

transportation workforce between [2020] and 2045."[770] Indeed, under that analysis, starting in 2024 and extending through the end of the analysis, cumulative year-over-year job losses in internal-combustion-related sectors outpace job growth in electric-vehicle-related sectors, with a net loss of some 200,000 full-time equivalent jobs by 2045.[771] The study the eNGOs cite as concluding that a policy "scenario with high levels of EVs would result in a peak of over 2 million jobs created in 2035,"[772] found net job loss by 2035 in auto manufacturing and closely-related sectors, with gains in "direct electricity and fuel sector jobs" (790,000) more than offset by "direct job losses in the auto sector" (483,000) and in the "vehicle maintenance industry" (470,000).[773] And the study the eNGOs cite as concluding that Michigan "stands to gain tens of thousands of high quality jobs, if it seizes the opportunities of the [electric-vehicle] sector,"[774] found that outside of auto manufacturing, transitioning to electric vehicles would result in nearly 25,000 fewer Michigan jobs by 2040, and more than 50,000 fewer jobs when omitting nearly 27,000 non-specific jobs the authors speculated might be created by "re-spending" of purported consumer savings on electric vehicles.[775]

Energy Security and Grid Reliability. Given the United States' growing domestic oil and gas production, and China's dominance of the lithium-ion battery supply chain, repealing EPA's electric-vehicle mandates will make the United States *more* energy independent and secure by decreasing dependence on foreign energy sources and adversarial nations.[776]

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[770] Brown et al., *Driving California's Transportation Emissions to Zero* 330 (2021), https://escholarship.org/uc/item/3np3p2t0 (emphasis added).

[771] *Id.* at 328–329 (compare lower panel of Figure 12.2 (year-over-year internal-combustion job losses) with Figure 12.1 (annual electric vehicle job gains).

[772] eNGO Vehicle Standards Comment at 149.

[773] Univ. of Cal. Berkeley Goldman Sch. of Pub. Pol'y, The 2035 Report: Transportation 23 (2021), https://www.2035report.com/transportation/wp-content/uploads/2020/05/2035Report2.0-1.pdf.

[774] eNGO Vehicle Standards Comment at 148 (cleaned up).

[775] Saha et al., *A Roadmap for Michigan's Electric Vehicle Future* 10 (2023), https://files.wri.org/d8/s3fs-public/2023-05/roadmap-michigan-ev-future.pdf (estimating by 2040, 7,500 jobs created related to installation and operation of electric vehicle charging stations; 1,800 jobs created related to electricity demand; 46,100 jobs lost related to gas stations; 1; 25,700 jobs lost related to automotive maintenance and repair; 6,400 jobs lost related to automotive finance; approximately 7,600 jobs created related to renewable energy; and 26,900 jobs created due to consumer re-spending of money saved on EVs). We do not include the 15,000 jobs the authors estimate would be created by IRA tax credit savings, *id*. 10, tbl. ES-2, 51, as those credits have been repealed.

[776] *See, e.g.*, AFPM Comment at 15–20.

As to grid reliability, EPA's electric-vehicle mandates place significant loads on the national electric grid at a time when electricity demand for advanced technologies, such as data centers and artificial intelligence, are projected to skyrocket. The eNGOs rely on theoretical "Vehicle-to-Grid" (V2G) technology as a solution, but V2G is currently theoretical or in pilot stages and not deployed at scale. The load increase from charging is immediate and massive, threatening reliability before V2G can compensate. EPA's repeal will reduce those loads, and so strengthen grid reliability and resilience.[777]

Vehicle safety. EPA previously concluded that mandating electric vehicles did not result in a "statistically significant change" in safety risks, so safety is, at most, neutral toward repeal.[778]

2.4.2.3. Irrelevant Considerations

Other factors that the eNGOs discuss are not relevant to EPA's repeal. Section 202(a) does not license EPA to set industrial policy for the U.S. transportation sector, but merely to set emissions standards to address air pollution.[779] There is therefore no reason for EPA to consider the purported non-emissions benefits of electric vehicles,[780] the asserted need for "[r]egulatory certainty to support investments" in electric vehicles,[781] or the global competitiveness of U.S. electric-vehicle manufacturers.[782] Under EPA's repeal, transportation policy is returned to the people's elected representatives in Congress, and consumers can assess for themselves the benefits (and drawbacks) of electric vehicles.

So-called environmental justice considerations are also irrelevant.[783] The Clean Air Act does not evince a greater concern for the health and welfare of individuals of a particular race, color, creed, or socio-economic status: its charge applies to protect *all* Americans. Basing environmental

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[777] *See, e.g.*, AFPM Comment at 20–27.

[778] 89 Fed. Reg. at 28,093; *but see* AmFree Phase 3 Comment at 50–53 (discussing unique safety risks of electric vehicles, which suggests vehicle safety concerns weigh in favor of repeal).

[779] 42 U.S.C. § 7521(a).

[780] eNGO Vehicle Standards Comment at 134–43.

[781] *Id.* at 131–32.

[782] *Id.* at 144–47.

[783] *Id.* at 1159–161.

regulations on particular demographics is inconsistent with that charge, and in some instances may be illegal.[784]

2.4.2.4. EPA Adequately Considered Reliance Interests

Finally, EPA adequately considered reliance interests. EPA discussed various potential manufacturer reliance interests, including the sunk costs of research and development into electric vehicles, but concluded none merited departing from its proposed repeals.[785] EPA also sought comment on reliance interests,[786] and commenters responded, explaining that the tepid consumer demand for electric vehicles and manufacturers' retreat from electric vehicle production demonstrate that there has been minimal reliance on EPA's electric-vehicle-forcing standards.[787] Regardless, even to the extent some automakers have investment-backed reliance interests in the GHG standards, EPA need only acknowledge these interests and explain why they do not outweigh the substantial legal, economic, and consumer harms inherent in the existing standards.

3. The Repeal is Reasonable and Procedurally Sound

EPA has engaged in a thorough, reasoned process to repeal flawed and unlawful regulations, appropriately balancing all factors and prioritizing the broader public interest in affordable transportation and the rule of law over narrow reliance interests.

3.1. EPA Provided Adequate Opportunity for Public Comment

Replies to eNGO Vehicle Standards Comment IV.A (pp. 23–27).

eNGO Claim: The eNGOs contend that the 52-day comment period is "woefully inadequate" for a proposal of this scope, contrasting it with the much longer periods for the original 2009 Endangerment Finding and the eight motor-vehicle standards that followed. They argue this abbreviated timeline denies a meaningful chance for public input.[788]

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[784] *See* Exec. Order 14173, *Ending Illegal Discrimination and Restoring Merit-Based Opportunity*, 90 Fed. Reg. 8,633 (Jan. 31. 2025); *cf. Louisiana v. EPA*, 712 F. Supp. 3d 820 (W.D. La. 2024) (enjoining EPA and DOJ from imposing disparate impact requirements on states or state agencies).

[785] 90 Fed. Reg. at 36,297.

[786] *Id.*

[787] *See supra* Section 2.1.

[788] eNGO Vehicle Standards Comment at 23–27.

Refutation: EPA's 52-day comment period is entirely reasonable and satisfies all statutory requirements.

By statute, EPA must provide "a reasonable period for public participation of at least 30 days" when promulgating regulations under the Clean Air Act. 42 U.S.C. § 7607(h). Recognizing the intense public interest surrounding its proposal, EPA provided a 52-day comment period—well above the statutory minimum—and received more than 500,000 submissions. EPA also provided four full days of hearings, during which hundreds of individuals had the opportunity to share their views.[789] The virtually unparalleled level of public participation undermines any argument that EPA provided inadequate opportunity for meaningful public input. Under *Vermont Yankee,* courts have no license to compel EPA to provide more time than required by law: 30 days.

The eNGOs ineptly analogize to the 2009 Endangerment Finding. But the adequacy of a comment period is determined not by a simple comparison to historical timelines for different regulatory actions, but by the public's ability to engage meaningfully with the material at hand. The 2009 Endangerment Finding was created on a blank slate, and so understandably EPA provided a longer period for the initial gathering and synthesis of the scientific and technical record. In contrast, EPA's proposal here reconsiders a long-standing rule and its underlying legal and scientific predicates—issues that have been the subject of intense public debate, litigation, and regulatory action for over a decade. Stakeholders, therefore—including the eNGOs themselves—are deeply familiar with the core arguments and are well-positioned to provide substantive comments within the provided timeframe. Indeed, in the provided comment period, jointly and individually the eNGOs submitted more than 600 pages of legal and technical arguments and hundreds of supporting documents. Nor have they identified "a party that would have commented or a substantive argument that would have been made had the comment window been longer."[790] Given the extensive pre-existing record and public discourse, and as evidenced by the significant response, the 52-day period was reasonable.

3.2. The Administrator Has Maintained an Open Mind and Exercised Independent Judgment

See eNGO Vehicle Standards Comment 27–33.

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[789] EPA, *Proposed Rule: Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards*, https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-reconsideration-2009-endangerment-finding (last visited Nov. 19, 2025) (EPA held full-day hearings on August 19, 20, 21, and 22).

[790] *Chamber of Com. of the United States v. SEC*, 115 F.4th 740, 755 (6th Cir. 2024).

eNGO Claim: The eNGOs assert that Administrator Zeldin and Secretary Wright have demonstrated an "unalterably closed mind," rendering the rulemaking process a sham.[791] They further argue that the reliance on the DOE's CWG Draft Report constitutes an abdication of the Administrator's duty to exercise independent judgment.[792]

Refutation: This claim is meritless. The Supreme Court has made clear that there is no "open-mindedness test" for rules promulgated under the APA.[793]

The eNGOs also conflate permissible statements of policy direction and opinion with impermissible prejudgment of the specific facts and arguments in a rulemaking record. Even under the now-abrogated open-mindedness test, "[a]dministrators … may hold policy views on questions of law prior to participating in a proceeding."[794] Indeed, it "would eviscerate the proper evolution of policymaking" if "every administrator who has opinions on the correct course of his agency's future actions" were disqualified.[795]

The statements by Administrator Zeldin cited by the eNGOs are expressions of the administration's policy goals and preliminary positions on a matter of significant public interest—an expected and transparent part of the democratic process—not clear and convincing evidence of an unalterably closed mind.[796] Indeed, the very act of issuing a notice of proposed rulemaking and soliciting public comment, as EPA has done, demonstrates a commitment to following the required administrative process and considering all substantive arguments presented in the docket.

Moreover, the eNGOs materially misrepresent the Administrator's March 12, 2025, Wall Street Journal op-ed to manufacture a claim of prejudgment. When the Administrator wrote that EPA "has ended" an electric-vehicle mandate, the context makes plain he was referring to EPA's

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[791] *See* eNGO Vehicle Standards Comment at 27–35.

[792] *Id.* at 35–37.

[793] *Little Sisters of the Poor Saints Peter & Paul Home v. Pennsylvania*, 591 U.S. 657, 685 (2020) ("We decline to evaluate the final rules under the open-mindedness test.").

[794] *C & W Fish Co., Inc. v. Fox, Jr.*, 931 F.2d 1556, 1565 (D.C. Cir. 1991).

[795] *Id.*

[796] *See, e.g.,* eNGO Vehicle Standard Comment at 28 (referring to EPA's greenhouse gas regulations as "EV mandates" and characterizing an announcement of deregulation as "the Greatest Day of Deregulation in American History"); *id.* at 29 (announcing policy intent to "overhaul[] massive rules on the endangerment finding").

distinct and completed action regarding the California waiver—which had been submitted to Congress weeks prior—rather than the federal greenhouse gas standards currently at issue.[797]

The eNGOs' allegations regarding Secretary of Energy Wright and the authors of the DOE CWG Draft Report similarly fall short. As an initial matter, the eNGOs incorrectly portray the CWG Draft Report as the sole basis for this proposal, when in fact it is one piece of technical information within a comprehensive docket that includes the entire record of the 2009 Endangerment Finding and all subsequent vehicle GHG emissions rules. In any event, the CWG expressly states that Secretary Wright "exerted no control over [the report's] conclusions,"[798] and the authors explain they agreed to participate in the working group "on the condition that there would be no editorial oversight by the Secretary, the Department of Energy, or any other government personnel."[799] The authors confirmed that the "condition [was] honored through the process and the writing team … worked with full independence."[800] The eNGOs offer nothing but speculation and innuendo to suggest otherwise. The Secretary's personal opinions on climate science are therefore irrelevant, although like Administrator Zeldin's statements, they wouldn't be disqualifying. The eNGOs' attack on the authors' objectivity fares no better, relying on sources that malign the authors merely for expressing an open mind to climate science.[801] In short, the eNGOs' allegations are nothing more than an ad hominem attack designed to distract from the substance of the working group's analysis.

3.3. EPA Complied with Feasible Consultation and Review Requirements

Replies to eNGO Vehicle Standards Comment IV.D, IV.E, and IV.G (pp. 37–42; 44-75).

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[797] Lee Zeldin, *EPA Ends the Green New Deal*, Wall St. J. (Mar. 12, 2025), https://www.wsj.com/opinion/lee-zeldin-epa-ends-the-green-new-deal-aa81de06.

[798] CWG Draft Report at viii.

[799] *Id.* at x.

[800] *Id.*

[801] *See* Maxine Joselow, *Trump Hires Scientists Who Doubt the Consensus on Climate Change*, N.Y. Times (Jul. 8, 2025), https://www.nytimes.com/2025/07/08/climate/trump-climate-energy-department.html (one author has "a book that calls climate science 'unsettled'"); Scott Waldman, *Trump Team Readies More Attacks On Mainstream Climate Science*, E&E News by Politico (Aug. 18, 2025), https://www.eenews.net/articles/trump-team-readies-more-attacks-on-mainstream-climate-science/) (another author advocates a "'red team vs. blue team' exercise for climate science.").

eNGO Claim: The eNGOs argue that EPA failed to consult with relevant stakeholders,[802] failed to consult with the Science Advisory Board (SAB), violated the Information Quality Act (IQA) by failing to subject its analysis to peer review, and violated the Endangered Species Act (ESA).[803]

Refutation: The assertion that the agency failed to consult with stakeholders misrepresents the rulemaking process. This proposal is, itself, the primary vehicle for stakeholder consultation. By issuing a notice of proposed rulemaking, the agency has invited input from *all* interested parties, including states, tribal organizations, and industry groups. Formal pre-proposal consultations are not mandatory for every rulemaking, and the eNGOs have cited no statutory requirement for such consultations that applies here. The extensive public record and the high level of engagement on this issue ensure that all relevant stakeholder perspectives will be thoroughly considered.

There also is no error in EPA's purported failure to consult with the SAB. New administrations regularly reconstitute advisory boards, including the SAB, to better align with administration priorities. EPA Administrator Regan did so within weeks of being confirmed in March 2021, directing "the release of current members of the SAB" and instructing staff "to reconstitute, restore and create [a] new committee[] to better address EPA priorities."[804] EPA acted consistent with this historical practice and moved promptly to reconstitute the board. In May 2025, EPA sought nominations for new members.[805] On August 14, 2025, EPA posted a list of 165 candidates, providing the public 21 days to comment.[806]

This routine reconstitution means that during the period when EPA was formulating its proposal there was no SAB, making compliance with 42 U.S.C. § 4365(c)(1)'s requirement that EPA make the proposal and supporting information "available to the [SAB]" impossible. In any event,

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[802] eNGO Vehicle Standards Comment at 37.

[803] *Id.* at 44–75

[804] EPA Press Release, *Administrator Regan Directs EPA to Reset Critical Science-Focused Federal Advisory Committees* (Mar. 31, 2021); *see also Young v. EPA*, 633 F. Supp. 3d 181 (D.D.C. 2022) (reconstituted SAB did not violate the Clean Air Act or Federal Advisory Committee Act), *vacated on other grounds* 106 F.4th 56 (D.C. Cir. 2024) (plaintiffs lacked standing).

[805] 90 Fed. Reg. 18,657 (May 1, 2025).

[806] EPA, *May 2025 Nominations for Science Advisory Board (SAB) Membership*, https://sab.epa.gov/ords/sab/r/sab_apex/sab/advisoryactivitydetail?p18_id=2662&clear=18&session=15738094649963 (last visited Nov. 20, 2025); *see also* 90 Fed. Reg. at 18,658 (explaining comment process).

EPA's decision to proceed without waiting for the SAB to be fully reconstituted is a "procedural determination" subject to the review standard of Section 307(d)(8) of the Clean Air Act, which provides for invalidation "only if the [procedural] errors were so serious and related to matters of such central relevance to the rule that there is a substantial likelihood that the rule would have been significantly changed if such errors had not been made."[807] That standard is clearly not met here, where primary bases for EPA's action are a revised legal interpretation and reassessments of technological feasibility and cost—areas in which the SAB has no expertise—and EPA nonetheless consulted with another expert working group and solicited (and received) significant scientific and technical input during the public engagement process.

Similarly, the eNGOs' claims regarding the IQA and peer review are misplaced. The IQA directed the Office of Management and Budget to "issue guidelines … that provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information … disseminated by Federal agencies." Pub. L. No. 106-554 § 515, 114 Stat. 2763, 2763A–153–154 (Dec. 21, 2000). OMB did so in February 2002[808] and issued its most recent bulletin on peer review in 2004.[809] But neither are prescriptive. OMB recommends standards, but underscores that "agencies are granted broad discretion to weigh the benefits and costs of using a particular peer review mechanism for a specific information product," even for "highly influential scientific assessments."[810] For such assessments, OMB directs agencies "to choose a peer review mechanism that is adequate, giving due consideration to the novelty and complexity of the science to be reviewed, the relevance of the information to decision making, the extent of prior peer reviews, and the expected benefits and costs of additional review."[811]

The draft CWG report was subject to adequate and appropriate peer review, including by "a team of anonymous DOE and national lab reviewers,"[812] and its release as part of the public docket invites the most robust form of peer review available: public scrutiny and comment from

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[807] 42 U.S.C. § 7607(d)(8).

[808] 67 Fed. Reg. 8,452 (Feb. 22, 2002).

[809] 70 Fed. Reg. 2,664 (Jan. 14, 2005) (publishing OMB's "Final Information Quality Bulletin for Peer Review" issued on December 16, 2004).

Id. at 2,665.

[810] *Id.* at 2,665.

[811] *Id.* at 2,668.

[812] CWG Draft Report at x.

the entire scientific community, which has actively engaged this process. The IQA is not prescriptive, and does not commit EPA to any particular peer-review process. EPA reasonably exercised its discretion to determine that a targeted review by federal experts, followed by making the draft report public and soliciting feedback, was the most effective way to ensure objectivity and independence, while transparently gathering a wide range of expert opinions.

Finally, the eNGOs' claim that EPA violated the ESA by failing to consult with its sister agencies is meritless. First, the ESA consultation requirement applies only to "discretionary" federal actions.[813] To the extent that EPA's repeals are based on an interpretation of Section 202(a) that forecloses imposing electric-vehicle-forcing GHG emissions regulations and determinations of technological infeasibility and cost inappropriateness, the repeals are not discretionary and EPA has no duty to consult under the ESA. Second, to the extent EPA's repeals are based upon discretionary considerations, consultation is required only if an agency determines that its action "may affect listed species or critical habitat."[814] Repealing new motor vehicle GHG standards does not meaningfully affect the global climate system or alter local air quality or any other local environmental factors,[815] and so does not conceivably affect protected wildlife. Indeed, the eNGOs do not identify any species or habitat threatened by EPA's repeal.

3.4. EPA Properly Considered National Academy of Sciences Studies

Replies to eNGO Vehicle Standards Comment Section VII.B (pp. 95–98).

eNGO Claim: The eNGOs argue that EPA has "failed to explain its departure from numerous National Academies of Science ('NAS') studies that have underpinned its subsequent vehicle GHG standards since the 2009" Endangerment Finding,[816] allegedly in violation of reasoned decisionmaking requirements and Section 307(d)(3) of the Clean Air Act, which requires EPA to "set forth or summarize and provide a reference to any pertinent findings, recommendations, and comments by … the National Academy of Sciences, and, if the proposal differs in any

[813] 50 C.F.R. § 402.03; *see Nat'l Ass'n of Home Builders v. Defs. of Wildlife*, 551 U.S. 644, 665 (2007) (reading "the ESA's requirements [to] come into play only when an action results from the exercise of agency discretion … harmonizes" the ESA and other federal statutes that impose non-discretionary mandates).

[814] 50 C.F.R. § 402.14(a).

[815] *See supra* Section 2.3.

[816] eNGO Vehicle Standards Comment at 96.

important respect from any of these recommendations, an explanation of the reasons for such differences."[817]

Refutation: In previous rulemakings, EPA referenced various NAS reports to support specific or general propositions related to GHGs and the climate. Specifically, the eNGOs state that EPA cited (1) a 1992 NAS report in two rulemakings for the specific proposition that the "less fuel [a vehicle] burns, the less CO_2 it emits in traveling that distance," and (2) various NAS reports, in conjunction with other publications, for the general proposition that GHG emissions from human activities affect the global climate system, which can impact public health and welfare.[818] There was no need for EPA to reference those NAS reports in its notice of proposed rulemaking here, however, because they are generally not pertinent to EPA's rationale and bases for the proposed action. Nor under EPA's primary rationale or separate bases for the standards repeal has the Agency claimed to depart from the propositions for which those studies were cited.

EPA's rulemaking does not rely upon—or call into question—the widely accepted scientific relationship between fuel economy and carbon dioxide emissions for internal-combustion-engine vehicles. Nor are general propositions related to the potential impacts of GHG emissions, writ large, on the *global* climate system relevant to EPA's determinations that GHG emissions from new motor vehicles in the United States "do not endanger public health or welfare through *local or regional* exposure"[819] and that there is no feasible and cost-appropriate emissions-reduction technology that would meaningfully address any climate risk.[820] Because these propositions are not "pertinent" to the reasons EPA has advanced for its proposal, the agency is not required to address the NAS reports under Section 307(d)(3)(C), nor did the agency have any reason to discuss its citations of them in prior rulemakings.

There is also no requirement that EPA "extend the comment period by an additional 60 days" to "allow the public time to review" and comment on a NAS report published after the notice of proposed rulemaking was issued.[821] As long as EPA's final rule is "a 'logical outgrowth' of the

[817] 42 U.S.C. § 7607(d)(3)(C).

[818] eNGO Vehicle Standards Comment at 96–98.

[819] 90 Fed. Reg. at 36,301 (emphasis added).

[820] *Id.* at 36,311–13.

[821] eNGO Vehicle Standards Comment at 98.

proposed rule," the agency is not required to solicit comment on every study published after the proposal.[822]

In any event, the recently published NAS report would not change EPA's analysis for this proposal.[823] The report concludes that the evidence for harm from GHGs is "beyond scientific dispute" and "even stronger" than in 2009.[824] However, a critical review reveals that the NAS Report is largely an echo chamber. It merely repackages the same flawed arguments, relies on the same skewed methodologies, and cites the same overstated studies already presented by the eNGOs in their comments. For example:

- The report claims that simple models "performed extremely well in matching the observed global mean warming," citing Hausfather et al. (2020).[825] But as noted below, that is a significant exaggeration.[826] The study's finding that "14 of 17 model projections were consistent with observations" is based on a metric ("implied TCR") specifically designed to evaluate model physics by correcting for the models' incorrect forcing assumptions. This metric does not mean the models' forecasts were accurate; it means their underlying physics were deemed plausible after accounting for their flawed (and often overstated) projections of future emissions.

- The report claims a trend of "more rapid intensification of hurricanes" citing Kossin et al. (2020).[827] But as noted below, that study's methodology is flawed by its reliance on a short, 39-year timeframe (1979–2017). This period coincides with a shift in the Atlantic Multidecadal Oscillation from a cool, quiet phase (roughly 1970–1990) to a warm, active phase (post-1995). By starting the analysis at a historical low point in Atlantic activity, the study mechanically produces an upward trend that likely reflects natural internal variability rather than a long-term climate signal.[828]

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[822] *City of Stoughton v. EPA*, 858 F.3d 747, 752–53 (D.C. Cir. 1988).

[823] *See* Nat'l Acads. of Scis., Eng'g, & Med., *Effects of Human-Caused Greenhouse Gas Emissions on U.S. Climate, Health, and Welfare* (2025) (NAS Report).

[824] *Id.* at 1, 2.

[825] *Id.* at 18.

[826] *See infra,* A92–93.

[827] NAS Report at 26.

[828] *See infra*, A51, A54

- The report claims storms are "slowing down or stalling," citing Kossin (2018).[829] But as the same author noted in other publications that year and the following year, he could "make no attribution to anthropogenic climate forcing for the stalling or rainfall; the trends could be due to low frequency natural variability."[830]

- The report identifies a human contribution to "intensifying 1- and 5-day precipitation extremes" citing Sun et al. (2021).[831] But as noted below, that study explicitly identifies "relatively well-organized areas where the intensity of extreme precipitation seems to be *weakening*, such as the Canadian Prairies, [and] some parts of the western United States" and notes that trends are "very noisy with widely scattered increasing and decreasing trends" and that its findings are consistent with other work that has concluded "a well-constrained estimate ... is difficult to obtain ... [due to a] weak signal compared to background year-to-year variability."[832]

- The report claims "wildfire intensity has been amplified by climate change," citing Parks & Abatzoglou (2020).[833] But as noted below, that claim is a significant overstatement.[834] Parks and Abatzoglou (2020) explicitly distinguish between the *amount* of land burned at high severity and the *severity* of the fires themselves. The authors state that temporal trends in actual severity metrics—specifically mean fire severity and the proportion of high-severity fire—were "less evident" and statistically insignificant across the majority of the Western U.S. ecoregions studied. The paper finds that the increase in high-severity acreage is largely a function of total area burned increasing, not an indication that fires are burning with greater intensity per acre. Furthermore, the study's methodology relies on a short 32-year observational window starting in 1985. This start date coincides with the end of a distinct cool and wet climatic cycle in the western United States, which naturally suppressed fire activity.

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829 NAS Report at 26.

830 *See infra*, A56 (citing Hall & Kossin (2018)); *see also id.* (citing Kossin (2019) ("The analyses presented here do not constitute a detection and attribution study" and "the explicit relationship between tropical-cyclone translation speed and anthropogenic forcing ... is not yet clear.").

831 NAS Report at 26.

832 *See infra*, A59 (citing Sun et al. (2020)).

833 NAS Report at 34.

834 *See infra*, A70–71 (citing Parks & Abatzoglou (2020)).

- The report claims "whiplash" events (severe floods and droughts) have increased, citing Swain et al. (2025).[835] But as noted below, this study relies on a novel "hydroclimate whiplash" metric, newly introduced by the authors, which measures the rate of transition between wet and dry states using a specific index—not a measure of extreme floods.[836] The same author explicitly states that "the evidence base for systematic increases in flooding is weaker, with suggestions that the overall frequency of floods has decreased regionally."

- The report states droughts are projected to become more frequent and severe, citing Overpeck & Udall (2020).[837] But as noted below, this study relies on the implausible high-end RCP 8.5 emissions scenario.[838]

- The report claims "average tropical storm contributed 7,000 to 11,000 excess deaths" over 15 years, citing Young & Hsiang (2024).[839] But as noted below, that study's extraordinary claim—that mortality effects persist for 14-15 years —is the product of a complex, opaque "deconvolution" statistical model, not a direct observation of fatalities.[840] The authors themselves concede the finding is "surprising" and that they "initially believed that these findings resulted from calculation errors."[841] Attributing 3.2–5.1% of *all* deaths in the contiguous US to this statistically-derived, long-lagged "impulse" peaking nearly six years after the event represents a significant conclusion unsupported by verifiable, empirical evidence of causation or even any vaguely plausible mechanism.[842]

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[835] NAS Report at 35.

[836] *See infra*, A31 (citing Swain et al. (2025)).

[837] NAS Report at 50.

[838] *See infra*, A120.

[839] NAS Report at 51.

[840] *See infra,* A85–86 (citing Young & Hsiang (2024)).

[841] *Id.*

[842] *Id.*

- The report states "pests are expected to reduce crop yield as a result of warming," citing Deutsch (2018).[843] But as noted below, that study's projections of crop loss are model outputs derived from feeding data into a model using what they call "a 'business-as-usual' emissions scenario (RCP 8.5)," an implausible scenario.[844]

Even if EPA erred by failing to address previous NAS reports in the proposal, that failure would not require reversal since the cited NAS reports generally address effects of GHG emissions on the global climate system—not local or regional air pollution—and do not address EPA's conclusions on technological feasibility or cost appropriateness. The reports therefore are not of "central relevance" to EPA's repeals and would not have "significantly changed" EPA's determinations, falling short of the applicable standard for invalidation under Section 307(d)(8).[845]

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843 NAS Report at 61.

844 *See infra*, A126.

845 42 U.S.C. § 7607(d)(8) (a "court may invalidate the rule only if the [procedural] errors were so serious and related to matters of such central relevance to the rule that there is a substantial likelihood that the rule would have been significantly changed if such errors had not been made").

CONCLUSION

Based on the analysis provided in these comments, EPA may repeal the 2009 Endangerment Finding. The administrative record demonstrates that Section 202(a) was designed to address local and regional air pollution, not to regulate global atmospheric concentrations of well-mixed greenhouse gases. As detailed above, the contribution of new U.S. motor vehicles to global climate change is scientifically undetectable and *de minimis*. Furthermore, the scientific evidence relied upon by the eNGOs to allege imminent catastrophe is riddled with uncertainties, relies on implausible emissions scenarios, and fails to account for the mitigating effects of human adaptation. Consequently, EPA's judgment that these emissions do not contribute to air pollution which may reasonably be anticipated to endanger public health or welfare is well-supported by both the statute and the scientific record.

Independently, EPA must repeal the existing GHG standards for model year 2027 and later new motor vehicles on multiple independent bases. Even if the Endangerment Finding were to remain, these standards represent an unlawful exercise of agency power. As explained above, the standards function as a *de facto* electric-vehicle mandate, triggering the major-questions doctrine under *West Virginia v. EPA*. Congress has not clearly authorized EPA to restructure the American transportation sector or to force a technological transition from internal-combustion engines to electric vehicles. Moreover, the factual record confirms that these standards are not technologically feasible given the insurmountable constraints on critical mineral supply chains, the lack of necessary charging infrastructure, and the faltering consumer demand for electric vehicles. Repealing these standards on multiple independent bases will provide a more durable regulatory framework.

Finally, recognizing the litigation risks inherent in such a significant regulatory course correction, EPA should also, as a severable alternative, issue replacement exercising its "extraordinarily broad" discretion recognized in *California v. EPA*.[846] In that decision, the D.C. Circuit confirmed that the Clean Air Act does not prescribe a determinate standard for setting standards or require a technology-forcing approach. Accordingly, EPA should promulgate an interim final rule while accepting comments for alternative standards that would spring into effect should the repeal of the Endangerment Finding be overturned in court. That rule should establish separate regulatory categories for internal-combustion engine vehicles, eliminate averaging, and set emissions standards achievable by the current fleet.

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[846] 940 F.3d 1342 (D.C. Cir. 2019)

The current practice of averaging allows manufacturers to mask the emissions of liquid-fuel vehicles with the theoretical "zero" emissions of electric vehicles, creating a hidden cross-subsidy that distorts the market, mandates fuel switching, and shifts emissions to the power sector. By separating the classes and eliminating averaging, EPA would ensure that "requisite technology" means technology applied *to* the regulated engine to improve its efficiency, rather than technology intended to *replace* the engine entirely. This interim rule should set standards for internal-combustion vehicles that are achievable by the current fleet without reliance on electrification credits. Such an approach would align the regulations with the plain text of Section 202(a)(2), allowing for genuine technological improvements to internal-combustion engines while respecting consumer choice and economic reality.

By finalizing these actions, EPA will restore the rule of law, protect the American automotive industry from unworkable mandates, and return the agency to its proper statutory role.

APPENDIX

This appendix provides a non-exhaustive catalog of significant scientific and technical misrepresentations identified during a review of Section VI of the eNGO Endangerment Finding Comment. Given the sheer volume of material submitted, this table represents a first pass review rather than a comprehensive audit of every claim. However, the high density of errors, incorrect citations, and reliance on flawed or irrelevant sources uncovered in this preliminary review suggests a systemic lack of rigor in the eNGOs' presentation of the scientific evidence. The discrepancies documented below furthermore demonstrate a consistent and concerning pattern: the eNGOs claim certainty where their own sources acknowledge doubt, and claim causality where their sources find only correlation.

As recounted in the introduction, below are a few highlights of misrepresentations found in the eNGOs' submission.

1. **The Faux Denunciation of RCP 8.5.** The eNGOs claim RCP 8.5 is not treated as a "business as usual" scenario and was never intended it as such.[847] But thousands of studies *have* explicitly labeled and used RCP 8.5 as the "business-as-usual" or default baseline scenario, including more than a dozen of the studies cited by the eNGOs in this very comment. Examples include studies projecting effects on nutrition (Smith & Myers (2018) describing RCP 8.5 as "the scenario most consistent with our current trajectory"), carbon uptake (Green et al. (2019) describing it as "business-as-usual"), ecosystem stability (Canteri et al. (2025) calling it a "business-as-usual emission-intensive scenario"), drought (Udall & Overpeck (2017) calling it a business-as-usual scenario), permafrost (Schuur et al. (2022) calling it a business-as-usual scenario), crop losses (Deutsch et al. (2018) calling it a business-as-usual scenario), economic growth (Kalkuhl & Wenz (2020) calling it a business-as-usual

[847] eNGO Endangerment Comment at 121 (citing Riahi et al., *RCP 8.5—A Scenario of Comparatively High Greenhouse Gas Emissions*, 109 Climatic Change 33 (2011), https://doi.org/10.1007/s10584-011-0149-y).

scenario), and many more.[848] The exaggerated damages from this highly implausible scenario make up most of the worst outcomes attributed to GHG emissions.

2. **The "20 Million" Flood Exaggeration.** The eNGOs claim "20 million coastal U.S. residents could be at risk of inundation due to sea level rise and/or storm surge by 2030."[849] This figure is a fabrication derived from a daisy-chain of misinterpretations. The eNGOs claim derives from a single sentence in the introduction to a 2023 study (Best et al.), which in turn cites a 2011 study (Curtis & Schneider).[850] A review of that primary source reveals that the authors did not count people living in flood zones. Instead, they summed the entire population of whole counties (like Miami-Dade, FL) if *any* part of the county might be touched by water. Worse, to generate this risk map, the authors used a 1-meter sea-level rise model because they lacked maps for smaller increments. The authors explicitly admitted that realistic rise by 2030 is only 4.2 to 13.9 centimeters and that "overestimating the degree of inundation in this manner may introduce error into [their] analysis," and they caution that their "results should be considered in light of this bias." The eNGOs ignore this caution, however, and

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[848] Smith & Myers, *Impact of Anthropogenic CO2 Emissions on Global Human Nutrition*, 8 Nature Climate Change 834 (2018), https://doi.org/10.1038/s41558-018-0253-3; Green et al., *Large Influence of Soil Moisture on Long-Term Terrestrial Carbon Uptake*, 565 Nature 476 (2019), https://doi.org/10.1038/s41586-018-0848-x (relying exclusively on RCP 8.5, mischaracterized as "business-as-usual"); Canteri et al., *Mismatch in Reindeer Resilience to Past and Future Warming Signals Ongoing Declines*, 11 Sci. Advances eado3354 (2025), https://doi.org/10.1126/sciadv.adu0175; Udall & Overpeck, *The Twenty-First Century Colorado River Hot Drought and Implications for the Future*, 53 Water Res. Rsch. 2404 (2017), https://doi.org/10.1002/2016WR019638; Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://epic.awi.de/id/eprint/57387/1/Schuur_2022.pdf; Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466; Kalkuhl & Wenz, *The Impact of Climate Change on Economic Growth and Development*, 127 World Dev. 104749 (2020), https://econpapers.repec.org/RePEc:eee:jeeman:v:103:y:2020:i:c:s0095069620300838. For further examples, see the Appendix at A41.

[849] eNGO Endangerment Comment at 114.

[850] Best et al., *Demographics and Risk of Isolation Due to Sea Level Rise in the United States*, 14 Nat. Commc'ns 7904 (2023), https://doi.org/10.1038/s41467-023-43835-6 (erratum 14 Nat. Commc'ns 8305) (citing Curtis & Schneider, *Understanding the Demographic Implications of Climate Change: Estimates of Localized Population Predictions Under Future Scenarios of Sea-Level Rise*, 33 Population & Env't 28 (2011), https://doi.org/10.1007/s11111-011-0136-2).

effectively claim that the entire population of Miami-Dade County is "at risk of inundation" by 2030 based on a map showing sea levels 7 to 24 times higher than the study's own projections, which even then barely touch urbanized areas of the County.

3. **The Solar Contradiction.** The eNGOs claim that "[w]hile solar radiation has slightly increased during the 20th century, its contribution to global warming is small compared to the contribution from greenhouse gases."[851] To support this claim, the eNGOs cite Ziskin & Shaviv (2012) and Meehl et al. (2004).[852] This is baffling, because Ziskin & Shaviv is famous for arguing the exact opposite. While Ziskin & Shaviv find that anthropogenic emissions account for approximately 60% of warming, they notably conclude that "40% of the 20th century global warming" is attributable to "the sun alone"—a figure the authors describe as "much larger than can be expected" by standard models, like those used in Meehl et al. (2004). Indeed, the study's error margins reveal that the maximum plausible solar contribution (0.34 °C) exceeds the minimum plausible anthropogenic contribution (0.31 °C). In sum, the eNGOs' primary support for their claim shows not that solar contribution to global warming is "small," but that it is a substantial contributor that is typically underestimated by standard climate models.

4. **The Zombie Hurricane Mortality.** The eNGOs claim that "mortality effects for each hurricane can persist for 15 years."[853] But the cited study (Young & Hsiang) uses a statistical model to identify "indirect" deaths that the authors admit yield a "surprising" total count orders of magnitude higher than official records.[854] The authors concede they "initially believed that these findings resulted from calculation errors" and cannot empirically identify a causal pathway for these deaths, instead attributing them to "cascades" of unspecified "indirect effects." Indeed, 99% of the infant deaths attributed to the storm

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[851] eNGO Endangerment Comment at 135–36.

[852] Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Research 762 (2012); Meehl et al. *Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate*, 17 Journal of Climate 3721 (2004).

[853] eNGO Endangerment Comment at 126.

[854] Young & Hsiang, *Mortality Caused by Tropical Cyclones in the United States*, 635 Nature 121 (2024), https://doi.org/10.1038/s41586-024-07945-5.

"occur more than 21 months" after the storm, meaning those "infants were not conceived prior to landfall," an implausible result that the authors speculate might result from broad, again unspecified, post-storm societal changes. The eNGOs rely on these unexplained statistical correlations as robust proof of endangerment.

5. **The Snowpack Reversal.** The eNGOs claim that "[s]nowpack is declining across the western U.S.."[855] This is a misreading of the cited study. Musselman et al. (2021) actually found that Snow Water Equivalent—the standard metric for snowpack magnitude—*did not decline at approximately 88% of stations* in western North America analyzed.[856] Even when limited to western U.S. stations with longer records, nearly 67% of stations showed no decline. The study distinguishes between winter melt trends (which are increasing) and snowpack magnitude (which is largely stable), noting that Snow Water Equivalent trends are driven primarily by precipitation variability rather than warming. Citing this study to claim a uniform decline in snowpack depth contradicts the study's own data.

6. **The Fishery "Collapse."** The eNGOs claim that climate change driven marine heatwaves "have led to the collapse of local fisheries along the west coast of North America and the east coast of Australia."[857] But the cited study (Frölicher & Laufkötter) does not state that fisheries in the West Coast or Australia "collapsed."[858] Instead it refers to the **"**closing**"** of fisheries—a regulatory management tool, not a biological extinction event. Furthermore, the study explicitly attributes the specific heatwaves to natural phenomena: "predominant La Niña conditions" for Western Australia and "strong positive sea level pressure anomalies" for the Northeast Pacific (the "warm blob"). The eNGOs frame a regulatory closure caused by natural climate variability as a biological "collapse" caused by fossil fuels.

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[855] eNGO Endangerment Comment at 113.

[856] Musselman et al., *Winter Melt Trends Portend Widespread Declines in Snow Water Resources*, 11 Nature Climate Change 418 (2021), https://doi.org/10.1038/s41558-021-01014-9.

[857] eNGO Endangerment Comment at 111.

[858] Frölicher & Laufkötter, *Emerging Risks from Marine Heat Waves*, 9 Nat. Commc'ns 650 (2018), https://doi.org/10.1038/s41467-018-03163-6.

7. **Hallucinated Studies.** The eNGOs cite a study purportedly titled "Mortality Risk from Climate-driven Wildfire Smoke" by Carleton et al. to support claims of "macroeconomic damages as approximately six times larger than previously estimated" and "large health and labor losses overlooked by aggregate growth regressions."[859] economic damages. This appears to be a hallucination. No such study by Carleton—or anyone else for that matter—appears to exist with that title. And the DOI link provided by the eNGOs in their footnote directs the reader to a completely unrelated paper titled "Misdemeanor Prosecution." While there is an article by Carleton in the same journal discussing global mortality,[860] neither the words "wildfire" nor "smoke" appear and the only time the word "six" appears is comparing projected climate fatalities in 2100—again using RCP 8.5.This suggests the eNGOs did not read, and perhaps did not even locate, the evidence they claim supports their economic arguments.

The eNGOs also repeatedly cite to a "Conference Report: Attribution Science and Climate Law" by Jessica Wentz for claims varying from increased "death, respiratory disease, cardiac events, and negative birth outcomes" from air pollution,[861] to "increase[d] severe precipitation, storm, and flooding events,"[862] and even increases in the "risk and potential severity of wildfires,"[863] while pointing to various studies that report purportedly cited in support. But that report, while real, says absolutely nothing about those claims and cites none of the studies the eNGOs claim it does.

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[859] eNGO Endangerment Comment at 151.

[860] Carelton et al., Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits, 137 Quarterly J. Econ. 2037 (2022), https://doi.org/10.1093/qje/qjac020.

[861] *Id.* at 166.

[862] *Id.* at 168.

[863] *Id.*

A more detailed breakdown of the eNGOs misrepresentations and errors follows.

1. SECTION VI.A. "CURRENT SCIENTIFIC EVIDENCE OVERWHELMINGLY SUPPORTS EPA'S ENDANGERMENT FINDING"

Claim	Analysis
eNGO Endangerment Comment 100: Increased concentrations of greenhouse gases in the atmosphere caused by human activity have led to increases in average temperatures and heatwaves on land and in the ocean, to the melting of glaciers and Arctic sea ice, to increases in sea level and coastal flooding, to the drying of parts of the land surface and enhanced conditions for wildfire, to more intense, heavy rainfall events that can lead to flooding, to shifts in weather patterns that can lead to lower crop yields and nutritional value, and to worsening air quality	**Misrepresentation:** The commenters' proposition is a laundry list of assorted negative climate impacts, yet the supporting citation is to the entire 90-page Technical Summary (pp. 37–118). This citation dump is a diversionary tactic that makes it impossible to verify which specific claim is supported by which evidence. Improper citation allows the commenters to obscure a fundamental error: their proposition conflates distinct categories of information. It mixes (a) straightforward observations (e.g., "increases in average temperatures"), (b) complex, model-dependent statistical attributions (e.g., "led to ... lower crop yields"), and (c) speculative future projections (e.g., "increase in the spread of pests and diseases"). By presenting this mixture in the past tense ("have led to"), the commenters misrepresent highly uncertain attributions and speculative model outputs as established, historical facts. The report itself relies on a source that contains one-sided framing and omits critical context. The Technical Summary is not a neutral scientific document, but a curated summary of negative impacts designed to support a policy agenda. The proposition, like the source, presents a one-sided list of harms while systematically minimizing or omitting contrary findings. For example, the proposition claims GHGs have led to "lower crop yields and nutritional value." This ignores the dominant, empirically observed impact of increased atmospheric on agriculture: the global-scale fertilization effect, which has significantly increased crop yields, forest greening, and food security. The report only mentions this critical positive effect (e.g., TS.B.1.5) to immediately dismiss it as being "increasingly limited" by warming, a speculative claim that contradicts decades of agricultural data. A

and an increase in the spread of pests and diseases.[864]	balanced assessment would weigh alleged harms against documented benefits; the commenters' proposition, by relying on this one-sided source, fails to do so. The cited source also relies extensively on mischaracterized climate scenarios. The most alarming claims summarized in the cited report—and implicitly referenced by the commenters' proposition—are predicated on high-end, "worst-case" emissions scenarios (e.g., RCP 8.5 or SSP5-8.5). For instance, the report's most severe projections for "deadly heat", agricultural suitability, and disease-vector spread are all explicitly tied *only* to these extreme and implausible scenarios. These scenarios are now widely understood in the scientific literature to be low-probability, and high-impact shock scenarios, not "business-as-usual" or likely outcomes. Reliance on these exaggerated scenarios as a baseline for risk assessment constitutes a fundamental methodological flaw that invalidates their use for policy decisions. **Out of Scope:** Further, many of the worst harms attributed to climate change in the study are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 100: Climate change made the 2021	**Flawed Study (General Weaknesses of Climate Attribution Studies):** The commenters' reliance on Leach et al. (2024) glosses over the fundamentally speculative nature of extreme event attribution as a scientific field. Such studies do not—and cannot—prove that human influence caused a specific weather event.

[864] IPCC AR6 WGII, at 37–118 (Technical Summary) (Pörtner et al.).

Pacific Northwest heatwave eight times more likely.[865]	• *Reliance on Unverifiable Counterfactuals:* Attribution studies attempt to quantify a change in probability by comparing the real world to a fictional counterfactual world that never existed—one with no human influence[1]. The validity of any finding rests entirely on the assumption that the chosen model can accurately simulate this fictional baseline, an assumption that is impossible to verify. • *Sensitivity to Event Definition:* The study concedes that the "event definition" is a "key methodological decision" and that past work shows it has a significant "impact on the quantitative outcome." The 8 times figure cited by commenters is a product of the authors' specific choice of a geographic area (45-52 N, 119-123 W) and time period. Even slight changes in this definition could produce a different, less alarming result. • *Conflating Probability with Causation:* These studies produce probabilities, not proof of causation. A finding that an event was 8 times more likely is a statistical estimate, yet it is often misrepresented in policy discourse as a definitive causal link, implying a level of certainty that the science itself does not support. Beyond the general problems with attribution, this specific study's methodology is marked by significant limitations, assumptions, and omissions, which the authors themselves acknowledge. • *Reliance on a Single, Uncorroborated Model:* The study's entire conclusion is derived from a *single model*—the ECMWF ensemble prediction system. The authors explicitly

[865] Leach et al., *Heatwave Attribution Based on Reliable Operational Weather Forecasts*, 15 Nat. Commc'ns 4530 (2024), https://doi.org/10.1038/s41467-024-48280-7.

	state: "our use of a single model is a limitation here." They concede that "another key development will be to apply this approach within alternative forecast models to check the sensitivity and consistency of attribution results." As it stands, the 8 times figure is a model-dependent artifact, uncorroborated by any other system. • *Findings are Scaled Extrapolations, Not Direct Results:* The 8 times figure is also not a direct output of the model. The authors admit their counterfactual simulation was incomplete. They only perturbed the *ocean and sea ice* and CO_2; they did not alter the land surface or the atmosphere in the initial conditions. Because of these limitations, the authors expected the model would produce "smaller estimated attributable changes." To correct for this expected result, the authors decided to statistically scale their results based on an assumed relationship. As a result, the study's headline claim is not even a direct result of an unverified mode, but a statistical extrapolation based on an incomplete simulation and an assumed linear scaling factor. • *Profound, Acknowledged Uncertainty:* Even the authors of the study note a massive 25-fold uncertainty range of between 2 and 50. This enormous range, which the commenters conveniently omit, further underscores the highly speculative nature of the attribution.
eNGO Endangerment Comment 100–01: Climate change has fostered more dangerous conditions for wildfires across the western United States, exposing Americans	**Flawed Study (Speculative Attribution Methodology):** The primary claim of cited study, Abatzoglou & Williams (2016), is that anthropogenic climate change (ACC) "nearly doubl[es] the forest fire area." But this attribution is not an observed fact but the result of a highly speculative, model-dependent statistical exercise. This methodology suffers from two critical weaknesses.

to unhealthy air associated with heart and lung disease deaths.[866]	• *Reliance on a Model-Derived Counterfactual:* The study's conclusion rests on comparing the real world to a fictional counterfactual world without climate change. The authors create this fictional world by first calculating an "ACC signal," which is defined as the average smoothed trend from 27 CMIP5 climate models. They then simply subtract this model-derived signal from the real-world observational data. The result is thus entirely dependent on the assumption that the CMIP5 model-mean is a true and accurate representation of the isolated ACC signal. As discussed above, *see supra* Response to Endangerment Comment, Sec. 3.1.2, many models in the CMIP suite run "hot," making this an unreliable assumption. • *Systematic Omission of Key Variables:* The attribution is also incomplete and biased by design. The authors only subtract the ACC signal for temperature and vapor pressure. They explicitly ignore the anthropogenic influence on other critical variables like precipitation, wind, or solar radiation. The study also acknowledges it does not account for numerous confounding factors, including fire suppression policies, changes in fuel loads, drought-induced vegetation mortality, or insect outbreaks —all of which the authors concede "have likely added to the area burned."
eNGO Endangerment Comment 101: Climate-induced wildfire smoke will cause an additional	**Flawed Study (Methodological Limitations / Uncertainty):** Qiu et al. (2025) has significant (and admitted) methodological weaknesses. The study's conclusions are the product of a multi-step modeling chain, each ultimately multiplying uncertainty, and relies on pessimistic climate assumptions that are not representative of a "most likely" future.

[866] Abatzoglou & Williams, *Impact of Anthropogenic Climate Change on Wildfire Across Western US Forests*, 113 Proc. Nat'l Acad. Scis. 11,770 (2016), https://doi.org/10.1073/pnas.1607171113.

26,500 to 30,040 annual excess deaths by mid-century.[867]	The study's headline-grabbing mortality figure is presented with a false sense of precision. The authors' modeling chain involves three distinct steps (climate-to-fire, fire-to-smoke, and smoke-to-mortality). In their own uncertainty analysis, the authors concede that the final step—the "smoke-mortality exposure-response function" used to calculate the 26,500-30,040 death toll—is the largest source of uncertainty in the entire analysis. The study's high mortality number is also significantly inflated by its "distributed lag" model, which assumes that smoke exposure continues to cause excess deaths for at least a full year after the smoke event occurs. The authors admit that "Estimating the long-term health impacts of smoke exposure is challenging because extreme smoke pollution events have only emerged in recent years." This speculative assumption is a primary driver of the study's high damage estimate. The study's projections also rest on an isolated, climate-only scenario. The authors explicitly state they "did not attempt to model the many non-climate factors that contribute to wildfires, including ... housing development, and fire suppression efforts." The study assumes a business-as-usual scenario in which human adaptation and land management do not improve for the next 30 years, despite also acknowledging that "land management policies could substantially ... decrease future wildfire and smoke levels."
eNGO Endangerment Comment 101: Extreme heat exposure causes thousands of deaths, 100,000 emergency room visits, and	**Misrepresentation (Misleading Omission and Conflation):** The commenters' claim is misleading. It strongly implies a direct and quantifiable link between *climate change* and these specific costs. The cited studies, however, do not support this attribution. Instead, the report just looks at the costs associated with extreme heat generally. Extreme heat existed before

[867] Qiu et al., *Wildfire Smoke Exposure and Mortality Burden in the US Under Climate Change*, Nature (forthcoming 2025), https://doi.org/10.1038/s41586-025-09611-w.

approximately $100 billion in lost labor annually.[868]	climate change and will exist without any climate change mitigation efforts. The cited studies do not disentangle these differences. Furthermore, the claim regarding "thousands of deaths" is contradicted by U.S. vital statistics, which show that coroner-verified heat-related deaths number less than 1,000 per year, not "thousands."[869] From 2000 to 2024, U.S. heat-related deaths (including deaths where heat was merely listed as a contributing factor, not a cause) are documented by the CDC's data at about 2.3 per million U.S. residents, or about 800 deaths per year.[870] Even if that could be an undercount, other attempts to second-guess those numbers through epidemiological correlations between heat and excess mortality have estimated approximately 1,300 excess deaths per year, not "thousands."[871] **Flawed Study (Unreliable Economic Modeling):** The claim of $100 billion in lost productivity is based on an unpublished consultant white paper (Adrienne Arsht-Rockefeller) that utilizes a demonstrably flawed methodology. The paper assumes that worker productivity declines linearly starting at a Wet Bulb Globe Temperature (WBGT) of 25 °C and **drops to**

[868] Howard et al., *Trends of Heat-Related Deaths in the US, 1999-2023*, 332 JAMA 1203 (2024), https://doi.org/10.1001/jama.2024.16386; Vaidyanathan et al., *Heat-Related Emergency Department Visits - United States, May-September 2023*, 73 Morbidity & Mortality Wkly. Rep. 324 (2024), https://doi.org/10.15585/mmwr.mm7315a1; Adrienne Arsht-Rockefeller Found. Resilience Ctr., Extreme Heat: The Economic and Social Consequences for the United States (2021), https://www.atlanticcouncil.org/wp-content/uploads/2021/08/Extreme-Heat-Report-2021.pdf.

[869] *See* Khatana et al., *Association of Extreme Heat with All-Cause Mortality in the Contiguous US, 2008-2017*, 5 JAMA Netw. Open e2212957 (2022), https://doi.org/10.1001/jamanetworkopen.2022.12957.

[870] *Climate Change Indicators: Heat-Related Deaths*, EPA, https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths (last visited Nov. 20, 2025).

[871] *Id.*

	zero productivity at 36.2 °C (97.2 °F). This assumption contradicts reality; outdoor work in sectors such as agriculture and construction continues in temperatures exceeding 97°F throughout the southern United States. Furthermore, the linear relationship used in the white paper ignores acclimatization and mitigation measures, leading to a significant overestimation of economic losses.
eNGO Endangerment Comment 101–102: Sea level rise is worsening flooding, causing some U.S. coastal communities to have to relocate and others to spend billions of dollars to remain in place.[872]	**Misrepresentation (Misleading Omission of Confounding Drivers):** The commenters attribute worsening flooding, relocation, and adaptation spending solely to "sea level rise [SLR]." This misrepresents the cited IPCC report, Oppenheimer et al., (2019), by omitting critical findings regarding the actual drivers of coastal risk. The IPCC explicitly states (with 'high confidence') that the "attribution of observed changes and associated risk to SLR remains challenging." The commenters ignore the IPCC's finding (with 'very high confidence') that "Non-climatic anthropogenic drivers, including recent and historical demographic and settlement trends and anthropogenic subsidence, have played an important role in increasing low-lying coastal communities' exposure and vulnerability." The report emphasizes that in many areas, these local, human-induced changes "can be rapid and modify coastlines over short periods of time, outpacing the effects of SLR." Furthermore, the IPCC finds that "Subsidence caused by human activities is currently the most important cause of relative sea level rise (RSL) change in many delta regions" and that anthropogenic subsidence can "exceed those of climate-induced SLR by an order of magnitude." By omitting this

[872] Shrestha et al., *A Review of Climate Change-Induced Flood Impacts and Adaptation of Coastal Infrastructure Systems in the United States*, 3 Env't Rsch.: Infrastructure & Sustainability 042001 (2023), https://doi.org/10.1088/2634-4505/ad097b; Oppenheimer et al., *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*, in IPCC Special Report on the Ocean and Cryosphere in a Changing Climate 321 (Pörtner et al. eds., 2019), https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/.

	essential context, the commenters improperly attribute impacts driven primarily by local subsidence and development choices entirely to global climate change. **Misrepresentation (Exaggeration / Overclaiming):** The commenters' specific claims that sea level rise is "causing some U.S. coastal communities to have to relocate" and others to "spend billions of dollars to remain in place" are significant exaggerations of the cited literature. Regarding relocation, the IPCC report offers only a highly qualified observation that "Retreat is observed but largely restricted to small communities." Shrestha et al. (2023), a literature review focused on infrastructure, provides no empirical evidence of forced community relocation due to sea level rise. Regarding spending, the commenters mischaracterize the economic data. Shrestha et al. (2023) cite billion-dollar figures related to damages from specific extreme weather events (e.g., Hurricane Katrina, Hurricane Sandy), not expenditures for ongoing climate adaptation. The study mentions future global adaptation costs could be "$150-$450 billion per year" but frames this as a projection rather than current spending. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. Furthermore, the study does not indicate if these damage figures were normalized for increased wealth and exposure. The projections of future risk synthesized in both cited sources are heavily anchored by high-end, worst-case emissions scenarios. The IPCC report's highest projections (e.g., 1.10m SLR by 2100) and the assessment that "almost high to very high risks are expected" are explicitly contingent on the RCP 8.5 pathway. Similarly, Shrestha et al. (2023) highlights extreme

	projections for the U.S. (up to 2.2m by 2100) derived from SSP5-8.5. These extreme scenarios do represent the magnitude of likely impacts.
eNGO Endangerment Comment 104: In the U.S., higher temperatures negatively affect pregnancy and birth outcomes and mental health, and lead to increased hospitalizations related to cardiovascular disease, diabetes, respiratory outcomes and other increases in morbidity.[873]	**Flawed Study (False Certainty and Reliance on Mischaracterized Scenarios):** The commenters rely heavily on Chapter 15 of the Fifth National Climate Assessment (NCA5). This assessment report suffers from methodological weaknesses that undermine its utility for specific regulatory determinations. The NCA5 frequently employs definitive language that minimizes the profound uncertainties inherent in attributing specific health outcomes to climate change. For example, the NCA5 characterizes complex outcomes, including impacts on mental and spiritual health, as an "established fact" causally linked to climate change. This stated certainty is contradicted by the report's own "Traceable Accounts," which acknowledge in some instances the "difficulties in isolating the impact of climate change from other significant environmental and human-driven changes" and "full range of mental health impacts of climate change and climate-related events is not yet fully understood." Furthermore, when the assessment projects future risks, it selectively utilizes extreme emissions scenarios. For instance, its projection regarding the spread of Valley Fever relies explicitly on the RCP 8.5 scenario. Relying on this scenario exaggerates potential future impacts.
eNGO Endangerment Comment 106–107: Addition of carbon	**Flawed Methodology (Improper Data):** The core claim—that a modern trend reverses a 50-million-year trend—is based on a methodologically invalid comparison. This argument, which

[873] Hayden et al., Ch. 15: *Human Health*, *in* Fifth National Climate Assessment (Crimmins et al. eds., 2023), https://repository.library.noaa.gov/view/noaa/61592..

dioxide to the ocean is reducing the pH (i.e., making it more acidic), reversing trends of increasing pH that have been in place over the last 50 million years.[874]	is synthesized in the Gulev et al. (2021) IPCC AR6 chapter, grafts a high-resolution, modern instrumental record onto a low-resolution, high-uncertainty paleo-proxy record. A 100-year instrumental reading and a 50-million-year proxy reconstruction (derived from sources like boron isotopes in foraminifera) are not comparable in their resolution or uncertainty. Gulev et al. (2021) itself notes the 50-million-year trend is an area of emerging understanding and that even in the last 2 million years, the assessment that "surface ocean pH as low as recent times is uncommon" can only be claimed "medium confidence." Attributing a short-term, 100-year change as a definitive reversal is a statistical overreach that conflates high-frequency variability with a long-term trend. **Flawed Methodology (Reliance on Mischaracterized Scenarios):** Furthermore, projections of future pH decline, such as those in Jiang et al. (2019), are not based on likely outcomes but on extreme, worst-case scenarios. The study's very negative conclusions regarding future acidification stem from reliance on the high-end RCP 8.5 emissions scenario, which it repeatedly and incorrectly labels the "business-as-usual scenario." RCP 8.5 is now widely understood to be an implausible, high-end pathway, not a likely future. The study notes that under RCP 4.5, surface ocean pH decreases at a much slower rate. Further, the study's projections are further limited by their reliance on the output of a single climate model (the GFDL-ESM2M), rather than a multi-model ensemble, making its results unrepresentative of the full range of scientific uncertainty.
eNGO Endangerment Comment 107: These trends in temperature,	**Flawed Study (Conclusion Overreach and Failure to Normalize for Confounding Variables):** The cited source makes attribution claims that are methodologically questionable.

[874] IPCC AR6 WGI (Ch. 2: Changing State of the Climate System) (Gulev et al.); Jiang et al., *Surface Ocean pH and Buffer Capacity: Past, Present and Future*, 6 Sci. Reps. 38437 (2019); Halevy & Bachan, *The Geologic History of Seawater pH*, 355 Science 1069 (2017).

oxygen, and pH cause displacement and disruption to ocean ecosystems and to the food webs that people depend on.[875]	For instance, the Technical Summary claims "high confidence" that "Ocean warming has decreased sustainable yields of some wild fish populations by 4.1% between 1930 and 2010." But this fails to properly account for the primary, non-climatic drivers of declining fish yields during that specific period. The impacts of the massive, global expansion of industrial fishing, technological advancements like factory trawlers, widespread pollution, and coastal habitat destruction are far more significant and direct drivers of yield declines than the modest warming observed over the same timeframe. Attributing a specific percentage of this decline solely to ocean warming minimizes these larger, confounding variables and overstates the certainty of climate attribution science.
eNGO Endangerment Comment 107: Greenhouse gases in the atmosphere have led to reduction in land glaciers and Arctic sea ice.[876]	**Misrepresentation (Misleading Omission / Overclaiming):** The commenters conflate two distinct climate metrics (land glaciers and Arctic sea ice) and omit critical context from their sources. This creates a misleading impression of uniform, long-term certainty that is not present in the cited studies. While the proposition implies a general, long-standing causality, the IPCC's only high confidence findings are explicitly limited to the recent satellite era. For example, very likely attribution for Arctic sea ice loss is cited "since the late 1970s" and for glacier retreat "since the 1990s." While the report states that it is "very likely" that human influence is the main driver of observed retreat, it simultaneously assigns only medium confidence to the claim that the observed glacier retreat is "unprecedented in at least the last

[875] IPCC AR6 WGII, at 48 (Technical Summary) (Pörtner et al.); Brierley & Kingsford, *Impacts of Climate Change on Marine Organisms and Ecosystems*, 19 Current Biology R602 (2009), https://doi.org/10.1016/j.cub.2009.05.046..

[876] IPCC AR6 WGI, at 76 (Technical Summary) (Arias et al.); Brennan et al., *Arctic Sea-Ice Variability During the Instrumental Era*, 47 Geophysical Rsch. Letters e2019GL086843 (2020), https://doi.org/10.1029/2019gl086843.

	2,000 years," undermining confidence in any specific attribution of glacier and sea ice reductions directly to GHGs. Brennan et al. (2020) further complicates a simplistic greenhouse gas attribution. That study's main objective is to reconstruct Arctic sea-ice extent before the satellite era. In doing so, it highlights a massive, naturally driven sea-ice decline during the "early 20th-century warming (1910-1940)," well before significant greenhouse gas forcing. While the authors conclude that the satellite-era (post-1979) trend is greater and thus implies anthropogenic driving, the study's core data reinforces that large-scale sea-ice reduction is a feature of natural variability. The commenters cite the study as support for a greenhouse gas-driven claim, but that study's main finding is a documentation of a similar, non-GHG-driven event. **Misrepresentation (Omission of Context regarding Natural Variability):** The commenters cite Brennan et al. (2020) to imply that recent sea-ice reductions are exclusively anthropogenic. However, they omit the study's critical finding regarding natural variability. Brennan et al. explicitly document a large, naturally driven Arctic sea-ice decline during the early 20th century (1910–1940), a period prior to significant greenhouse gas forcing. By focusing only on the recent satellite era, the commenters obscure the study's evidence that large-scale reduction in sea ice is a recurrent feature of natural climate variability, not solely a result of GHG emissions. **Out of Scope:** Further, many of the worst harms attributed to climate change in the studies are experienced outside of the United States or will occur only long in the future. As noted above, see supra, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally

	to the useful life of the vehicle and geographically to the United States. Retreats of Arctic sea ice will occur primarily in internationa/high-seas areas. While glaciers exist in the U.S., the IPCC Technical Summary refers to "global-scale" glacier changes and to specific non-U.S. regions like the Andes, Alps, and Himalayas. The claims of sea level rise are associated with long-term projections, and the Technical Summary focuses heavily on projections "by 2100."
eNGO Endangerment Comment 107: Continued greenhouse gas emissions "greatly increase the likelihood of potentially irreversible changes in the climate system," including ice sheet loss causing global sea level rise.[877]	**Flawed Study (False Certainty / Misleading Omission of Uncertainty):** The commenters cite the IPCC Technical Summary for the proposition that continued emissions "greatly increase the likelihood of potentially irreversible changes," particularly concerning ice sheet loss. This claim conveys a degree of certainty that masks the profound limitations acknowledged within the same document regarding the modeling of ice sheet dynamics. The Technical Summary explicitly states that "Deep uncertainty persists with respect to the possible evolution of the Antarctic Ice Sheet within the 21st century and beyond." Furthermore, the report acknowledges there is only "low confidence in simulations of ice-sheet instabilities, ice-shelf disintegration and basal melting," the processes required to drive rapid or irreversible loss. The commenters rely on a generalized statement of increased likelihood while omitting the critical context that the IPCC characterizes the most severe sea-level rise scenarios not as likely outcomes, but as "low-likelihood, high-impact" storylines characterized by "deep uncertainty." **Flawed Study (Reliance on Speculative Mechanisms and High-End Scenarios):** The commenters' reliance on DeConto et al. (2021) is similarly misplaced, as the study's alarming

[877]IPCC AR6 WGI, at 63 (Technical Summary) (Arias et al.); DeConto et al., *The Paris Climate Agreement and Future Sea-Level Rise from Antarctica*, 593 Nature 83 (2021), https://doi.org/10.1038/s41586-021-03427-0.

	projections depend on specific, high-end warming scenarios combined with a speculative physical mechanism. The study only projects an "abrupt jump" leading to "rapid and unstoppable sea-level rise" in scenarios that exceed 2 °C, such as those reaching 3 °C or the high-emissions RCP 8.5 pathway. Crucially, the authors find that if warming is limited to 2 °C or less, "Antarctic ice loss will continue at a pace similar to today's." Furthermore, the rapid acceleration projected under these high-end scenarios is driven by the inclusion of "Marine Ice Cliff Instability," a controversial hypothesis that posits runaway structural failure of ice cliffs. The authors themselves characterize Marine Ice Cliff Instability as a "key wild card" that remains "largely untested with process-based models of mechanical ice failure." The study's headline findings are therefore contingent on an unlikely high-emission pathway triggering a highly speculative and uncertain mechanism. Any prediction predicated on this chain is not a reasonable assessment of likely future outcomes. **Out of Scope: Out of Scope:** Further, many of the worst harms attributed to climate change in the studies are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. DeConto et al. (2021) explicitly identifies the inflection point for rapid ice loss occurring mid-century or later.
eNGO Endangerment Comment 108: Natural sources of carbon removal will become less efficient over time with additional climate change, leading to a higher	**Misrepresentation (Misleading Omission):** The commenters' proposition is a misleading oversimplification that omits critical context from the cited IPCC chapter. The commenters present a future decline in carbon sink efficiency as a general and unavoidable outcome. However, the cited source explicitly states this projection is scenario-dependent and is true only for high-emissions scenarios (e.g., SSP'-7.0 and SSP5-8.5). The commenters fail to disclose the study's contrary finding that under low-emissions stabilization scenarios (e.g.,

percentage of emissions remaining in the atmosphere.[878]	SSP1-2.6 and SSP2-4.5), the natural sinks are projected to take up an increasing fraction of emissions, meaning they would become more efficient. Furthermore, the IPCC chapter's FAQ 5.1 explicitly states, "There is currently no direct evidence that the natural sinks are slowing down." In other words, the commenters have presented a high-emissions, scenario-dependent projection as an observed, unconditional fact. **Flawed Study (Reliance on Mischaracterized Climate Scenarios):** The commenters' reliance on Green et al. (2019) is similarly flawed, as that study's conclusions are predicated on an extreme, implausible scenario. The study's projection that the carbon uptake rate "may not be sustained past the middle of the century" is based exclusively on the high-emission RCP 8.5 scenario, which the study mischaracterizes as "business-as-usual." This scenario is very unlikely to come to pass. **Out of Scope:** Further, many of the harms in the study will occur only long in the future, and the projected regional damages are experienced outside of the United States. The central projections for sink decline in Green et al. (2019) cover the period 1971–2085, clearly extending well past 2050. Additionally, the regional projections cover multiple continents, including Brazil, India, Australia, and Africa, with a non-exclusive focus on the United States. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.

[878] IPCC AR6 WGI (Ch. 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks) (Canadell et al.); Green et al., *Large Influence of Soil Moisture on Long-Term Terrestrial Carbon Uptake*, 565 Nature 476 (2019), https://doi.org/10.1038/s41586-018-0848-x.

eNGO Endangerment Comment 108–109: CO_2 fertilization effects in terrestrial ecosystems, which are not categorically positive or occurring at the same rate in different areas or for all plant types, are increasingly limited by drought and warming.[879]	**Misleading Omission (Mischaracterization / Direct Contradiction):** Commenters framing of the issues significantly mischaracterize the cited sources by implying that the positive effects of CO_2 fertilization are, as a general rule, being negated by warming. The primary source they cite for this proposition, Li et al. (2023), finds the opposite. That study explicitly and repeatedly states that the positive CO_2 fertilization effect is the dominant factor controlling long-term global vegetation growth (i.e., greening). The study finds that the "elevated CO_2 concentration dominated the long-term trends of [gross primary productivity]." According to the study's own analysis, the positive CO_2 effect "dominated" productivity changes of "most global land for all products." And the authors' data in Table 2 shows that CO_2 fertilization is the dominant driver across 53% to 75% of the globe's vegetated land. The negative effect from Vapor Pressure Deficit—which the commenters attribute to "drought and warming"—is identified as only a secondary factor that "partly offset[s]" the dominant positive trend from CO_2.The commenters have misleadingly framed this secondary, limiting factor as the primary conclusion. **Out of Scope:** Further, the harms cited in the supporting study are experienced predominantly outside of the United States. The study explicitly identifies regions outside of the U.S. as being most significantly impacted by vegetation decline and VPD-driven effects, including the Amazon basin, eastern Europe, Central Asia, and arid and tropical regions. The document provides broad global trends from 1982-2016 but offers no quantitative projections of damages specific to the United States beyond the near term. As noted above, *see supra*,

[879] IPCC AR6 WGII, at 47 (Technical Summary) (Pörtner et al.); Li et al., *Vegetation Growth Due to CO2 Fertilization is Threatened by Increasing Vapor Pressure Deficit*, 619 J. Hydrology 129292 (2023).

	Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 109: Heatwaves and hot extremes have been more common and more intense and are attributable to greenhouse gas emissions.[880]	**Misrepresentation (Misleading Omission):** The IPCC citation omits critical context regarding regional variability and non-GHG drivers. The commenters cite the IPCC's AR6 Chapter 11 to support the general claim that hot extremes are more intense and attributable to GHG emissions. While the IPCC concludes that GHG forcing is the "main driver" globally, the commenters omit the report's critical qualification that this global signal is significantly altered at the local level. The chapter explicitly states that the effect of GHGs is "moderated or amplified at the regional scale by regional processes ... by regional forcing from land-use and land-cover changes, or aerosol concentrations, and decadal and multi-decadal natural variability." Specifically, the chapter acknowledges that "[u]rbanization has likely exacerbated changes in temperature extremes in cities" and, conversely, that "[i]rrigation and crop expansion have attenuated increases in summer hot extremes in some regions." By presenting the global attribution finding without this context, the commenters misleadingly imply that all observed local temperature increases are direct, unmodulated consequences of GHG emissions, ignoring the significant confounding effects of local land-use changes and the Urban Heat Island effect on the observed temperature record. **Flawed Study (Conclusion Overreach):** The commenters cite Bartusek et al. (2022), an analysis of the 2021 Pacific Northwest heatwave, which concluded the event was "virtually

[880] IPCC AR6 WGI (Ch. 11: Weather and Climate Extreme Events in a Changing Climate) (Seneviratne et al.); Bartusek et al., *2021 North American Heatwave Amplified by Climate Change-Driven Nonlinear Interactions*, 12 Nature Climate Change 1143 (2022), https://doi.org/10.1038/s41558-022-01520-4.

	impossible" without global warming. This conclusion is an overreach given the extraordinary nature of the event, which the authors describe as a "5-sigma heat event" that "exceeded what many may have considered plausible under current climate conditions." Attributing such an extreme statistical outlier relies entirely on the fidelity of climate models at the extreme tails of their probability distributions, an inherently uncertain exercise. Furthermore, the study's own findings attribute 40% of the event's severity to "nonlinear interactions" between atmospheric drivers and land-atmosphere feedbacks. These complex nonlinear processes are difficult to model accurately. The authors themselves identify as a "pressing question" whether the mechanisms driving the event are "inadequately captured by climate models." It is unsound to claim an event was "virtually impossible" based on models that may not adequately capture the very mechanisms that caused the event's extremity.
eNGO Endangerment Comment 109: The combination of heatwaves and droughts is also becoming more common. [881]	**Flawed Study (Methodological Bias in Drought Indices):** The primary study cited, Mukherjee & Mishra (2021), concludes that compound drought and heatwave (CDHW) events have increased, but this finding is largely a methodological artifact. The study defines drought using the Palmer Drought Severity Index (PDSI) and calculates potential evapotranspiration using the outdated Thornthwaite method. The Thornthwaite method is heavily reliant on temperature. Because heatwaves are also defined by temperature, the two metrics used to identify compound events are not independent. Higher temperatures

[881] Mukherjee & Mishra, *Increase in Compound Drought and Heatwaves in a Warming World*, 48 Geophysical Rsch. Letters e2020GL090617 (2021), https://doi.org/10.1029/2020GL090617; Jarvis & Forster, *Estimated Human-Induced Warming from a Linear Temperature and Atmospheric CO2 Relationship*, 17 Nature Geoscience 1222 (2024), https://doi.org/10.1038/s41561-024-01580-5; Sherwood et al., *An Assessment of Earth's Climate Sensitivity Using Multiple Lines of Evidence*, 58 Revs. Geophysics e2019RG000678 (2020); Sun et al., *A Global, Continental and Regional Analysis of Changes in Extreme Precipitation*, 34 J. Climate 243 (2021), https://doi.org/10.1175/JCLI-D-19-0892.1.

	mechanically decrease the PDSI value (indicating drier conditions), inherently increasing the likelihood of identifying compound events as temperatures rise, irrespective of changes in precipitation. This built-in correlation inflates the finding of increased CDHW frequency. **Flawed Study (Cherry-Picking of Timeframes):** Furthermore, Mukherjee & Mishra's claim of a significant increase is based on splitting a relatively short 34-year record (1983–2016) into two arbitrary halves: a "past period" (1983–1999) and a "recent warmer period" (2000–2016). Analyzing climate trends based on 17-year periods is methodologically unsound, as it risks conflating short-term natural variability with long-term climate change. The authors' own analysis (Figure 1) shows a flat or negative trend in the first period, meaning the reported increase is entirely concentrated in the second half of the study period. The generalized conclusion is therefore highly sensitive to the arbitrary division of the dataset. **Misrepresentation (Irrelevant Source):** The commenters also cite Jarvis & Forster (2024) in support of this claim. This source is entirely irrelevant to the proposition. The study discusses alternative statistical methods for estimating global human-induced warming and refining the pre-industrial temperature baseline; it provides no analysis regarding the frequency of droughts, heatwaves, or compound events.
eNGO Endangerment Comment 110–111: Coral reefs are experiencing global declines.[882]	**Flawed Study (Conclusion Overreach)**: The Eddy et al. (2021) study's eye grabbing headline is a clear example of conclusion overreach, where the definitive claims in the abstract are not supported by the data and caveats described in the study's own text. The study's abstract and highlights state definitively that "Global coverage of living coral has declined by half since the 1950s," creating an impression of high certainty. But the study's methodology

[882] Eddy et al., *Global Decline in Capacity of Coral Reefs to Provide Ecosystem Services*, 4 One Earth 1278 (2021), https://doi.org/10.1016/j.oneear.2021.08.016.

	section fundamentally undermines this certainty. The authors concede they had "only a few observations in the early part of the time series" and that this results in "high uncertainty around what the average coral cover was during the mid-20th century." The authors further "recognize the bias that this introduces into [their] analysis." Instead, the study's "estimated baseline"—against which the "50% decline" narrative is judged—is not based on empirical field data, but derived from a "global survey" that asked other scientists for their "expert opinion on what the baseline average global coral reef cover might be in the absence of human impacts." The commenters also ignore that the study acknowledges that reefs face multiple "anthropogenic stressors such as overfishing, pollution, habitat destruction, and climate change" While they conclude that climate change is the "greatest threat," they also admit that the effects of these other local drivers "have been difficult to assess, measure, and quantify." **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States. The study's focus is global, examining coral reef cover and associated services in Exclusive Economic Zones around the world. For example, the countries with the highest per-capita Indigenous consumption of coral reef fish—which are threatened by the documented decline—are Palau, Micronesia, and Kiribati. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 111: Marine heatwaves have led to the collapse of local fisheries along	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' claim is a significant exaggeration and misapplication of the cited study's findings. Frölicher & Laufkötter (2018), which is a "comment" article reviewing other studies, does not use the term "collapse." In

the west coast of North America and east coast of Australia.[883]	relation to the 2013-2015 marine heatwave in the northeast Pacific, it cites other literature which found the event "caused the *closing* of both commercial and recreational fisheries resulting in millions of dollars in losses." The commenters' substitution of the definitive word "collapse" for the managerial action of a "closing" is an unsupported escalation of the study's actual language. Further, the study makes no claim of fishery collapse on the "east coast of Australia." While the study does note marine heatwaves in that region are associated with "mass coral bleaching," they make no claim about fishery impacts. The commenters appear to have incorrectly conflated findings from different regions, as the study does not support this specific claim. Furthermore, the commenters' use of this study as definitive proof of marine heatwave impacts or their attribution to global climate change is a misleading omission of the study's central thesis. The article is expressly intended to highlight "[i]mportant knowledge gaps" and call for more research precisely because so little is understood. The authors repeatedly state that "we know little" about how ocean extreme events will change, the "processes leading to ... a [marine heatwave] are in general not well understood." and that there is "currently limited ability to project the effects of [marine heatwaves] on the future of marine ecosystems." As for the two specific heatwaves the commenters focus on, the study attributes both to factors *other than climate change*: "the 2011 [marine heatwave] off the coast of Western Australia was caused by predominant La Niña conditions" and the "northeast Pacific [marine heatwave] from 2013 to 2015 was attributed to strong positive sea level pressure anomalies."
eNGO Endangerment Comment 111: Higher temperatures increase	**Misrepresentation (Irrelevant Source):** The commenters' claim is not a finding contained within the cited source. The study, "The Fungal Threat to Global Food Security," s a brief

[883] Frölicher & Laufkötter, *Emerging Risks from Marine Heat Waves*, 9 Nat. Commc'ns 650 (2018), https://doi.org/10.1038/s41467-018-03163-6.

the occurrence of toxigenic fungi on food crops.[884]	editorial commentary that summarizes a workshop discussion. It presents no new data, experimental results, or quantitative analysis to substantiate the specific causal claims made by the commenters. It serves to introduce a special issue of the journal *Fungal Biology*, summarize a recent workshop, and identify key research areas. It does not present new data or experimental results. The editorial does not make the specific, causal claim advanced by the commenters. While it mentions "climate change" as one of several "escalating" challenges to food security, it does not establish a direct link between higher temperatures and increased occurrence of specific fungi.
eNGO Endangerment Comment 112: Smith and Myers (2014) estimated that reduced zinc, protein, and iron levels in certain crops under anticipated 2050 carbon dioxide levels could cause zinc deficiencies in 175 million people, with 122 million more deficient in protein, with 1.4 billion women of childbearing age and children at-risk of losing dietary	**Flawed Study (Reliance on Mischaracterized Scenarios):** The commenters present the figures from Smith & Myers (2018)—such as "175 million people" becoming zinc deficient—as reliable estimates of a future outcome. But speculative projections are entirely dependent on a specific, high-end emissions scenario. The study's authors base their 2050 calculations on what they describe as "the scenario most consistent with our current trajectory (Representative Concentration Pathway (RCP) 8.5)." This framing is a significant mischaracterization. RCP 8.5, which is an improbable worst-case scenario, with emissions levels that are significantly higher than most plausible futures. The study's alarming headline figures are a direct output of this unlikely, alarmist assumption. The study's conclusions are further predicated on key methodological choices and caveats that the commenters ignore. The study's model intentionally isolates the negative effect of CO_2 on nutrient density while "isolating the effects ... without simultaneously assessing its effect on increasing overall crop yields, often referred to as CO_2 fertilization." The authors explicitly omit the primary, known benefit of CO_2—that it increases the total quantity of

[884] Avery et al., *The Fungal Threat to Global Food Security*, 123 Fungal Biology 555 (2019), https://doi.org/10.1016/j.funbio.2019.03.006.

iron in countries with high anemia prevalence.[885]	crops—to focus exclusively on the percentage of nutrients within them. The model's "first ... caveat" is its "assumption that diets remain static into the future." The projections assume "no change in diets or caloric intake" for decades. This is a deeply speculative and unrealistic assumption, as it models out any possibility of human adaptation, such as economic development, dietary diversification, or changes in agricultural practices, which would mitigate or erase the modeled deficiencies. **Out of Scope:** Further, many of the harms in Smith & Myers (2018) are experienced outside of the United States and will occur only long in the future. The regions at the highest risk are explicitly named as South and Southeast Asia, Africa, and the Middle East, with India being the largest contributor to all three nutritional vulnerabilities. The estimated impacts are projections for the year 2050. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 112: Increased tropospheric ozone levels decreased estimates of global yield for soybean (8.5 to 14 percent), wheat (3.9 to 15 percent),	**Misrepresentation:** The eNGOs frame the issue of increased ozone as a "climate" problem. But the losses identified in the study are attributable to surface ozone exposure, which is a criteria air pollutant (smog), not an inevitable consequence of global warming.

[885] Zhu et al., *Rising Temperatures Can Negate CO2 Fertilization Effects on Global Staple Crop Yields: A Meta-Regression Analysis*, 344 Agric. & Forest Meteorology 109737 (2023), https://doi.org/10.1016/j.agrformet.2023.109737; Zhang et al., *VPD Modifies CO2 Fertilization Effect on Tomato Plants via Abscisic Acid and Jasmonic Acid Signaling Pathways*, 9 Horticultural Plant J. 1151 (2024), https://doi.org/10.1016/j.hpj.2023.07.005; Smith & Myers, *Impact of Anthropogenic CO2 Emissions on Global Human Nutrition*, 8 Nature Climate Change 834 (2018), https://doi.org/10.1038/s41558-018-0253-3.

and maize (2.2 to 5.5 percent) in 2000 with estimated economic losses in the billions of dollars.[886]	**Flawed Study (Conclusion Overreach / Compounded Uncertainty:** Avnery et al., (2011), is not a study of observed crop losses but a modeled estimate based on a cascade of uncertain inputs, a fact the authors themselves acknowledge. The study's results are generated by feeding simulated ozone concentrations from one model (MOZART-2) into simulated "concentration-response" functions derived from unrelated field studies. The authors concede this method "accumulate[s] the uncertainties of each step of the analysis." Further, the study's baseline ozone model (MOZART-2) is concededly inaccurate, which necessarily flaws the output. The authors explain the model "systematically overestimates O_3 exposure in the U.S." and "significantly overestimate[s] O_3 in northern India"—two of the most critical agricultural regions. The study also applies generalized concentration response functions from western cultivars "popular in the 1980s/90s" and applies them "to crops across the globe today." This approach ignores vast differences in modern cultivars, climate, and agricultural practices. Finally, the authors note their exposure-based metrics fail to account for climatic parameters like soil moisture. In arid regions, water stress causes plant stomata to close, reducing ozone uptake. Because it fails to model this, the study concedes "yield losses may be less than predicted."
eNGO Endangerment Comment 112: The adverse impacts of ozone on tree species are also well	**Misrepresentation:** The eNGOs frame the issue of increased ozone as a "climate" problem. But the losses identified in the study are attributable to surface ozone exposure, which is a criteria air pollutant (smog), not an inevitable consequence of global warming.

[886] Porter et al., Ch. 7: *Food Security and Food Production Systems*, *in* IPCC AR5 WGII (2014), https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap7_FINAL.pdf; Avnery et al., *Global Crop Yield Reductions Due to Surface Ozone Exposure: Crop Production Losses and Economic Damage in 2000 and 2030 under Two Futures Scenarios of O3 Pollution*, 45 Atmospheric Env't 2297 (2011).

documented in the scientific literature.[887]	**Misrepresentation (Misleading Omission and Exaggeration):** The eNGOs cite the study to imply a crisis of widespread and certain damage across the U.S. This is misleading. The study explicitly finds that nationally, recent ozone exposure (2016–2018) levels were below the Critical Levels (CLs) for growth for most species and only *may* have exceeded the survival CLs for some species. The study explicitly states that for over 50% of the land area, less than 20% of tree species are in exceedance of the growth CLs at any confidence level.
eNGO Endangerment Comment 112: Climate change has intensified the extremes of the water cycle, leading to more droughts, water scarcity, and floods.[888]	**Misrepresentation (Misleading Omission and Exaggeration)**: The claim that climate change "has intensified" the water cycle to create "more droughts ... and floods" is a significant exaggeration that misrepresents the nuanced and uncertain findings of the cited sources. The sources themselves treat this claim with low confidence or explicitly challenge it. • *Weak Attribution for Droughts:* The cited IPCC Technical Summary finds only low confidence that human influence has affected trends in *meteorological* droughts in most regions. The IPCC's confidence is only medium for *agricultural and ecological* droughts, and even then, only "in some regions." The commenters' unqualified assertion of "more droughts" ignores this significant, stated uncertainty. • *Conflating Precipitation with Flooding:* The claim of "more ... floods" is also a conflation of two distinct findings. The IPCC Technical Summary distinguishes between increased heavy precipitation (for which attribution is high confidence) and

[887] Pavlovic et al., *Quantification of Ozone Exposure Impacts and their Uncertainties on Growth and Survival of 88 Tree Species Across the United States*, 130 J. Geophysical Rsch.: Atmospheres e2024JD042063 (2025), https://doi.org/10.1029/2024JD042063.

[888] IPCC AR6 WGI, at 85 (Technical Summary) (Arias et al.); Swain et al., *Hydroclimate Volatility on a Warming Earth*, 6 Nature Revs. Earth & Env't 35 (2025), https://doi.org/10.1038/s43017-024-00624-z.

	increased river floods, for which it does not make a confident attribution of observed trends. Swain et al. (2025), cited as the second source, directly addresses this "extreme precipitation-flood paradox." It explicitly states that "the evidence base for systematic increases in flooding is weaker, with suggestions that the overall frequency of floods has decreased regionally." The commenters have cited a source that contains a detailed explanation (Box 2) of why their simplistic claim—that more rain equals more floods—is not supported by the evidence. **Flawed Study (Conflating a Novel Metric with Observed Harms):** The commenters' reliance on Swain et al. (2025) is also misplaced because that study does not find a systematic increase in floods; but only an increase in "hydroclimate volatility." This conclusion is based on a "formal 'hydroclimate whiplash' metric" newly introduced by the authors, which measures the rate of transition between wet and dry states using a specific index.
eNGO Endangerment Comment 113: The intensity of precipitation has increased in many areas since the 1950s, with more people living in "unfamiliar" precipitation patterns (e.g., dry spells, extreme precipitation).[889]	**Misleading (Conflation of Climatic and Demographic Trends):** The commenters cite claims from the IPCC Technical Summary that more people are experiencing unfamiliar precipitation patterns. These claims are statistically misleading as they improperly conflate two distinct drivers: (1) alleged changes in regional precipitation and (2) non-climatic demographic changes (i.e., population growth and migration into vulnerable areas). The source, for example, claims "Approximately 163 million people now live in unfamiliarly dry areas" and "more people (around 700 million) have been experiencing longer dry spells." These figures are presented without clearly normalizing for population change. It is impossible to discern whether these numbers are high because the *climate* in given regions has

[889] IPCC AR6 WGII, at 49 (Technical Summary) (Pörtner et al.).

	changed, or simply because *more people* have moved into regions that were already prone to dry spells. This "expanding bull's-eye" analysis misattributes a change in human exposure (a demographic trend) to a change in climate hazard. **Out of Scope:** Further, many of the harms alleged are experienced outside of the United States. The population figures cited are global in scope, discussing people affected worldwide. The same section on health notes that between 1970 and 2019, drought-related disaster events occurred mostly in Africa. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 113: Many communities across the U.S. have had to adapt their stormwater management systems to address impacts from climate-related increases in storm frequency and/or intensity, from Massachusetts to Washington State.[890]	**Flawed Study (Reliance on Low-Probability Engineering Scenarios):** The Horsley Witten report relies on extreme, low-probability scenarios intended for risk-averse engineering rather than likely climatic baselines. The report recommends considering a "Highest" SLR scenario of 2.0 meters by 2100, noting that this figure surpasses IPCC estimates and assumes "maximum possible glacier and ice sheet loss". The report explicitly states this scenario is useful "in situations where there is little tolerance for risk." Utilizing worst-case engineering "safety factors" as evidence of likely future endangerment significantly exaggerates the probable scope of impacts.

[890] Horsley-Witten Grp., Assessment of Climate Change Impacts on Stormwater BMPs and Recommended BMP Design Considerations in Coastal Communities (2015), https://www.mass.gov/files/documents/2016/08/oj/climate-change-sw-bmps-report-no-appendix.pdf; Washington State, *Five-Year Implementation Update Olympia Sea Level Rise Response Plan* (2025), https://www.olympiawa.gov/Document_center/Community/Climate%20Change%20Response/SLR/SLR-5yr-Update-Factsheet-031925.pdf.

	Misrepresentation: The eNGOs conflate adaptations designed for Sea Level Rise with adaptations for increased rainfall intensity. While the cited sources acknowledge potential increases in precipitation, the primary structural interventions described are engineered to address tidal inundation, not rainfall volume. For instance, the Olympia update focuses heavily on the installation of "tide gates" and "backflow prevention on stormwater outfalls." These are mechanisms designed to prevent the ocean from entering the pipe system, rather than increasing the system's capacity to handle intense rain events. Similarly, the Massachusetts report identifies "submerged outfalls" as a primary vulnerability, noting that rising seas reduce the "hydraulic head" available to discharge water. Characterizing these tidal defense measures as adaptations to "storm intensity" (precipitation) is mechanically inaccurate. **Misrepresentation:** The commenters' broad assertion regarding increased storm intensity is also partially contradicted by the specific regional data in the cited Massachusetts report. While the report notes increases in tropical cyclone intensity, it explicitly concludes that for the region's dominant winter storm type, the "frequency and intensity of extra-tropical (nor'easter) storms has not changed." Furthermore, the report concludes that "extra-tropical storm intensity in the 21st century is not likely to be statistically different than storm intensity for the 20th century." The commenters fail to acknowledge this finding, which refutes the implication of a universal increase in storm intensity for that region.
eNGO Endangerment Comment 113: Droughts have reduced hydropower production, impacting energy supplies and increasing	**Misrepresentation (Cherry-Picking and Generalization):** The commenters fundamentally misrepresent the cited study by cherry-picking isolated regional examples to fabricate a universal global trend. While Wasti et al. (2022) do note that historical droughts have reduced generation in specific areas like Southeast Australia and parts of Brazil, the study

competition for scarce water resources.[891]	simultaneously reports that other regions have seen *increased* generation. For example, in the Swiss Alps, increased glacier melt has "increased hydropower generation by 3%–4%," and in Norway, "recent increases in average streamflow have incentivized hydropower extension projects." The commenters ignore this regional heterogeneity to project a falsely uniform narrative of decline, contradicting the authors' explicit conclusion that impacts are "not globally uniform" and "might be positive, negative, or inconsequential depending upon the local timing and magnitude of changes." **Misrepresentation (Attribution):** Furthermore, the commenters conflate climate change with other drivers of water scarcity. The study explicitly warns against attributing all flow reduction to climate change, noting that for the Yellow River, "climate change accounts for less than 35% of the reduction in volume," while human activities like dam construction and land use account for "over 65%." In West Africa, the study notes that the "climate change signal may not be distinguishable from natural variability until after 2050." Finally, regarding the United States specifically, the study finds that for the Southeast, "the impact of climate change on hydropower there is unclear." By presenting highly variable, regionally specific, and often non-climatic data as a definitive global climate impact, the commenters materially misrepresent the cited source. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. The Wasti

[891] Wasti et al., *Climate Change and the Hydropower Sector: A Global Review*, 13 Wiley Interdisc. Revs.: Climate Change e757 (2022), https://doi.org/10.1002/wcc.757.

	et al. study is a self-described "global survey" that predicates many of its findings on risks to developing nations in Asia, Africa, and Latin America—such as the Zambezi River basin, the Mekong River, and the Himalayas —rather than impacts within the United States. Moreover, where the study does examine the United States, it notes that impacts in regions like the Southeast are "unclear" or rely on projections extending toward the "end of the century," falling well outside the relevant temporal scope of this rulemaking.
eNGO Endangerment Comment 113: Snowpack is declining across the western U.S., where 40 million people rely on the Colorado River, a snowpack-driven watershed that serves municipal, agricultural, and ecosystem demands of the Colorado River Basin.[892]	**Misrepresentation (Direct Contradiction):** The commenters' claim is directly contradicted by the core data in the Musselman et al. (2021) study. The study's central finding is that *snowpack magnitude is not declining at most locations*. The study explicitly states that "at snowpack magnitude has declined at ~12% of 634 stations with long records in western North America." The commenters appear to have fundamentally misunderstood the study's thesis. They have confused the study's actual finding (an increase in winter melt, in other words, a change in timing) with a decline in the total amount of snowpack (a change *in magnitude*). The authors propose a new, more sensitive metric—"accumulation season snowmelt"—which they find is increasing at 34% of stations. The study's title itself clarifies that these melt trends merely "portend" future declines. Furthermore, the commenters obscure the specific climatic drivers identified by the study. Musselman et al. found that while snowmelt trends are "highly sensitive to temperature and an underlying warming signal," current trends in Snow Water Equivalent (SWE) are "more sensitive to precipitation variability." The authors conclude that "SWE trends are more sensitive to precipitation variability" and that the "weaker climate change signal in

[892] Musselman et al., *Winter Melt Trends Portend Widespread Declines in Snow Water Resources*, 11 Nature Climate Change 418 (2021), https://doi.org/10.1038/s41558-021-01014-9.

	precipitation" makes detecting changes in SWE difficult. By citing this study to assert a generalized decline in snowpack due to climate change, the commenters ignore the authors' finding that precipitation variability—not the warming signal—is currently the dominant driver of snowpack magnitude at these stations.
eNGO Endangerment Comment 114: 20 million coastal U.S. residents could be at risk of inundation due to sea level rise and/or storm surge by 2030.[893]	**Misrepresentation (Irrelevant Source)** The commenters cite Best et al. (2023) as the authority for the claim that "20 million coastal U.S. residents could be at risk of inundation ... by 2030." This citation is a misrepresentation of the scientific literature for two primary reasons: (1) the cited study, Best et al. (2023) does not derive this figure but merely repeats it as background context; and (2) the primary source for the figure, Curtis & Schneider (2011), explicitly conflates *total county populations* with *inundated populations* based on admitted exaggerations of sea-level rise. The 20 million figure originates from Curtis & Schneider (2011), which estimates that "19.3 million people will be affected by sea-level rise in 2030." A review of this primary source reveals that the eNGO comment fundamentally misinterprets what "affected" means in this context. The Curtis & Schneider study does not count the number of people living in inundation zones. Instead, it sums the total population of 19 selected "case study" counties—such as Miami-Dade, FL, and several counties in California and New Jersey. The authors explicitly state their methodology assumes that "the total county population will be affected" due to indirect factors like migration and economic shifts, even if only a fraction of the county is flooded.

[893] Best et al., *Demographics and Risk of Isolation Due to Sea Level Rise in the United States*, 14 Nat. Commc'ns 7904 (2023), https://doi.org/10.1038/s41467-023-43835-6 (erratum 14 Nat. Commc'ns 8305).

	The 20 million figure is derived from a "1-meter" (100 cm) sea-level rise scenario. However, the authors explicitly acknowledge that a realistic projection for 2030 is only "4.2 to 13.9 cm.". They admit that because they lacked maps for such a small rise, they connected the 4–13 cm projection to the 1-meter map. The authors concede that "overestimating the degree of inundation in this manner may introduce error into our analysis." he eNGO comment relies on a daisy-chain of citations to support a headline-grabbing number that implies 20 million Americans will face wet feet by 2030. In reality, this figure represents the total population of entire counties based on a map of sea-level rise that is 7 to 24 times higher than the authors' own 2030 projections.
eNGO Endangerment Comment 114: By 2030, 108–116 million people will be exposed to sea level rise in Africa.[894]	**Misrepresentation (Misleading Omission of Causality):** The commenters frame "sea level rise" as the sole driver for the 108–116 million people exposed. The cited source, however, explicitly contradicts this framing. The cited report states that "High population growth and urbanisation in low-lying coastal zones will be the major driver of increasing exposure to sea level rise in the coming decades (high confidence)." The report's baseline number for 2000 was 54 million people; the projection for 2030 effectively doubles this exposure. The commenters are thus *conflating a socioeconomic trend (rapid population growth and development in coastal Africa) with a climate impact.* They conveniently omit the report's own conclusion that the primary reason for the increased exposure is this non-climatic demographic growth, not a catastrophic rise in sea level by 2030. **Out of Scope**: Further, the harm alleged is experienced outside of the United States. As noted above, see supra, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably

[894] IPCC AR6 WGII, at 62 (Technical Summary) (Pörtner et al.).

	determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 114: Key infrastructure and services, such as energy supply and distribution, transportation, communication, and water and waste systems are increasingly vulnerable to compounding climate impacts like sea level rise, droughts, heatwaves, floods, wildfires, and more, with the most vulnerable populations often located where adaptive capacity is limited.[895]	**Misrepresentation (Misleading Omission):** The commenters' claim, while closely paraphrasing the text of the source, is misleading because it omits the report's own superseding caveat located just one page later. The commenters attribute the "increasingly vulnerable" nature of infrastructure directly to "compounding climate impacts." But the report clarifies that these observed increases in damages and costs are driven primarily by non-climate factors. The report explicitly states: "Recent extreme weather and climate-induced events have been associated with large costs through damaged property, infrastructure and supply chain disruptions, although development patterns have driven much of these increases (high confidence)." The source confirms that "rapid urbanization," "patterns of urban growth," and the rise of "unplanned and informal settlements" are the mechanisms increasing risk. This describes the "expanding bull's-eye" effect: more people and assets are being placed in harm's way (e.g., in coastal zones and floodplains) By failing to include this critical context, the commenters misrepresent the source's findings, implying that climate change is the established primary driver for increased infrastructure risk, whereas the report itself identifies socioeconomic "development patterns" as the principal cause. **Out of Scope:** Further, the claims about "vulnerable populations" and "adaptive capacity" are focused on the Global South, not the United States. The text on page 53 regarding "limited" adaptive capacity and vulnerable populations explicitly refers to "low- and middle-

[895] IPCC AR6 WGII, at 53 (Technical Summary) (Pörtner et al.).

	income communities" and "unplanned and informal settlements." The paragraph immediately following the text paraphrased by the eNGOs clarifies that this vulnerability is concentrated in "less developed regions," specifically noting sub-Saharan Africa and Asia. Applying these findings to a U.S. domestic endangerment finding is a misapplication of the data. *See supra*, Response to Endangerment Comment, Sec. 2.1.3.

2. SECTION VI.B. "THE PROPOSAL'S SCIENTIFIC CLAIMS ARE INACCURATE, MISLEADING, AND INCOMPLETE"

Claim	Analysis
Increases in greenhouse gas concentrations and global temperatures.	
eNGO Endangerment Comment 118: Rapid climate change in the past has resulted in multiple mass extinctions.[896]	**Flawed Study (Mischaracterized Climate Scenario):** The commenters imply that mass extinction events in the distant past that were correlated with rapid climate variations mean that current climate trends risk a similar extinction event in the near (within a century) future. The study's conclusion about modern climate change, however, relies *exclusively* on a high-end, worst-case scenario, RCP 8.5. By omitting other, more likely scenarios, the study frames a low-probability, high-impact outcome as a "likely" prediction. **Flawed Study (False Certainty):** The authors rightly acknowledge the "clear resolution limitations" of the data and the geological record used to derive their thresholds, which were based on a million-year timescale, complicate applying their thresholds to the modern decadal-to-centennial timescale. Despite admitting this profound uncertainty, they proceed to make the direct comparison and state that a mass extinction "would likely result," eliding this uncertainty. The ultimate conclusion of the study—that we will experience a "mass

[896] Song et al., *Thresholds of Temperature Change for Mass Extinctions*, 12 Nat. Commc'ns 4694 (2021), https://doi.org/10.1038/s41467-021-25019-2.

	extinction comparable to the major Phanerozoic events" by 2100 (i.e., in 75 years)—beggars belief.
eNGO Endangerment Comment 118–19: The rapid rate of increase in today's CO_2 levels presents significant challenges with differential impacts on biota and ecosystems on Earth today.[897]	**Misrepresentation (Misleading Omission):** The commenters' claim summarizes the study's *premise*, not its *findings*. The study takes the proposition as established background context and then proceeds to its actual, more complex argument: analyzing *how* species will (or will not) adapt to these challenges. Presenting the study as proof that climate change is happening and has differential impacts is misleading.
eNGO Endangerment Comment 119: Anthropogenic emissions are causing changes in atmospheric concentrations of CO_2 at up to 9-10 times higher than those at the onset of the Paleocene-Eocene Thermal Maximum, which corresponded to rapid rates of species loss.[898]	**Flawed Study (Mischaracterized Climate Scenario):** The study's core projection of reaching PETM-scale carbon accumulation in "as few as 140 to 259 years" is derived from a simple linear extrapolation of the 1959–2015 emissions data. The study concedes that this trajectory "resembles the upper bound for carbon emissions in the Representative Concentration Pathway or RCP 8.5 model." By framing this simple extrapolation as the default "if the present trend … continues" outcome, the study effectively treats a scenario analogous to the worst-case RCP 8.5 as a business-as-usual or likely future. This methodology relies on the significant assumption that the 57-year trend will continue perfectly unabated for more than two centuries, ignoring all potential for societal, political, or technological mitigation that would alter the emissions trajectory.

[897] Catullo et al., *The Potential for Rapid Evolution Under Anthropogenic Climate Change*, 29 Current Biology R996 (2019), https://doi.org/10.1016/j.cub.2019.08.028.

[898] Gingerich, *Temporal Scaling of Carbon Emission and Accumulation Rates: Modern Anthropogenic Emissions Compared to Estimates of PETM Onset Accumulation*, 34 Paleoceanography & Paleoclimatology 329 (2019), https://doi.org/10.1029/2018PA003379.

eNGO Endangerment Comment at 119: The present rapid rate of CO_2 increase and accompanying impacts of climate change create threats due to decreases in ecosystem, water, and nutrient stability.[899]	**Misrepresentation (Overclaiming):** Canteri et al. (2025) only studies the impact on Reindeer, not on ecosystems writ large. Warren et al. (2018) models warming's effects on the "climatically determined range" of certain species, not on other ecosystem metrics like water resources or nutrient stability. **Flawed Study (Mischaracterized Climate Scenario):** Canteri et al. presents a stark forecast, including a potential 84% population collapse in North America by 2100. However, this figure is generated using the RCP 8.5 scenario, which the study explicitly calls a "business-as-usual emission-intensive scenario." This mischaracterization exaggerates the most probable threat to *Rangifer* populations by presenting a worst-case possibility as the default. Similarly, Warren et al.'s most dramatic effects occur for 4.5 °C of warming, which roughly corresponds to the implausible worst-case RCP 8.5 scenario, with significantly mitigated impacts for less extreme warming scenarios. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. Here, the cited literature relies on global models and century-long timelines that far exceed these bounds. Canteri et al. (2025) relies on a "Holarctic" model that aggregates data from Europe and Asia alongside North America, with key forecasts projecting out to the year 2100. Similarly, Warren et al. (2018) provides a

[899] Canteri et al., *Mismatch in Reindeer Resilience to Past and Future Warming Signals Ongoing Declines*, 11 Sci. Advances eado3354 (2025), https://doi.org/10.1126/sciadv.adu0175; Warren et al., *The Projected Effect on Insects, Vertebrates, and Plants of Limiting Global Warming to 1.5 C Rather than 2 C*, 360 *Science* 791 (2018), https://doi.org/10.1126/science.aar3646.

	"global assessment" of biodiversity risks, utilizing a timeline that focuses on the difference in warming impacts "by 2100."Consequently, these studies project damages that are both geographically attenuated and temporally distant, rendering them largely irrelevant to the analysis of reasonable anticipation of endangerment within the United States during the relevant regulatory timeframe.
eNGO Endangerment Comment 119: The Draft CWG Report is wrong to suggest that CO_2 levels could fall below the level required for plant survival. In fact, atmospheric CO_2 levels during glacial minima and interglacial maxima have been quite stable through the Pleistocene[900] due to known orbital changes and earth system feedbacks.[901]	**Misrepresentation (Direct Contradiction):** The proposition that CO_2 levels have been "quite stable" is a severe distortion of the sources' findings. The studies clearly describe a highly dynamic system, not a stable one. The sources show that CO_2 levels repeatedly and dramatically oscillated between over 100 p.p.m.v.—from glacial lows around 180 p.p.m.v. to interglacial highs around 280–300 p.p.m.v. Characterizing a recurring fluctuation of over 60% (relative to the minimum) as "quite stable" is fundamentally misleading. Furthermore, the proposition's claim of stability *within* interglacials is directly contradicted by Brovkin et al. (2016), which highlights that the current Holocene interglacial was *not* stable, experiencing a 20 p.p.m. rise *before* the industrial era, unlike the stable Eemian interglacial era. The proposition twists the scientific term "stable bounds" to imply a static condition that does not exist in the data. Petit et al. explicitly define "stable bounds" not as a static state, but as the "maximum and minimum values of climate properties between which climate

[900] Petit et al., *Climate and Atmospheric History of the Past 420,000 Years from the Vostok Ice Core, Antarctica*, 399 Nature 429 (1999), https://doi.org/10.1038/20859; Brovkin et al., *Comparative Carbon Cycle Dynamics of the Present and Last Interglacial*, 137 Quaternary Sci. Revs. 15 (2016), https://doi.org/10.1016/j.quascirev.2016.01.028; Da et al., *Low CO2 Levels of the Entire Pleistocene Epoch*, 10 Nat. Commc'ns 4342 (2019), https://doi.org/10.1038/s41467-019-12357-5.

[901] Van Nes et al., *Causal Feedbacks in Climate Change*, 5 *Nature Climate Change* 445 (2015).

	oscillates." By conflating the existence of a floor (minimum value) with stability, the comment ignores the massive variability—"almost always ... in a state of change"—that occurs between those bounds.
eNGO Endangerment Comment 119–20: The magnitude of observed warming cannot be reproduced based only on the role of Total Solar Irradiance ("TSI") without accounting for the dominant factor, anthropogenic greenhouse gas forcing.[902]	**Misrepresentation:** The commenters fundamentally misrepresent the findings of Ziskin and Shaviv (2012). While the comments cite this study to support the proposition that solar contributions are "small" compared to greenhouse gases, the study explicitly concludes the opposite: that solar activity is a primary driver of climate change, not a negligible one. Ziskin and Shaviv (2012) attribute approximately 40% of 20th-century warming to solar activity, with the remaining 60% attributed to anthropogenic causes. A 40/60 split indicates that solar forcing is a major component of the climate system. By characterizing this contribution as merely "small," the commenters improperly minimize a finding that identifies solar activity as a driver comparable in scale to anthropogenic forcing. Further, the commenters gloss over the statistical uncertainties presented in the study, which prevent a definitive separation of causes. The study estimates the anthropogenic contribution at 0.42 ± 0.11 °C and the solar contribution at 0.27 ± 0.07 °C. Critically, the upper bound of the solar contribution (0.34 °C) exceeds the lower bound of the anthropogenic contribution (0.31 °C). Consequently, the study does not statistically rule out the possibility that the solar contribution is equal to, or even slightly larger than, the anthropogenic contribution. **False Certainty and Methodological Limitations:** The commenters' claim of "unequivocal evidence" relies on models that may systematically underestimate solar influence by excluding non-thermal amplification mechanisms. The consensus cited by the commenters

[902] Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Research 762 (2012); Meehl et al. *Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate*, 17 Journal of Climate 3721 (2004).

	(e.g., Meehl et al., 2004) relies on General Circulation Models (GCMs) that generally limit solar influence to variations in Total Solar Irradiance (TSI). Ziskin and Shaviv challenge this approach, identifying a necessary "Indirect Solar Effect" (ISE)—potentially linked to cosmic ray flux or stratospheric UV variability—that amplifies the climate's response to the sun. By ignoring ISE, standard GCMs must compensate for the missing warming by assuming high climate sensitivity to greenhouse gases. The divergence between the cited studies highlights profound uncertainty regarding climate sensitivity. While IPCC models assume significant positive feedbacks, Ziskin and Shaviv find that the best fit for the 20th-century record is obtained with "negligible net feedback" (low climate sensitivity). If sensitivity is indeed low, the unequivocal attribution of warming to greenhouse gases is incorrect, as the observed data would require the larger direct forcing provided by the amplified solar mechanism proposed by the authors. Regarding Meehl et al. (2004), the commenters rely on a study that is over twenty years old, dependent on a single climate model (DOE PCM), and uses a single, outdated solar dataset (Hoyt and Schatten, 1993). The authors of that study admitted that "forcing uncertainties… admit a quite wide range of sensitivity possibilities." Presenting this outdated modeling as definitive proof of current attribution ignores two decades of subsequent debate regarding solar amplification. **Out of Scope** Further, the cited studies rely exclusively on globally averaged surface temperature anomalies rather than data specific to the United States. As noted in the Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited temporally to the useful life of

	the vehicle and geographically to the United States. Global mean temperature models lack the requisite granularity to assess domestic endangerment.
eNGO Endangerment Comment 120: The Urban Heat Island ("UHI") effect has a relatively small global impact, especially when compared to anthropogenic greenhouse gas forcing, with greater relevance on a localized scale and has already been accounted for in warming models.[903]	**Misrepresentation (Misleading Omission):** While it is technically correct that some of the literature attempts to account for UHI, the commenters improperly present a complex, uncertain, and vigorously debated methodological process as a finished and perfectly solved problem. The cited sources reveal that "accounting for" UHI is a primary source of uncertainty and a subject of continuous scientific improvement, and has a discernible impact on temperature measurements, especially at stations located in the United States. First, the studies show there is no single, universally agreed-upon method of "accounting." For example, Hansen et al. (2001) evaluates the effect of using satellite data rather than population data to account for UHI effects in the GISS analysis. It shows that the average adjustment using satellite data for the U.S. of 0.15 °C is more than double the average adjustment used in the standard USHCN dataset of 0.06 °C, which applied only population data. Second, the accounting methods themselves are actively debated and criticized. For example, Dienst et al. (2019) argues that common statistical homogenization (like the HOMER script) can fail to properly remove UHI bias. It "reveals substantial differences of > 3K [degrees Kelvin]," (equivalent to 3 °C), between the automated method and a detailed, metadata-based correction for a single village, an enormous disparity in a field where

[903] Hansen et al., *A Closer Look at United States and Global Surface Temperature Change*, 106 J. Geophysical Rsch.: Atmospheres 23,947 (2001), https://doi.org/10.1029/2001JD000354; Jones et al., *Urbanization Effects in Large-Scale Temperature Records, with an Emphasis on China*, 113 J. Geophysical Rsch.: Atmospheres D16122 (2008), https://doi.org/10.1029/2008JD009916; Parker, *Urban Heat Island Effects on Estimates of Observed Climate Change*, 1 Wiley Interdisc. Revs.: Climate Change 123 (2010), https://doi.org/10.1002/wcc.21; Dienst et al., *Detection and Elimination of UHI Effects in Long Temperature Records from Villages–A Case Study from Tivissa, Spain*, 27 Urban Climate 372 (2019), https://doi.org/10.1016/j.uclim.2018.12.012.

	purportedly meaningful temperature deltas are often measured in tenths or hundredths of a degree. This suggest that the broad, automated accounting commenters described may be insufficient to address UHI effects, especially for measurements of temperature in heavily urbanized countries like the United States. Moreover, more accurate methods like that of Dienst et al. are "laborious and require[] a suitable sensor network as well as detailed metadata," suggesting they may not be easily extensible to existing stations. In short, the studies confirm that the process of removing UHI impact is a major source of uncertainty and a frontier of climate data science.
eNGO Endangerment Comment 120: Suggesting the UHI is not important because the fastest warming areas of the world (Arctic and Antarctic) are remote, not urban, and Urban Heat Island effect is not relevant to those cases.[904]	**Misrepresentation (Irrelevant Source):** The studies show that Arctic warming is driven by GHGs and unique local feedback loops in those regions, like loss of sea ice cover, Serreze, et. al (2019), and the removal of atmospheric aerosols as a result of antipollution efforts, England et al. (2021). The comments distort this by presenting it as evidence against a different, unrelated warming mechanism (UHI). This twists the implication of the research from "GHGs are warming the planet, and feedbacks amplify this in the Arctic" to "warming is not always urban, so UHI is insignificant."
eNGO Endangerment Comment 120–21: Suggesting UHI is not significant because the majority of Earth's surface is ocean, where UHI has no impact, and sea	**Misrepresentation (Irrelevant Source):** The study's entire focus is on reconstructing *sea surface* temperatures using data from ships, buoys, and Argo floats. The UHI effect is a well-documented phenomenon related to *land-based* temperature measurements in developed areas. This is exclusively about the oceans and has no data or analysis relevant to the UHI

[904] Serreze et al., *The Emergence of Surface-Based Arctic Amplification*, 3 Cryosphere 11 (2009); England et al., *The Recent Emergence of Arctic Amplification*, 48 Geophysical Rsch. Letters e2021GL094086 (2021) https://doi.org/10.5194/tc-3-11-2009; Arctic Climate Impact Assessment (Carolyn Symon ed., 2005), https://doi.org/10.5860/choice.43-6507.

surface and air temperatures have been rising over the past several decades.[905]	debate. The proposition attempts to use a study about ocean warming to dismiss a separate, land-based phenomenon.
eNGO Endangerment Comment 121: The proposal's criticisms based on its assertion that RCP 8.5 has been treated as a "business as usual scenario" are wrong because the authors of that scenario did not treat it as such.[906]	**Misrepresentation (Irrelevant Source):** Whether the authors of RCP 8.5 *intended* it to be used as a "business as usual" scenario is irrelevant. It has, in fact, been used that way by *hundreds* of studies, including more than a dozen relied on by commenters in this very comment. For example: • Diffenbaugh et al. (2018)—cited on pages 102, 124, and 126 of the eNGO Endangerment Comment—analyzes historical changes and aspirational targets regarding unprecedented climate events, framing RCP 8.5 as the "UN Commitment Level."[907] • Udall & Overpeck (2017) —cited on page 125 of the eNGO Endangerment Comment—investigates the implications of hot drought on the Colorado River in the 21st century and explicitly calls RCP 8.5 a "business as usual" scenario.[908]

[905] Huang et al., *NOAA Extended Reconstructed Sea Surface Temperature (ERSST), Version 5*, NOAA Nat'l Ctrs. for Env't Info. (2017), https://doi.org/10.7289/V5T72FNM.

[906] Riahi et al., *RCP 8.5—A Scenario of Comparatively High Greenhouse Gas Emissions*, 109 Climatic Change 33 (2011), https://doi.org/10.1007/s10584-011-0149-y.

[907] Diffenbaugh et al., *Unprecedented Climate Events: Historical Changes, Aspirational Targets, and National Commitments*, 4 Sci. Advances eaao3354 (2018), https://doi.org/10.1126/sciadv.aao3354.

[908] Udall & Overpeck, *The Twenty-First Century Colorado River Hot Drought and Implications for the Future*, 53 Water Res. Rsch. 2404 (2017), https://doi.org/10.1002/2016WR019638

	• Schuur et al. (2022) —cited on pages 108 and 140 of the eNGO Endangerment Comment— examines carbon cycle feedback from the warming Arctic and permafrost, characterizing RCP 8.5 as a "business as usual" scenario.[909] • Deutsch et al. (2018) —cited on page 148 of the eNGO Endangerment Comment—assesses the increase in crop losses due to insect pests in a warming climate, utilizing RCP 8.5 and describing it as "business as usual."[910] • Kalkuhl & Wenz (2020) —cited on page 151 of the eNGO Endangerment Comment—examines the impact of climate change on economic growth and development, describing RCP 8.5 as "business as usual."[911] • Halevy & Bachan (2017)—cited on page 107of the eNGO Endangerment Comment—looks at the geologic history of seawater pH and describes RCP 8.5 as "business as usual."[912] • Green et al. (2019)—cited on page 109 of the eNGO Endangerment Comment—examines the influence of soil moisture on long-term terrestrial carbon uptake, describing RCP 8.5 as "business as usual."[913]

[909] Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://doi.org/10.1146/annurev-environ-012220-011847

[910] Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466

[911] Kalkuhl & Wenz, *The Impact of Climate Change on Economic Growth and Development*, 127 World Dev. 104749 (2020), https://doi.org/10.1016/j.worlddev.2019.104749

[912] Halevy & Bachan, *The Geologic History of Seawater pH*, 355 Science 1069 (2017).

[913] Green et al., *Large Influence of Soil Moisture on Long-Term Terrestrial Carbon Uptake*, 565 Nature 476 (2019), https://doi.org/10.1038/s41586-018-0848-x

	• Smith & Myers (2018)—cited on page 112 of the eNGO Endangerment Comment—assesses the impact of anthropogenic carbon dioxide emissions on global human nutrition, basing its 2050 projections on RCP 8.5 as it is described as "the scenario most consistent with our current trajectory."[914] • Jiang et al. (2019)—cited on page 107 of the eNGO Endangerment Comment—examines surface ocean pH while repeatedly and incorrectly labeling RCP 8.5 as the "business-as-usual" scenario.[915] • Canteri et al. (2025)—cited on page 119 of the eNGO Endangerment Comment—looks at reindeer resilience in the face of climate change and calls RCP 8.5 a "business-as-usual emissions intensive scenario."[916] • Kane & Fletcher (2020)—cited on page 131 of the eNGO Endangerment Comment—examines reef island stability and frames a 1.91 m sea level rise—associated with RCP 8.5—as the most likely scenario.[917]

[914] Smith & Myers, *Impact of Anthropogenic CO2 Emissions on Global Human Nutrition*, 8 Nature Climate Change 834 (2018), https://doi.org/10.1038/s41558-018-0253-3.

[915] Jiang et al., *Surface Ocean pH and Buffer Capacity: Past, Present and Future*, 6 Sci. Reps. 38437 (2019); Halevy & Bachan, *The Geologic History of Seawater pH*, 355 Science 1069 (2017).

[916] Canteri et al., *Mismatch in Reindeer Resilience to Past and Future Warming Signals Ongoing Declines*, 11 Sci. Advances eado3354 (2025), https://doi.org/10.1126/sciadv.adu0175

[917] Kane & Fletcher, *Rethinking Reef Island Stability in Relation to Anthropogenic Sea Level Rise*, 8 Earth's Future e2020EF001525 (2020), https://doi.org/10.1029/2020EF001525.

	• Gingerich (2019)—cited on page 119 of the eNGO Endangerment Comment—looks at carbon emissions rates and uses a linear extrapolation that resembles RCP 8.5 and frames the outcome as what will occur "if the present trend … continues."[918]
eNGO Endangerment Comment 121: We are already experiencing impacts from climate change which are projected to become worse in the coming years even on relatively low future emissions trajectories.[919]	**Misleading Omission and Exaggeration (Failure to Distinguish Drivers):** The commenters' proposition—that "we are already experiencing serious impacts from climate change"—is a misleading oversimplification. The commenter uses this phrasing to imply that *all* observed increases in harmful impacts (such as rising disaster costs) are attributable *solely* to climate change. The cited source, Jay et al. (NCA5), explicitly refutes this simplistic attribution. The document states that the "number and cost of weather-related disasters have increased dramatically" due to two distinct factors. It attributes the rise only "in part due to the increasing frequency and intensity of extreme events." The source clearly states that costs are also driven "in part due to increases in assets at risk (through population growth, rising property values, and continued development in hazard-prone areas)." By omitting the source's critical context regarding socioeconomic drivers—that is, the fact that there is simply more wealth and property in harm 's way—the commenter misrepresents the source's findings and exaggerates the *observed* role of climate change as the sole driver of these costs.

[918] Gingerich, *Temporal Scaling of Carbon Emission and Accumulation Rates: Modern Anthropogenic Emissions Compared to Estimates of PETM Onset Accumulation*, 34 Paleoceanography & Paleoclimatology 329 (2019), https://doi.org/10.1029/2018PA003379

[919] Jay et al., Ch. 1: *Overview: Understanding Risks, Impacts, and Responses*, *in* Fifth National Climate Assessment (Crimmins et al. eds., 2023), https://doi.org/10.7930/NCA5.2023.CH1.

	Conclusion Overreach (Conflating Near-Term and Long-Term Projections): The proposition's second claim—that impacts "are projected to become worse in the coming years even on relatively low future emissions trajectories"—conflates near-term "locked-in" impacts with the results of long-term policy choices. The source does support that impacts in the immediate future (e.g., "over the next decade") are largely unavoidable as emissions scenarios only "take time to diverge." The focus on unavoidable near-term impacts, while technically correct, serves to misleadingly minimize the source's central finding: that different long-term emissions pathways (such as the "Very low" SSP1-1.9 vs. the "Very high" SSP5-8.5 scenarios) result in profoundly different outcomes by mid-century and beyond.
eNGO Endangerment Comment 121–22: The Draft CWG Report is wrong to suggest that actual emissions trajectories have tracked the IPCC's more optimistic scenarios.[920]	**Misrepresentation**: The commenter misrepresents the Draft CWG Report**.** The report argues that *high-end, pessimistic* IPCC emission scenarios (like RCP 8.5 and SSP5-8.5) have overstated observed emissions and are increasingly considered implausible. It suggests actual emissions are tracking *below* these extreme scenarios, closer to mid-range ones. The commenter incorrectly claims the report suggests reality follows *optimistic* scenarios; the report's main point is that the *worst-case* scenarios often used in impacts literature are less likely than portrayed. Hausfather (2025) *supports* the Draft CWG Report's point. Hausfather confirms that high-emissions pathways are becoming less plausible due to clean energy progress and policy. That

[920] Jay et al., Ch. 1: *Overview: Understanding Risks, Impacts, and Responses*, *in* Fifth National Climate Assessment (Crimmins et al. eds., 2023), https://doi.org/10.7930/NCA5.2023.CH1.

	analysis shows that the most recent assessments based on current emissions estimates tend to most closely match or fall slightly below the *middle-of-the-road SSP2-4.5 scenario*, directly aligning with the CWG Report's observation that actual emissions are tracking below the more extreme scenarios. Both the Draft CWG Report and Hausfather (2025) agree that under the best, most recent analyses, the highest IPCC scenarios are unlikely baselines.
Health risks from heat waves and other extreme weather events.	
eNGO Endangerment Comment 122–23: Since the 1950s hot extremes have increased in frequency and intensity, while cold extremes have correspondingly decreased. GHG emissions are very likely the main driver.[921]	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' claim of a uniform increase in hot extremes across North America is an oversimplification contradicted by the cited sources. Dunn et al. (2020), which introduced the HadEX3 dataset, explicitly identifies the "warming hole" over the southern-central United States, a region that shows "reduced warming, or even cooling." Seong et al. (2021) shows cooling trends from 1951 to 2015 in parts of North American, South America, and Asia for both cold and hot extremes, including the U.S. warming hole. The commenters imply a uniform, continent-wide warming trend that contradicts the observational record. They omit the well-documented warming hole over the southern-central United States, where observational data shows neutral or cooling trends. This regional data precludes a finding of endangerment based on a universal national trend of increasing heat extremes. The commenters attribution to "human-induced greenhouse gas emissions" is presented as a simple, observed fact, when the source, Seong et al. (2021), presents a far more complex picture, in which GHGs and aerosols exert competing (and sometimes cancelling) effects on

[921] Seong et al., *Anthropogenic Greenhouse Gas and Aerosol Contributions to Extreme Temperature Changes During 1951–2015*, 34 J. Climate 857 (2021), https://doi.org/10.1175/JCLI-D-19-1023.1; Dunn et al., *Development of an Updated Global Land In Situ-Based Data Set of Temperature and Precipitation Extremes: HadEX3*, 125 J. Geophysical Rsch.: Atmospheres e2019JD032263 (2020), https://doi.org/10.1029/2019JD032263.

	extreme temperatures. Seong et al. *itself* admits a mismatch between its attribution models and reality, stating that models "underestimate the observed warming of cold extremes." The failure of Seong et al.'s model to replicate the real-world observational record or explain why GHGs differentially impact extremes, undermines the credibility of its attribution theory. **Flawed Study (Cherry-Picking):** Furthermore, the trends noted in Dunn et al. (2020)—and emphasized by the eNGOs—are a result of cherry-picking of the timeframe. Figure 2(c) and Figure 6(a) show time series starting in 1900. In the U.S., the 1930s "Dust Bowl" era saw extreme heat. By starting the analysis in the 1950s—which Dunn et al. note was a period of "smaller amplitude changes"—authors effectively start their trend line in a valley, ignoring the high peaks of the 1930s that are visible in the datasets they use, and thereby artificially steepening the trend line for the United States.
eNGO Endangerment Comment 123: Recent research indicates that heatwaves are now seven times more likely than 40 years ago, are substantially hotter, and affect larger geographical areas, primarily due to baseline global warming that is altering fundamental weather	**Misrepresentation (Exaggeration / Overclaiming):** The commenter's proposition misrepresents the scope of the cited study. Rogers et al. (2022) is a Northern Hemisphere analysis, evaluating trends across mid- to high latitudes (20°N–80°N), not a study focused on the United States. The study's "seven times" finding applies to the *entire* hemispheric study area. The commenters improperly extrapolate this large-scale, hemispheric finding and misapplies it specifically to the United States. The study only identifies the "eastern United States" as one of several regional "hotspots," not as the primary subject of its main sevenfold claim. **Flawed Study (Conclusion Overreach / Arbitrary Definition):** Furthermore, the study's headline sevenfold increase is not for heatwaves generally, but for a highly specific, author-defined metric: "concurrent large heatwave days." This metric is based on an arbitrary size threshold, defined as the 98th percentile of heatwave extent. The authors concede that this

patterns across the United States.[922]	specific threshold is critical to their finding; using a slightly lower (95th percentile) threshold causes concurrent heatwaves to occur "every day for multiple years at the end of the time series, making the trends unclear." This suggests the "sevenfold" statistic is not a robust finding but a fragile artifact of a carefully selected, non-obvious definition. Finally, the commenters repeat the study's claim that it can cleanly separate the primary effects of "baseline global warming" (thermodynamic) from the secondary effects of "altering fundamental weather patterns" (dynamic). However, the study's own caveats reveal that these two drivers are fundamentally entangled. The authors acknowledge that their method for separating these factors is problematic, noting that the "spatial pattern of historical … warming … could be influencing midlatitude circulation patterns." When they test this by removing the warming trend from the circulation data, the results change, and "fewer" circulation patterns show significant trends. This confirms the study's separation of warming from weather patterns is an artificial simplification, and its attribution of the *causes* of the observed increase is confounded by its own methodology.
eNGO Endangerment Comment 123: There is robust evidence that rainfall rates from tropical cyclones and hurricanes have increased due	The commenters' claim selectively aggregates findings from the cited studies, misrepresents their conclusions, and omits critical context and explicit disclaimers. The proposition presents disputed, model-driven storyline attributions as "robust evidence."

[922] Rogers et al., *Six-Fold Increase in Historical Northern Hemisphere Concurrent Large Heatwaves Driven by Warming and Changing Atmospheric Circulations*, 34 J. Climate 715 (2021), https://doi.org/10.1175/JCLI-D-21-0200.1.

to global warming. In addition, human-caused greenhouse gas emissions have increased the probability of tropical cyclones reaching major intensity, have caused more frequent rapidly intensifying tropical cyclones, and have slowed hurricane track speeds over the United States.[923]	**Misrepresentation (Direct Contradiction and Misleading Omission):** The claims regarding rainfall rates and hurricane track speeds are contradicted by the studies cited to support them. The commenters claim these trends are "due to global warming" and "human-caused," yet the authors of those specific studies explicitly disclaim making such an attribution. • *On Rainfall and Track Speed:* The *only* provided study that analyzes both stalling (track speed) and rainfall, Hall & Kossin, (2019), explicitly states: "We make no attribution to anthropogenic climate forcing for the stalling or rainfall; the trends could be due to low frequency natural variability." • *On Track Speed:* Similarly, the Kossin (2019) reply, which defends the slowing-speed trend, cautions: "The analyses presented here do not constitute a detection and attribution study" and "the explicit relationship between tropical-cyclone translation speed and anthropogenic forcing … is not yet clear." The commenters have taken a study's *observation* of a trend and attached a *cause* (anthropogenic forcing) that the study's own authors explicitly state is not supported by their analysis.

[923] Gilford et al., *Human-Caused Ocean Warming Has Intensified Recent Hurricanes*, 3 Env't Rsch.: Climate 045019 (2024); Kishtawal et al., *Tropical Cyclone Intensification Trends During Satellite Era (1986–2010)*, 39 Geophysical Rsch. Letters L10810 (2012), https://doi.org/10.1029/2012GL051700; Hall & Kossin, *Hurricane Stalling Along the North American Coast and Implications for Rainfall*, 2 npj Climate & Atmospheric Sci. 17 (2019), https://doi.org/10.1038/s41612-019-0074-8; Kossin, *Reply to: Moon, I.-J. et al.; Lanzante, J. R.*, 570 Nature E16 (2019), https://doi.org/10.1038/s41586-019-1224-1; Bhatia et al., *Recent Increases in Tropical Cyclone Intensification Rates*, 10 Nat. Commc'ns 635 (2019), https://doi.org/10.1038/s41467-019-08471-z; Kossin et al., *Global Increase in Major Tropical Cyclone Exceedance Probability Over the Past Four Decades*, 117 Proc. Nat'l Acad. Scis. 11,975 (2020), https://doi.org/10.1073/pnas.1920849117.

	Flawed Study (False Certainty and Data Unreliability): The proposition's claim of "robust evidence" for increasing major intensity and rapid intensification ignores the profound data uncertainties and methodological disputes that are openly discussed *within* the cited studies. The findings are not based on raw, stable data, but on highly processed, statistically constructed datasets. • *Conflicting "Homogenized" Data*: The authors (Kossin 2020, Bhatia 2019) concede that the standard observational record (IBTRACS) is "heterogeneous" and "unsuitable for global trend analysis." The homogenized dataset creates a trend where raw observational data shows none. While statistical adjustment is valid to remove known artifacts (e.g., station moves or UHI), it is methodologically unsound to rely on a dataset where the processing itself—rather than the observation—generates the reported intensification signal. • *Data Discrepancy:* These homogenized datasets are not consistent. Bhatia et al. (2019) found that for global rapid intensification, the standard record and the homogenized record have *no correlation*; the variance explained between the two is only 1.8%. This deep uncertainty led the authors to warn that "any conclusions stemming from the global trend analysis must be treated with caution." This is the opposite of "robust evidence." *Flawed Study (Speculative Attribution):* The proposition conflates model-driven, storyline attribution with observed fact. The studies making causal claims (Bhatia 2019, Gilford & Pershing 2024) do not observe an attributed trend; rely on storyline attribution models that lack empirical validation. These attribution studies rely on counterfactual simulations that

	cannot be validated against historical observations because the counterfactual world does not exist. • *Model-Dependent Findings:* Gilford & Pershing (2024) create their headline finding (hurricanes are "8.3 m/s faster") by running climate model outputs through a "storyline attribution" framework. But this attribution is only as accurate as the counter-factual scenario its measured against. Given the complexity of disentangling natural and anthropogenic effects, creating an accurate counter-factual scenario is very, very difficult. • *Omission of Key Variables:* This "storyline" approach is a narrow, single-factor analysis. The authors explicitly admit "A limitation of this study is that it has not comprehensively assessed how nonlocal atmospheric responses ... could influence ... estimates" and does not account for critical confounding variables like "changes in atmospheric circulation or hurricane wind shear." This omission is problematic because the GHGs the authors are are attempting to attribute effects to would also cause "nonlocal atmospheric" effects. • *Attribution by Model Comparison:* Bhatia et al. (2019) base their attribution on the claim that the observed trend is "outside the range of normal climate variability defined by HiFLOR"—a high-resolution climate model. This conclusion is entirely dependent on that model's ability to "accurately represent natural variability," which is a significant, unprovable assumption. In summary, the proposition misrepresents its own sources on rainfall and track speed, and the "robust evidence" it cites for intensity is based on conflicting, statistically adjusted datasets and speculative, model-dependent attribution methods that omit key variables.

eNGO Endangerment Comment 123–24: Hurricane activity in the North Atlantic basin has increased since the 1970s. [924]	**Misrepresentation (Direct Contradiction):** Although literally true, this claim omits the study's central, critical conclusion: that the increase observed since the 1970s is merely a rebound from an anomalous low. As the abstract of the study explains "After homogenization, increases in basin-wide hurricane and major hurricane activity since the 1970s are not part of a century-scale increase, but a recovery from a deep minimum in the 1960s-1980s."
eNGO Endangerment Comment 124: The Draft CWG report's suggestion that uncertain trends in landfalling hurricanes ignores the increasing probability of tropical cyclones reaching major intensity, more frequent rapidly intensifying tropical cyclones, and slowed tropical cyclone track speeds. [925]	**Misrepresentation (Misleading Omission / Contradiction):** The commenters' claim is undermined by the very source it cites. The cited source, Sobel & Emanuel (2025), is not a primary research study but a short *Nature* comment. It does not present new data but provides a high-level perspective on the state of the science. As its title suggests, "Hurricane Risk in a Changing Climate — the Role of Uncertainty," the source contradicts the commenters' attempt to dismiss uncertainty. The source concludes that "there remains a high level of uncertainty" in the hurricane risk to the United States, and in their view, "at least some of the uncertainties are irreducible, and the true distributions are not, in general, knowable." The commenters' assertion of specific, certain trends (increasing intensity, rapid intensification, track speed) therefore significantly misrepresents the source's central theme.
eNGO Endangerment Comment 124: The frequency, intensity, and/or total amount of rainfall from	**Misleading Omission and Exaggeration:** The commenters' proposition that extreme precipitation has increased "across North America" is a significant oversimplification that omits critical context and contrary findings from the cited studies. The studies do not find a uniform, continent-wide trend.

[924] Vecchi et al., *Changes in Atlantic Major Hurricane Frequency Since the Late-19th Century*, 12 Nat. Commc'ns 4054 (2021), https://doi.org/10.1038/s41467-021-24268-5.

[925] Sobel & Emanuel, *Hurricane Risk in a Changing Climate — The Role of Uncertainty*, Nature (May 19, 2025), https://doi.org/10.1038/d41586-025-01552-8.

extreme precipitation events have increased across North America.[926]	• *Geographic Inconsistency:* The "across North America" claim is directly challenged by Sun et al. (2020), which explicitly identifies "relatively well-organized areas where the intensity of extreme precipitation seems to be weakening, such as the Canadian Prairies, [and] some parts of the western United States." • *Omission of High Uncertainty:* While the studies do find that a *majority* of stations show a positive trend (e.g., in Central and Eastern North America), the commenter omits the authors' own significant caveats. Sun et al. (2020) states that trends are "very noisy with widely scattered increasing and decreasing trends" and that its findings are consistent with other work that has concluded "a well-constrained estimate ... is difficult to obtain ... [due to a] weak signal compared to background year-to-year variability." **Flawed Study (Conflating Data Artifacts with Climatic Trends):** The studies themselves contain significant methodological caveats, acknowledged by the authors, which suggest the observed "trend" may be a statistical artifact of data quality issues rather than a reliable climatic signal. • *Acknowledged Data Inhomogeneity:* Sun et al. (2020) explicitly warns that "data quality remains a concern." The authors state that "Precipitation measurements are difficult to homogenize" and that the uncoordinated, widespread switch to "Automatic gauges

[926] Sun et al., *A Global, Continental, and Regional Analysis of Changes in Extreme Precipitation*, 34 J. Climate 243 (2021), https://doi.org/10.1175/JCLI-D-19-0892.1; Paik et al., *Determining the Anthropogenic Greenhouse Gas Contribution to the Observed Intensification of Extreme Precipitation*, 47 Geophysical Rsch. Letters e2019GL086875 (2020), https://doi.org/10.1029/2019GL086875; Dunn et al., *Development of an Updated Global Land In Situ-Based Data Set of Temperature and Precipitation Extremes: HadEX3*, 125 J. Geophysical Rsch.: Atmospheres e2019JD032263 (2020), https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019JD032263.

	... has no doubt induced inhomogeneities in the precipitation data we analyze that for the moment are unavoidable." Dunn et al. (2020) likewise confirms that the level of quality control and "homogeneity adjustment ... varies between the sources." These uncorrected, non-climatic changes in instrumentation are a known confounding variable that can create a spurious trend. **Conclusion Overreach (Failure of Attribution):** The commenters' implicit suggestion that this trend is a consequence of anthropogenic warming is not supported by the cited attribution study. • *Signal Not Detectable:* The Paik et al. (2020) study, which was designed specifically to attribute observed trends, *failed* to find a link in North America. The study concluded that "GHG signals are not detectable over ... NA [North America]." • *Trend Indistinguishable from Natural Variability:* Paik et al. also state that any influence of GHGs in North America cannot be statistically separated from "larger internal variability and intermodal uncertainties." This finding undermines any attempt to portray the noisy, data-artifact-laden trend as a robust, human-caused climatic change.
eNGO Endangerment Comment 124: There is robust evidence that human-caused warming has contributed to increased frequency and severity of the heaviest	**Misrepresentation (Exaggeration / Overclaiming):** The commenter's proposition that "robust evidence" shows human-caused warming has impacted precipitation "across 70% of the United States" is a significant exaggeration that is not supported by the cited sources. • *Unsupported Statistic:* Neither study cited provides this "70% of the United States" statistic. The figure appears to be a misreading of Diffenbaugh et al. That study finds that 73.6% of *available grid points in North America*—a region that includes Canada and Mexico—showed *an increase* in probability (defined as a ratio > 1) for the "wettest

precipitation events across 70% of the United States.[927]	day" metric relative to a "Natural" baseline. This finding is about the spatial *area* of *any* probability increase, not a specific measure of severity across 70% of the U.S. • *Contradictory Evidence:* The commenter's claim is further weakened by Kirchmeier-Young & Zhang (2020). That study found a *weaker* signal for the United States specifically, noting that attribution for the U.S. region as a whole was only achieved in *one* of the three models analyzed. The authors describe the US-specific results as "slightly weaker" than those for the North American mean. **Flawed Study (Conclusion Overreach and Reliance on "Hot" Models):** Furthermore, the commenter's claim of "robust evidence" ignores the significant model disagreements and methodological limitations explicitly acknowledged in the studies. • *Significant Model Disagreement:* Kirchmeier-Young & Zhang reveals profound disagreement on the *magnitude* of precipitation changes across models. It states that while the Canadian models (CanESM2, CanRCM4) showed strong trends, the CESM1 model's trend was "much smaller." • *Reliance on "Hot" Models:* The study's strongest results are driven by the models that show stronger warming. The authors explicitly concede that the model with the larger trend, CanESM2, "overestimates surface warming compared to observations." This reliance on a known "hot" model to drive the headline finding undermines the claim of robust attribution.

[927] Diffenbaugh et al., *Unprecedented Climate Events: Historical Changes, Aspirational Targets, and National Commitments*, 4 Sci. Advances eaao3354 (2018), https://doi.org/10.1126/sciadv.aao3354; Kirchmeier-Young & Zhang, *Human Influence Has Intensified Extreme Precipitation in North America*, 117 Proc. Nat'l Acad. Scis. 13,308 (2020), https://doi.org/10.1073/pnas.1921628117.

	• *Reliance on Mischaracterized Scenarios:* Diffenbaugh et al. predicates its future projections on the high-end RCP 8.5 scenario, which it misleadingly frames as the "UN commitment level." This treats an implausible, "worst-case" emissions pathway as a likely outcome, exaggerating the projected impacts.
eNGO Endangerment Comment 124: Rainfall frequency has increased across the continental United States since the 1950s, contributing to increased stream and river flooding.[928]	**Misrepresentation (Contradiction & Irrelevance):** The commenters' proposition is a misrepresentation of the cited sources. The claim that rainfall frequency has contributed to increased stream and river flooding is not supported and is directly challenged by the most relevant study cited. First, the only source that actually analyzes stream and river flood data, Mallakpour & Villarini (2015), finds "limited evidence of significant changes in the magnitude of flood peaks." The commenters fail to distinguish between flood *magnitude* (larger floods), which the study finds has *not* significantly changed, and flood *frequency* (more frequent, smaller events), which the study does find has increased in some areas. Second, the other two studies do not analyze *physical* stream and river flooding (i.e., stream gauge discharge) at all:

[928] Mallakpour & Villarini, *The Changing Nature of Flooding Across the Central United States*, 5 Nature Climate Change 250 (2015), https://doi.org/10.1038/nclimate2516; Kunkel et al., *Precipitation Extremes: Trends and Relationships with Average Precipitation and Precipitable Water in the Contiguous United States*, 59 J. Applied Meteorology & Climatology 125 (2020), https://doi.org/10.1175/JAMC-D-19-0185.1; Davenport et al., *Contribution of Historical Precipitation Change to US Flood Damages*, 118 Proc. Nat'l Acad. Scis. e2017524118 (2021), https://doi.org/10.1073/pnas.2017524118.

	• Kunkel et al. (2020) is a study of precipitation (rainfall) trends and their relationship to precipitable water (atmospheric moisture). It offers no findings on whether these rainfall trends have translated into observed increases in flooding. • Davenport et al. (2021) is an economic attribution study. It analyzes the monetary cost of flood damages and models the portion of that cost attributable to precipitation changes. It does not analyze trends in the physical volume or magnitude of floodwaters. **Misrepresentation (Exaggeration / Overclaiming):** The proposition exaggerates the geographic scope of the findings by claiming a trend "across the continental United States." The cited sources do not support this. Mallakpour & Villarini (2015) is explicitly limited to the central United States. Kunkel et al. (2020) explicitly refutes a uniform national trend, instead finding a "pronounced east-to-west gradient" with "strong upward trends east of the Rocky Mountains" and different results to the west. The commenter is improperly generalizing highly regional findings to the entire continent.
eNGO Endangerment Comment 124–25: The intensification of precipitation extremes is evident across various event durations as well as return intervals, particularly east of the Rocky Mountains.[929]	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' proposition is a significant exaggeration of the study's findings. The cited study, Dunn et al. (2020), does not analyze changes in precipitation extremes by "return intervals," as the commenter suggests. A return interval, also called a return period or recurrence interval, is the estimated average time between occurrences of an event of a certain magnitude, such as a flood or earthquake. The study's analysis is based on a specific set of 12 precipitation indices, which use fixed thresholds (e.g., R10mm, or days with precipitation less than or equal to 10 mm) and

[929] Dunn et al., *Development of an Updated Global Land In Situ-Based Data Set of Temperature and Precipitation Extremes: HadEX3*, 125 J. Geophysical Rsch.: Atmospheres e2019JD032263 (2020), https://doi.org/10.1029/2019JD032263.

	percentile-based thresholds (e.g., R95p, or precipitation on "very wet days" greater than 95th percentile). These percentile-based indices are not equivalent to a statistical analysis of return intervals, which are not mentioned or studied in the study. **Misleading Omission (Ignoring Stated Uncertainty):** The claim that intensification is "evident" omits the study's extensive and significant caveats regarding the profound uncertainty in precipitation trends. The authors repeatedly state that precipitation data is far less reliable than temperature data: • *Spatial Incoherence:* The study finds that "Spatial changes in the linear trends of precipitation indices ... are less spatially coherent than those for temperature indices" and "show spatially more heterogeneous patterns." • *Coverage Uncertainty:* The authors explicitly warn that the uncertainty from incomplete station coverage for precipitation is "consequently larger, in many cases being comparable to both the long- and short-term variability." This admission fundamentally undermines the claim that a clear, statistically "evident" trend has been identified. • *Data Quality:* The study is a composite of almost 37,000 stations from numerous different sources. The authors concede that "the level of quality control and homogeneity adjustment or assessment applied to each station varies between the sources" and that "We do no quality checks on the observed data." They further warn that the "homogenization techniques applied [by the original sources] may not be well suited for extremes."

	While the study does find an increase in the "Rx1day" (maximum 1-day precipitation) index in the "eastern half of North America," this single finding from a dataset with self-acknowledged limitations does not support the commenter's broad and certain proposition.
eNGO Endangerment Comment 125: Agricultural and ecological droughts have intensified on all continents, including North America, due to human-induced greenhouse gases.[930]	**Misrepresentation (Exaggeration / Overclaiming & Misleading Omission):** The commenters significantly overstate and misrepresent the findings of the cited literature regarding drought trends. The claim that agricultural and ecological droughts have *intensified on all continents* due solely to human-induced greenhouse gases is not directly supported and omits crucial context and contrary findings presented in the sources. • *Widespread Lack of Robust Trends:* Greve et al. (2014), analyzing over 300 dataset combinations from 1948-2005, found that "robust dryness changes *cannot be detected*" (emphasis added) over approximately three-quarters (75.4%) of the global land area. This directly contradicts the proposition's assertion of universal intensification. The study concluded that "aridity changes over land … have not followed a simple intensification of existing patterns." • *Role of Natural Variability & Uncertainty:* Dai & Zhao (2017) emphasize "[s]ubstantial uncertainties" in calculating historical drought changes, particularly due to forcing data choices. While identifying drying trends in some regions since 1950, they note these primarily resulted from precipitation changes linked to natural multi-decadal

[930] Greve et al., *Global Assessment of Trends in Wetting and Drying Over Land*, 7 Nature Geoscience 716 (2014), https://doi.org/10.1038/ngeo2247; Dai & Zhao, *Uncertainties in Historical Changes and Future Projections of Drought. Part I: Estimates of Historical Drought Changes*, 144 Climatic Change 519 (2017), https://doi.org/10.1007/s10584-016-1705-2; Spinoni et al., *A New Global Database of Meteorological Drought Events from 1951 to 2016*, 22 J. Hydrology: Regional Studs. 100593 (2019), https://doi.org/10.1016/j.ejrh.2019.100593; Williams et al., *Observed Impacts of Anthropogenic Climate Change on Wildfire in California*, 7 Earth's Future 892 (2019), https://doi.org/10.1029/2019EF001210.

	climate variations (Pacific sea surface temperatures), although warming since the 1980s has become an "increasingly important cause." The study notes that "large internal variability still dominates over GHG-induced drought trends" in many regions, including "southwestern North America, [and] South America." The commenters ignore the critical role of natural variability and the substantial uncertainties highlighted. • *Sensitivity to Metrics:* Spinoni et al. (2019) show that trends differ based on the drought index used. While the temperature-inclusive SPEI-12 indicated an approximately 10% increase in global drought frequency between 1951–80 and 1981–2016, the precipitation-only SPI-12 showed a nearly 3% decrease. This highlights that conclusions about intensification are sensitive to the chosen metric and the relative roles attributed to precipitation versus temperature changes. • *Geographic Specificity:* Williams et al. (2019) focuses specifically on wildfire trends in California, linking increased summer forest fire area strongly to warming-driven atmospheric aridity. However, these findings are specific to certain ecosystems (forests) and seasons (summer) *within one region* and do not support a *global* claim about the intensification of agricultural and ecological droughts. **Flawed Study (Acknowledged Data Limitations & Uncertainties):** The cited studies explicitly acknowledge significant limitations and uncertainties that undermine the commenters' unqualified proposition. • *Data Uncertainty:* Both Dai & Zhao (2017) and Greve et al. (2014) extensively discuss the major uncertainties stemming from the choice and quality of underlying climate datasets (precipitation, radiation, wind speed) used to calculate drought indices and

	potential evapotranspiration. Greve et al. specifically used over 2,000 dataset combinations to address this, finding massive areas with no robust detectable trend. The proposition ignores these fundamental data uncertainties. • *Debate on PET Role:* Spinoni et al. (2019) acknowledge the ongoing scientific debate regarding the role of temperature and potential evapotranspiration (PET) calculations in drought indices, noting that some formulations can overestimate PET and drought severity in arid areas. The different trends yielded by SPI versus SPEI in their study reflect this complexity. In summary, the commenters' claim presents an overly simplistic and alarmist generalization that is not substantiated by a critical reading of the cited sources. The literature points to a much more complex picture involving significant uncertainties, the influence of natural variability, differing regional trends, and sensitivity to the metrics used, with large portions of the globe showing no robust change.
eNGO Endangerment Comment 125: Drought conditions are regional with robust trends evident in the southwestern United States, which is experiencing the driest soil moisture conditions in the past 1,200 years, along with decreased Colorado River streamflow. These drought patterns interact with	**Misrepresentation (Exaggeration / Overclaiming):** The cited studies do not state that the region is experiencing the driest soil moisture conditions in the past 1,200 years." The studies' palaeoclimatological discussion is limited to *streamflow* reconstructions and a 12th-century megadrought by Udall & Overpeck (2017), which those authors do not claim is less severe than the current event. Milly & Dunne (2020) focuses on the physics of snow albedo and evaporation to estimate discharge sensitivity. It does not present a 1,200-year paleo-reconstruction of soil moisture. **Flawed Study (Reliance on Mischaracterized Scenarios):** In any event, Udall & Overpeck's most significant *future* projections—which are presented as a key takeaway —are

rising temperatures to create compounding stress on water resources and agricultural systems.[931]	derived from high-end emissions scenarios (SRES A2 and RCP 8.5). The authors explicitly mischaracterize these high emissions pathways as "business-as-usual." Udall & Overpeck's most dire end-of-century flow reduction estimates (e.g., -35% to -55%) are a direct product of this reliance on an extreme and unlikely baseline.
eNGO Endangerment Comment 125–26: Fire weather conditions have already become more probable in some regions and will become more frequent as global warming intensifies. This trend toward more dangerous fire weather intersects with drought and temperature extremes to create heightened wildfire risk across multiple regions.[932]	**Flawed Study (Conclusion Overreach / Minimizing Confounding Factors):** The proposition, while accurately reflecting the conclusions of the cited sources, relies on studies that methodologically minimize or dismiss the primary non-climatic drivers of wildfire, thereby overstating the role of climate. The studies acknowledge that factors like "the legacy of fire suppression": and "human ignitions" are critical. However, to isolate the climate signal they either: (a) statistically dismiss these factors as non-contributors to the observed trend (e.g., Williams et al. (2019) (arguing their modeled relationship with fire was "stable" and so not "overtaken by another climatic or nonclimatic variable"); Abatzoglou & Williams (2016) (treating climate factors "as independent" from "confounding influences" like "the effects of fire management … ignition, …exurban development)" or (b) explicitly assume in future projections that "human and management effects" will remain "time-invariant" over the course of their projections (e.g., Abatzoglou et al. (2021)). These assumptions are highly speculative and effectively treat decades of complex, evolving forest management and fuel

[931] Udall & Overpeck, *The Twenty-First Century Colorado River Hot Drought and Implications for the Future*, 53 Water Res. Rsch. 2404 (2017), https://doi.org/10.1002/2016WR019638; Milly & Dunne, *Colorado River Flow Dwindles as Warming-Driven Loss of Reflective Snow Energizes Evaporation*, 367 Science 1252 (2020), https://doi.org/10.1126/science.aay9187.

[932] Jolly et al., *Climate-Induced Variations in Global Wildfire Danger from 1979 to 2013*, 6 Nat. Commc'ns 7537 (2015), https://doi.org/10.1038/ncomms8537; Abatzoglou & Williams, *Impact of Anthropogenic Climate Change on Wildfire Across Western US Forests*, 113 Proc. Nat'l Acad. Scis. 11,770 (2016), https://doi.org/10.1073/pnas.1607171113; Williams et al. (2019); Abatzoglou et al. (2021).

	accumulation as a static background condition, rather than a primary driver of the observed changes. **Flawed Study (Model-Derived Attribution Presented as Fact):** The key attribution claims in the studies are not observed facts but the outputs of model-on-model calculations. For instance, the claim that anthropogenic climate change "contributed to an additional 4.2 million ha of forest fire area"(Abatzoglou & Williams (2016)) is a model-derived figure. It is the result of a regression model that uses a counterfactual baseline without the effects of projected anthropogenic climate change, which itself is created by subtracting the mean simulated trend from 27 climate models (CMIP5) from the observational record. The study's conclusion is therefore entirely contingent on the debatable assumption that this "multimodel mean" accurately represents the sole impact of anthropogenic climate change.
eNGO Endangerment Comment 126: In the U.S., the high severity burned area has significantly increased across most ecoregions over the past several decades, with an eightfold increase observed in the Western U.S., and this increase is linked to warmer and drier fire seasons.[933]	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' claim, while accurately quoting the study's abstract, rests on a headline claim that is undermined by the study's data. The "eightfold increase" is in the total area burned at high severity, a figure that conflates an increase in total acres burned with an increase in fire severity itself. A closer analysis of the data reveals that the more precise metrics for severity—the annual mean fire severity and the annual proportion burned at high severity—showed no statistically significant trend for the Western US as a whole, and only one ecoregion should a statistically significant trend for either metric individually. The authors concede this, stating that "the observed increases in [total area burned at high severity] largely reflect increases in [total annual area burned]," not a fundamental shift in the character or intensity of the fires. The study finds

[933] Parks & Abatzoglou, *Warmer and Drier Fire Seasons Contribute to Increases in Area Burned at High Severity in Western US Forests From 1985 to 2017*, 47 Geophysical Rsch. Letters e2020GL089858 (2020), https://doi.org/10.1029/2020GL089858.

	that "there is only limited evidence in increasing fire severity" which the authors note "is consistent with previous fire severity studies." **Flawed Study (Correlation vs. Causation):** The study also fails to establish a causal link between climate change and the observed increase in burned area, relying instead on simple correlation. The study finds that warmer/drier fire seasons "corresponded with" or were "coincident with" the increase in fire activity. This correlational analysis does not methodologically isolate the effects of a changing climate from other dominant, non-climatic factors, such as the well-documented accumulation of fuel loads from decades of fire suppression policies, which the study acknowledges is a critical caveat. **Flawed Study (Cherry-Picking of Timeframes and Context):** The study's finding of a "trend" in fire severity is based on a relatively short 33-year timeframe (1985–2017) that is explicitly chosen after the upward trend in burned area was already known to have begun. This selective timeframe risks exaggerating the trend's significance. Most importantly, the study's discussion section explicitly states that "there is not a clear scientific consensus regarding temporal trends in fire severity," context that directly contradicts the certainty implied by the study's abstract and the commenters' claim.
eNGO Endangerment Comment 126: It is very likely that negative impacts of fire will worsen in the future due to climate change.[934]	**Misrepresentation (Misleading Omission / Exaggeration):** The commenters' claim—that "it is very likely that negative impacts of fire will worsen in the future"—is a significant exaggeration of the cited study's highly nuanced findings. The study, Halofsky et al. (2020), does not make this broad claim. Instead, the study's core analysis is a specific risk assessment that varies substantially by forest type. For "moist coniferous forests" (e.g., west-side

[934] Halofsky et al., *Changing Wildfire, Changing Forests: The Effects of Climate Change on Fire Regimes and Vegetation in the Pacific Northwest, USA*, 16 Fire Ecology 4 (2020), https://doi.org/10.1186/s42408-019-0062-8.

	Cascades, Olympics), the study finds the climate-fire risk to be "relatively low," and the "Likelihood of consequences" for increased wildfire frequency, extent, and severity is rated as "Low." The commenters proposition misleadingly omits this critical, countervailing finding. It appears to improperly extrapolate the study's "high" risk assessment, which applies *only* to "dry coniferous forests," and present it as a universal fact for the entire region. **Flawed Study (False Certainty / Conclusion Overreach):** Furthermore, the commenters' tone of high certainty ("very likely") is undermined by the significant uncertainties and contrary data acknowledged within the study itself. The commenters ignore these crucial qualifications, presenting speculative projections as established facts. • *Observed Data Contradiction:* The study reviews observed data from 1985 to 2010 and states that "the proportion of area burning at high severity did not increase ... either for the region as a whole or for any subregion." • *Causality Acknowledged as Complex:* The study concedes that "bottom-up controls such as vegetation, fuels, and topography are more important drivers of fire severity than climate" in many Western forests. • *Projections are Speculative:* The study's most dramatic future projections are explicitly tied to "a hot, dry scenario" and it acknowledges that key drivers, like future precipitation and lightning, remain "less certain" or "equivocal."
eNGO Endangerment Comment 126: Concurrent heatwaves and	**Misrepresentation (Misleading Omission):** The commenters' claim that there is "strong evidence" for the increasing probability of compound events, is directly undermined by the

droughts are becoming more likely, with strong evidence that human-caused climate change has increased the probability of such compound events. [935]	sources cited. Herrera-Estrada &Sheffield (2017), cited for support, does not find "strong evidence" but instead concludes the *opposite*, finding "large uncertainty" in these projections. That study's central conclusion is that the range of model projections is "large and there is no absolute consensus on the sign of most of these changes across regions." The commenters' claim of "strong evidence" is a misleading omission of the unreliability and uncertainty of such projections. **Flawed Study (Reliance on Mischaracterized Scenarios):** The forward-looking claims in *all four studies cited* are predicated on high-end, "worst-case" emissions scenarios, primarily RCP 8.5. Diffenbaugh et al. (2018) bases its "UN commitment level" (~2-3 °C) projections on the 2036–55 period of the RCP 8.5 scenario. Zscheischler & Seneviratne (2017) study bases its future projections on "climate projections with the strongest greenhouse-gas forcing for the future (RCP8.5, 2006–2100)." Sarhadi et al. (2018) and Herrera-Estrada & Sheffield (2017) also use RCP 8.5 as the high-end basis for their future projections. These studies rely on an implausible, low-probability scenario to generate their most alarming future projections, exaggerating the likely risk. **Flawed Study (Insufficient Data / Timeframe Selection):** The studies' historical analyses are based on limited timeframes that are insufficient to separate long-term trends from natural variability. Herrera-Estrada & Sheffield (2017) explicitly caveats this weakness, noting its

[935] Diffenbaugh et al. (2018); Zscheischler & Seneviratne, *Dependence of Drivers Affects Risks Associated with Compound Events*, 3 Sci. Advances e1700263 (2017), https://doi.org/10.1126/sciadv.1700263; Herrera-Estrada & Sheffield, *Uncertainties in Future Projections of Summer Droughts and Heat Waves over the Contiguous United States*, 30 J. Climate 6225 (2017), https://doi.org/10.1175/JCLI-D-16-0491.1; Sarhadi et al., *Multidimensional Risk in a Nonstationary Climate: Joint Probability of Increasingly Severe Warm and Dry Conditions*, 4 Sci. Advances eaau3487 (2018), https://doi.org/10.1126/sciadv.aau3487.

	historical analysis was "calculated from the limited time period of 1979–2005 that spans 27 years, so decadal variability is not fully captured." Attributing "strong evidence" to a trend derived from a dataset that the authors admit does not capture full decadal variability is methodologically flawed.
eNGO Endangerment Comment 126: Mortality effects for each hurricane can persist for 15 years.[936]	**Flawed Study (False Certainty / Speculative Causation):** The claim of the commenters, while an accurate summary of the cited study's abstract, is based on a finding of *statistical correlation*, not observable causation. The study does not identify a verifiable mechanism for these long-term "excess deaths." Instead, it attributes mortality to "complex chains of events" and "indirect deaths" for which the authors explicitly state the "underlying mechanisms" are unknown. The study's causal claim rests on speculative, non-obvious pathways, such as mortality in infants who, as the study notes, "were not conceived prior to landfall." **Flawed Study (Conclusion Overreach):** The study's extraordinary claim—that mortality effects persist for 14-15 years —is the product of a complex, opaque "deconvolution" statistical model, not a direct observation of fatalities. The authors themselves concede the finding is "surprising" and that they "initially believed that these findings resulted from calculation errors." Attributing 3.2–5.1% of *all* deaths in the contiguous US to this statistically-derived, long-lagged "impulse" peaking nearly six years after the event represents a significant conclusion unsupported by verifiable, empirical evidence of causation or even any vaguely plausible mechanism.

[936] Young & Hsiang, *Mortality Caused by Tropical Cyclones in the United States*, 635 Nature 121 (2024), https://doi.org/10.1038/s41586-024-07945-5.

eNGO Endangerment Comment 127–28: The Draft CWG Report uses inappropriate metrics and spatial/temporal scales (large averages, 5-day precipitation, global wildfire area) that obscure significant underlying trends in extreme weather, specifically citing increases in western U.S. wildfires and a "two-fold" increase in the global frequency of extreme wildfires.[937]	**Misrepresentation (Ignoring Context / Scope):** The commenters assert the Draft CWG Report uses metrics designed to "obscure" signals, but this misrepresents the report's purpose and methodology. The report appropriately uses national and large-regional averages (e.g., for U.S. drought area, heatwave context) and standard metrics (e.g., global burned area, U.S. fire counts) to evaluate overall, long-term trends relevant to the U.S. national context. This approach provides statistical robustness and avoids cherry-picking specific regions or metrics that might show alarming trends while ignoring others that do not. The report *does* incorporate regional analysis where appropriate (e.g., comparing Western vs. Eastern U.S. heatwaves) and discusses contributing factors beyond climate, like forest management. Studies cited by the commenter, such as Spinoni et al. (2019) on drought, also utilize macro-regional scales, confirming the validity of analysis beyond the grid-point level. The commenters wrongly characterize certain metrics as inappropriate. But these criticisms miss the mark. For example: • Using 5-day precipitation totals is a valid method for analyzing significant rainfall accumulation relevant to flooding, especially given the superior availability and consistency of long-term daily precipitation data compared to sparse sub-daily records.

[937] Neiman et al., *Meteorological Characteristics and Overland Precipitation Impacts of Atmospheric Rivers Affecting the West Coast of North America Based on Eight Years of SSM/I Satellite Observations*, 9 J. Hydrometeorology 22 (2008), https://doi.org/10.1175/2007JHM855.1; Guirguis et al., *Four Atmospheric Circulation Regimes Over the North Pacific and Their Relationship to California Precipitation on Daily to Seasonal Timescales*, 47 Geophysical Rsch. Letters e2020GL087609 (2020), https://doi.org/10.1029/2020GL087609; Spinoni et al. (2019); O'Gorman, *Precipitation Extremes Under Climate Change*, 1 Current Climate Change Reps. 49 (2015), https://doi.org/10.1007/s40641-015-0009-3; Cunningham et al., *Increasing Frequency and Intensity of the Most Extreme Wildfires on Earth*, 8 Nature Ecology & Evolution 1 (2024), https://doi.org/10.1038/s41559-024-02452-2.

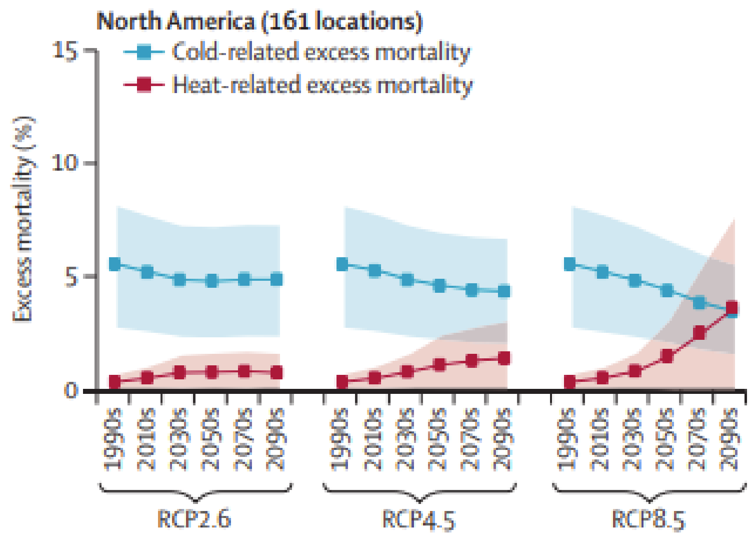
	• Addressing global burned area is necessary because it is a frequently cited metric, often used (incorrectly) to dismiss all wildfire concerns due to its overall decline. The Draft CWG Report contextualizes this by examining U.S. fire counts (stable since the 80s) and historical fire deficits. • The commenters reference to the "two-fold" increase in global frequency of extreme wildfires refers to a specific, novel metric developed in Cunninham et al. (2024) based on Fire Radiative Power clusters. This is distinct from total global area burned (which the study acknowledges may be declining) and distinct from the total number of fires (which the CWG report shows has not increased in the U.S. since the 1980s).While that finding may be valid for that specific definition, it does not negate the Draft CWG Report's findings using other standard metrics like total U.S. fire counts or historical context, which show a different picture. The commenter selectively emphasizes one metric suggesting worsening conditions while ignoring others presented by the CWG Report that provide crucial balance and context.
eNGO Endangerment Comment 128–29: The Draft CWG Report inaccurately assesses extreme weather impacts by exclusively using the Billion Dollar Disasters dataset, ignoring other relevant metrics like health statistics	**Misrepresentation (Exaggeration / Overclaiming & Misleading Omission):** The commenters' claim that the Draft CWG Report relies solely on Billion Dollar Disasters (BDD) data is inaccurate and misrepresents the report's scope. While the report does critique the BDD dataset in Section 10.2, citing analyses showing normalized disaster losses as a percentage of GDP have actually *decreased*, it utilizes multiple lines of evidence beyond BDD to assess impacts. • Chapter 6 extensively analyzes historical trends in various extreme weather events (hurricanes, temperature extremes, precipitation, tornadoes, floods, droughts,

(morbidity/mortality), crop yields, and satellite flood data.[938]	wildfires) using long-term observational datasets from sources like NOAA, often finding no significant increasing trends attributable to human influence. • Chapter 9 discusses impacts on U.S. agriculture, referencing econometric studies, field experiments (FACE), and crop modeling, concluding that climate change, including CO_2 fertilization, has likely been neutral or beneficial. • Section 10.3 directly addresses mortality from temperature extremes using EPA/CDC data and epidemiological studies like Gasparrini et al. (2015), Barreca et al. (2016), and Wang et al. (2018) The commenters cite sources on morbidity and mortality (Ebi et al., Baker et al., Ma et al.), crop yields (Kuwayama et al.), and satellite flood data (Tellman et al.), but these do not refute the CWG report's broader analysis. For example, Tellman et al. finds increased *exposure* to floods primarily due to population shifts, not necessarily increased flood *hazard*, consistent with the CWG report's finding of no robust trend in U.S. flood magnitude. Kuwayama et al. finds negative drought impacts on yield but little impact on farm income, whereas the CWG report considers the net effect including CO_2 fertilization.
eNGO Endangerment Comment 129: The Draft CWG Report misunderstands temperature-	**Misrepresentation (Misleading Omission):** The commenters critique the report's statement that "Mortality during heat extremes is typically caused by heat stroke and heat exhaustion" as incomplete, citing other causes like cardiovascular issues. But the report's

[938] Baker et al., *Infectious Disease in an Era of Global Change*, 20 Nature Revs. Microbiology 193 (2022), https://doi.org/10.1038/s41579-021-00639-z; Ebi et al., *Extreme Weather and Climate Change: Population Health and Health System Implications*, 42 Ann. Rev. Pub. Health 293 (2021), https://doi.org/10.1146/annurev-publhealth-012420-105026; Kuwayama et al., *Estimating the Impact of Drought on Agriculture Using the US Drought Monitor*, 101 Am. J. Agric. Econ. 193 (2019); Tellman et al., *Satellite Imaging Reveals Increased Proportion of Population Exposed to Floods*, 596 Nature 80 (2021), https://doi.org/10.1038/s41586-021-03695-w.

related mortality causes, incorrectly limiting them primarily to heat stroke/exhaustion, whereas many cardiovascular, respiratory, and mental diseases are also implicated.[939]	statement uses the word "typically" and focuses on the most direct physiological impacts unique to heat, contrasting them with cold impacts like hypothermia and heart strain. It does not claim these are the *only* causes. Critically, the commenters omit the main point of the CWG report's Section 10.3: historically and globally, cold weather causes substantially more mortality than hot weather. This core finding is supported by the EPA/CDC data cited and by Gasparrini et al. (2015), which found cold killed ~14 times more people than heat in the U.S. based on 1985–2012 data. Even Ma et al. (2020), cited by the commenter, found cold responsible for a larger fraction of total mortality than heat in their study area. The study states: "In total, 11.98% … of mortality was attributable to heat and cold, with 3.49% … attributable to heat and 8.48% … attributable to cold." The commenters' focus on the nuance of heat-related causes ignores the report's central, evidence-based argument about the relative risks of cold versus heat. **Out of Scope:** Further, the harms in Ma et al. (2020), cited by the commenters, are experienced outside of the United States, since the study analyzes mortality data exclusively from Jiangsu Province, China. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. Evidence regarding health impacts in specific Chinese provinces does not directly inform the endangerment to public health and welfare in the United States.

[939] Ma et al., *Burden of Cause-Specific Mortality Attributable to Heat and Cold: A Multicity Time-Series Study in Jiangsu Province, China*, 144 Env't Int'l 105994 (2020), https://doi.org/10.1016/j.envint.2020.105994.

eNGO Endangerment Comment 129: The Draft CWG Report misleadingly cites a 2015 study on historical temperature-related deaths while omitting a subsequent 2017 projection study by the same lead author, which reportedly found that future heat-related deaths would outweigh reductions in cold-related deaths without significant emissions cuts.[940]	**Misrepresentation (Exaggeration / Overclaiming):** The CWG report accurately uses Gasparrini et al. (2015) to describe observed, historical mortality patterns showing a much higher burden from cold than heat. **Flawed Study Critique (Reliance on Mischaracterized Scenarios & Ignoring Adaptation):** Gasparrini et al. (2017) makes projections, not observations, based on climate models and scenarios. Its conclusion that heat deaths will outpace cold reductions relies heavily on high-emission scenarios like RCP 8.5 – a scenario the CWG report finds implausible and misused. Indeed, the only scenario in which the study predicts "increased heat-related deaths will outpace reduction in cold-related deaths" in North America is under RCP 8.5. In all other scenarios, cold-deaths continue to be far more significant. 

[940] Gasparrini et al., *Projections of Temperature-Related Excess Mortality Under Climate Change Scenarios*, 1 Lancet Planetary Health e360 (2017), https://doi.org/10.1016/s2542-5196(17)30156-0.

	More significantly, Gasparrini et al. (2017) explicitly assumes no adaptation to future warming. This assumption is unrealistic and directly contradicted by historical evidence presented in the CWG report (Section 10.3.1), which shows that adaptation (e.g., air conditioning adoption) has led to dramatic *declines* in heat-related mortality risks in the U.S. over recent decades, despite warming. Studies incorporating adaptation, like Wang et al. (2018), project stable or even *decreasing* U.S. heat mortality by 2050. The omission of the 2017 projection study is not misleading; rather, it reflects a valid choice to prioritize observed data and historical trends demonstrating adaptation over speculative projections based on implausible scenarios and unrealistic "no adaptation" assumptions.
eNGO Endangerment Comment 129–30: Both adaptation and mitigation are necessary to address climate risks.[941]	**Misrepresentation:** The eNGOs' assertion that both mitigation and adaptation are "necessary" relies on literature that aggregates policy ambitions rather than empirical cost-benefit analyses. Neither cited source provides a causal determination that mitigation is "necessary" to avoid specific harms; rather, they simply catalog what various entities *are doing* or *could do*. Gupta & Shukla (2024) is not a primary scientific study but a descriptive review of "policy documents" from a hand-picked selection of cities. By summarizing the climate action plans of cities like Amsterdam, Singapore, and Copenhagen, the authors create a circular justification: they present the existence of these political targets as proof of their technical necessity. The study explicitly notes that while mitigation provides "global benefits that are, however, postponed," adaptation yields "immediate returns" and "net benefits being larger

[941] Lawler et al., *Mitigation and Adaptation Strategies to Reduce Climate Vulnerabilities and Maintain Ecosystem Services*, *in* Climate Vulnerability 315 (2013), https://doi.org/10.1016/B978-0-12-384703-4.00436-6; Gupta & Shukla, *Optimal Approaches in Global Warming Mitigation and Adaptation Strategies at City Scale*, 5 Discov. Sustain. 272 (2024), https://doi.org/10.1007/s43621-024-00497-8.

	at regional scales." This admission undermines the eNGOs' claim that local mitigation is equally "necessary," as the source itself acknowledges the economic disparity between the two approaches. Lawler et al. (2013) is similarly a broad overview chapter that lists potential options without rigorously evaluating their economic feasibility or necessity. It conflates standard conservation practices with highly speculative interventions, lending undue credibility to the latter. **Flawed Study (Conflating Speculation with Strategy):** Lawler et al. (2013) demonstrates a significant flaw by framing high-risk, unproven interventions as strategies on par with conventional efficiency standards. For example, the study promotes "Assisted Colonization"—the intentional introduction of species to non-native ranges—as a valid adaptation tool, despite admitting it is "controversial for both ethical and ecological reasons" and carries risks of creating invasive species problems. The authors also dedicate specific attention to "Geoengineering," explicitly discussing the injection of "sulfate aerosols into the stratosphere" to reflect solar radiation. It is deeply ironic that the eNGO cites a study proposing the intentional release of aerosols to cool the planet—effectively mimicking the cooling properties of pollution that the Clean Air Act was designed to eliminate. This concession in the literature implies that GHG concentrations are not the sole driver of temperature and that other atmospheric variables are potent enough to offset them. The eNGOs' reliance on these studies obscures the historical reality that humans are highly capable of autonomous adaptation. Lawler et al. admit that adaptation includes "autonomous" adjustments by private actors. History demonstrates that human resilience to extreme weather has improved dramatically due to wealth and technology (e.g., air conditioning, safer infrastructure), independent of emissions reductions. By insisting that mitigation is "necessary," the comment ignores that societal resilience is often a function of

	economic development—which expensive mitigation mandates threaten to stifle—rather than atmospheric carbon levels. Gupta & Shukla inadvertently highlights the economic irrationality of city-scale or national-scale mitigation mandates. The authors admit that "Mitigation actions occur predominantly at the country and regional scale, with net benefits being larger on a global scale." This confirms the classic free rider problem: costs are borne locally by the regulated entity (or city), while the benefits are diffused globally, allowing non-regulating jurisdictions (e.g., China or India) to free-ride. The study contrasts this with adaptation, where "net benefits [are] larger at regional scales, making them more attractive." The source itself provides the economic argument *against* the eNGOs' position, suggesting that adaptation is the rational, self-interested investment for a jurisdiction, whereas mitigation is an act of economic self-sacrifice with "postponed" benefits. **Out of Scope:** Further, many of the harms and case studies in the cited materials are experienced outside of the United States or will occur only long in the future. Gupta & Shukla (2024) relies heavily on case studies of non-U.S. cities, including Amsterdam (Netherlands), Singapore, Ahmedabad (India), Copenhagen (Denmark), Hamburg (Germany), and Vancouver (Canada). Lawler et al. (2013) discusses impacts and strategies in global contexts, such as the relocation of the population of the Maldive Islands to India or Sri Lanka, deforestation in South America and Africa, and swidden agriculturalists in Southeast Asia. Both studies focus on long-term horizons that exceed the relevant timeframe for current vehicle standards. Lawler et al. discuss climate combinations emerging within the "next 50–100 years" and urban slum projections for 2050. Gupta & Shukla focus on "long-term efforts" spanning the "next 50 to 100 years." As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or

	contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 130: The Draft CWG Report wrongly assumes that adaptation alone will be sufficient to reduce the risks from extreme weather because even if adaptation strategies may reduce damage somewhat, the evidence shows that this is not occurring fast enough in relation to climate change.[942]	**Misrepresentation (Misleading Omission):** The commenters' claim misrepresents the central conclusion of the cited studies. The commenter cherry-picks the *problem statement* from these studies (i.e., that current adaptation efforts are lagging) to imply that adaptation is an insufficient or failing strategy. This omits the authors' actual conclusions. The sources cited use this "adaptation gap" to argue the *opposite*: that more, better-funded, and accelerated adaptation is urgently required. • Ebi (2024), cited for the claim that risk management "is not keeping pace," concludes not by stating adaptation is futile, but with an urgent call for *more* investment in adaptation, stating, "Coordinated transdisciplinary research and implementation are urgently needed.... The second best time [to have invested] is now.". • Brown et al. (2019), cited for the claim that adaptation measures have "external costs," concludes by advocating for specific adaptations—namely, improving irrigation efficiency and reducing institutional barriers to water transfers. • Parker et al. (2019) concludes by calling for "focused research on crop responses and sustainable adaptation strategies".

[942] Parker et al., *Extreme Heat Effects on Perennial Crops and Strategies for Sustaining Future Production*, 295 Plant Sci. 110397 (2020), https://doi.org/10.1016/j.plantsci.2019.110397; Brown et al., *Adaptation to Future Water Shortages in the United States Caused by Population Growth and Climate Change*, 7 Earth's Future 219 (2019), https://doi.org/10.1029/2018EF001091; Ebi, *Understanding the Risks of Compound Climate Events and Cascading Risks*, 2 Dialogues on Climate Change 33 (2024), https://doi.org/10.1177/29768659241304857.

	The commenter has taken the studies' call to action for adaptation and misrepresented it as claim that adaptation will be ineffective. **Flawed Study (Conflating Variables and Scenario Reliance):** The cited sources are unsuitable for supporting the commenters' sweeping claim, as their findings are based on speculative assumptions and "worst-case" scenarios. • *Conflating Climate with Demographics:* The Brown et al. (2021) study's projected water "shortages" are not driven solely by climate change. The model's results are heavily confounded by a built-in, non-climate assumption that the U.S. population will increase by 67% (from 308 million to 514 million) by 2100. The projected shortages are as much a product of this speculative demographic boom as they are of any climate signal. • *Reliance on "Worst-Case" Scenarios:* Parker et al. (2019), a literature review focused narrowly on California crops, bases its most dramatic projections (e.g., Figures 2 and 4) on high-end, "worst-case" emissions scenarios (RCP 8.5 and SRES A2), which are increasingly considered low-probability outcomes. • *Weak Sourcing:* Ebi (2024) is a "Commentary," not new primary research, and supports its claims by citing non-peer-reviewed pre-prints (medRxiv) and news articles. **Misrepresentation:** The eNGOs also ignore that their cited studies emphasize the strong neglect of adaptation in the literature. Parker et al. admit that the models cited (which predict reduced suitability for winegrapes) are flawed because they ignore human adaptation. The authors explain: "However, these future distribution and suitability models are not based on grapevine physiology ... and adaptive practices were not considered despite adaptive

	management having the capacity to cut potential California winegrape production losses by more than half." Further, Brown et al. admit that past water withdrawals stabilized around 1985 despite population growth because of adaptation. This historical data suggests that adaptation decouples population growth from water shortages, undermining the assumption that future population growth must inevitably lead to shortage. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. Specifically, the Brown et al. (2019) study relies on a "far future" analysis period of 2071–95, and the Parker et al. (2019) study relies on climate projections extending to 2099. Additionally, the Ebi (2024) commentary relies on international examples of climate impacts, including cyclones in Vanuatu and dengue fever trends in Asia, which are outside the relevant geographic scope.
eNGO Endangerment Comment 130: As extreme weather events become more frequent, impacts can compound if recovery is still in progress before the next event.[943]	**Flawed Study (False Certainty / Speculative Causation):** The commenters' claim, while an accurate summary of the study's abstract, is based on a finding of statistical correlation, not observable causation. As discussed previously in this document, the study does not identify a verifiable mechanism for these long-term "excess deaths." Instead, it attributes mortality to "complex chains of events" and "indirect deaths" for which the authors explicitly state the "underlying mechanisms" are unknown. The study's causal claim rests on speculative, non-

[943] Young & Hsiang, *Mortality Caused by Tropical Cyclones in the United States*, 635 Nature 121 (2024), https://doi.org/10.1038/s41586-024-07945-5.

	obvious pathways, such as mortality in infants who, as the study notes, "were not conceived prior to landfall." **Flawed Study (Conclusion Overreach):** Furthermore, the study's extraordinary claim—that mortality effects persist for 14–15 years—is the product of the complex, opaque "deconvolution" statistical model already critiqued above, not a direct observation of fatalities. The authors themselves concede the finding is "surprising" and that they "initially believed that these findings resulted from calculation errors." Indeed, the authors found there was a long-lagged "impulse" peaking nearly six years after the event representing 3.2–5.1% of total deaths, a significant conclusion unsupported by verifiable, empirical evidence of causation or even any vaguely plausible mechanism.
eNGO Endangerment Comment at 130: Climate change is increasing the likelihood of cascading risks—for example high temperatures that lead to drought, crop failures, malnutrition, and increased vulnerability to infectious diseases.[944]	**Flawed Study (Conclusion Overreach / Misattribution):** The commenters' claim is drawn directly from Semenza et al. (2022), but that study should be given little weight as its core methodology is flawed. The study's "cascading risk" framework systematically conflates the impacts of specific weather events with the impacts of long-term climate change. The study builds its thesis by linking disease outbreaks to "climate hazards" like hurricanes, floods, and droughts. This is a significant overreach. The study's own examples show that these outbreaks are proximately caused by secondary, non-climatic factors, such as the "breakdown of vector control programs," "compromised [Water, Sanitation, and Hygiene] systems," or "inadequate sanitation infrastructure." The study thus fundamentally misattributes the consequences of infrastructure vulnerability and societal failures to climate.

[944] Semenza et al., *Climate Change and Cascading Risks from Infectious Disease*, 11 Infectious Diseases & Therapy 1371 (2022), https://doi.org/10.1007/s40121-022-00647-3.

	Flawed Study (Reliance on Mischaracterized Scenarios): When the study shifts from analyzing past events to projecting future risk, its conclusions are predicated on high-end, worst-case emissions scenarios, including RCP 8.5. The study presents these scenarios (e.g., in Figure 2) without qualification, omitting the critical context that they are now widely considered low-probability, high-impact pathways, not plausible "business-as-usual" projections. This reliance on an implausible baseline mechanically exaggerates the study's projected impacts. **Flawed Study (False Certainty):** The study's definitive claims, such as those in its abstract, are undermined by the speculative and non-causal language used in the body of the text. To connect specific weather events to disease outbreaks, the study frequently relies on weak, qualified language, such as "seem to have contributed," "might have created," and "could have activated." This reveals a high degree of uncertainty that is masked by the study's alarmist conclusions. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. The study is explicitly global in nature, focusing heavily on transmission risks in "Asia, sub-Saharan Africa, and South America" and outbreaks in Europe, with specific case studies drawn from Yemen, Mozambique, and Pakistan. Furthermore, the study relies on projections that extend well beyond the relevant timeframe, utilizing models that forecast changes in vector abundance for the period "2090–2099." As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 130–31: The climate will cross hard	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' claim, regarding "extreme heat thresholds" that the climate "will cross ... by mid-century," misrepresents the

limits, those to which we can no longer adapt, by mid-century, including extreme heat thresholds intolerable to the human body and islands made uninhabitable due to sea level rise and lack of fresh water.[945]	central findings of Raymond et al. (2020). The study's primary finding is not about a future event, but that these extreme wet-bulb temperature thresholds "have already reported" in weather station data. Crucially, the commenters omit the study's explicit and significant qualifications: these observed exceedances are not a persistent, widespread "hard limit" but are "highly localized in both space and time" and "have mostly occurred only for 1- to 2-hours' duration." These temperatures may be intolerable to the human body, but we seem to be doing a fairly good job of adapting to those risks where they exist. Indeed, the study supports this inference, noting a "paucity of reported mortality and morbidity impacts associated with observed near 35 °C conditions," which implies that despite hitting these theoretical "hard limits," widespread catastrophic mortality has not yet occurred. And as noted above, deaths from extreme heat are far below deaths from extreme cold, and will remain as such in all but the worst climate scenarios. **Flawed Study (Reliance on Mischaracterized Scenarios):** The commenters' claim regarding island uninhabitability by "mid-century" is drawn from Kane & Fletcher (2020), but this claim is predicated on a methodologically questionable assumption. The study's "mid-century" conclusion is entirely dependent on its selection of the "intermediate-high" anthropogenic sea level rise (ASLR) scenario, which it projects will reach 1.91 meters by 2100. The study repeatedly frames this 1.91-meter scenario as the "most likely scenario". This characterization is fundamentally flawed. The study's own literature review justifies using

[945] Raymond et al., *The Emergence of Heat and Humidity Too Severe for Human Tolerance*, 6 Sci. Advances eaaw1838 (2020), https://doi.org/10.1126/sciadv.aaw1838; Kane & Fletcher, *Rethinking Reef Island Stability in Relation to Anthropogenic Sea Level Rise*, 8 Earth's Future e2020EF001525 (2020), https://doi.org/10.1029/2020EF001525.

	high-end projections by noting that IPCC models may be "overly conservative" and citing an expert survey that found a "1 in 20 chance (5%) that seas could rise by more than 2 m by 2100". This is a critical flaw in the study's reasoning: it conflates a low-probability, high-impact tail risk (a 5% chance) with the "most likely" outcome. The study's alarming "mid-century" conclusions about habitability are not a forecast of a probable event, but rather a speculative projection based on a "worst-case" scenario that the authors have arbitrarily relabeled as "most likely." **Out of Scope:** Further, many of the harms in the cited studies are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. Specifically, Kane & Fletcher (2020) focuses exclusively on atoll islands within the sovereign Republic of the Marshall Islands. The geological and hydrological vulnerability of these atolls is distinct to that region and does not represent impacts within the United States. Similarly, while Raymond et al. (2020) discusses global trends, the specific "intolerable" wet-bulb temperatures (>35 °C) identified by the eNGO are concentrated in the Persian Gulf and South Asia, not the United States.
Sea Level Rise	
eNGO Endangerment Comment 131: Global mean sea level rose faster in the 20th century than in any prior century over the last three	**Flawed Study (Methodological Concerns):** Comparing the 20th century to the "last three millennia" rests on combining modern instrumental data (tide gauges since the late 19th/early 20th century, satellites since 1993) with lower-resolution, less certain proxy data (geological reconstructions) for the pre-instrumental period. Such comparisons between precise, high-

millennia and has further accelerated since the late 1960s.[946]	frequency instrumental records and smoothed, uncertain proxy reconstructions are methodologically challenging. While the study expresses "high confidence," this level of certainty arguably underemphasizes the significant differences in data type, resolution, and inherent uncertainties involved in comparing these distinct records. Further, the assertion of Global Mean Seal Level acceleration since the late 1960s is derived from statistical analysis of the instrumental record (tide gauges and satellite altimetry). Calculations of acceleration can be sensitive to the chosen start and end dates and the statistical methods employed, particularly over periods susceptible to multi-decadal natural variability. While multiple reconstructions support acceleration, attributing the *entirety* of this recent acceleration purely to a long-term forced trend, separate from natural oscillations over ~50 years, remains complex given the known decadal variability in ocean dynamics and the significant adjustments applied to sea level data.
eNGO Endangerment Comment 131–33: The Draft CWG Report's conclusion that U.S. measurements reveal no obvious acceleration beyond the historical average rate of sea level rise is arbitrary, unsupported by scientific consensus, and relies on the authors' flawed and selective use of	**Misleading Omission (Conflation of Regional/Global and Satellite/Historical Data):** The commenters framing fundamentally misrepresents the specific finding of the Draft CWG Report. That report concludes that "U.S. tide gauge measurements in aggregate show no obvious acceleration ... beyond the historical average rate." This is a specific claim about the *long-term, historical, U.S.-based tide gauge record*. The commenters attempt to refute this specific claim by citing studies that analyze three different and irrelevant datasets: • *Short-term global satellite data (post-1993):* Guérou (2023), Otosaka (2022), and Hugonnet (2021) measure acceleration in the global satellite record specifically by

[946] IPCC AR6 WGI, at 1216 (Ch. 9: Ocean, Cryosphere and Sea Level Change) (Fox-Kemper, et al.).

a subset of data that favors the authors' conclusions.[947]	studies analyzing global mass balance from ice sheets (Otosaka) and glaciers (Hugonnet), and global sea level from satellite altimetry (Guérou). They find acceleration in these global metrics during the satellite era (post-1993). But this is an irrelevant comparison. The CWG report's finding is explicitly about the historical trend in U.S. tide gauges. Historical tide gauge records (e.g., CWG Figure 7.2, 7.5) extend back over 100–150 years. A 30-year trend from a different dataset (global satellite) cannot refute a finding based on a 100+ year dataset (U.S. tide gauges). Furthermore, the CWG report's Figure 7.6 shows that the 30-year trailing rate of sea level rise at The Battery, NY, has oscillated, with the recent rate being comparable to the rate centered around 1960. • *Regional acceleration explicitly attributed to natural variability:* The commenters' primary source for East/Gulf Coast acceleration (Dangendorf 2023) directly contradicts their implied point. The study explicitly attributes this recent acceleration to "internal climate variability" and states the resulting signal is **"neither historically unprecedented nor inconsistent with internal variability."** This supports the

[947] Guérou et al., *Current Observed Global Mean Sea Level Rise and Acceleration Estimated from Satellite Altimetry and the Associated Measurement Uncertainty*, 19 Ocean Sci. 431 (2023), https://doi.org/10.5194/os-19-431-2023; Otosaka et al., *Mass Balance of the Greenland and Antarctic Ice Sheets from 1992 to 2020*, 15 Earth Sys. Sci. Data 703 (2023), https://doi.org/10.5194/essd-15-1597-2023; Hugonnet et al., *Accelerated Global Glacier Mass Loss in the Early Twenty-First Century*, 592 Nature 726 (2021), https://doi.org/10.1038/s41586-021-03436-z; Dangendorf et al., *Acceleration of US Southeast and Gulf Coast Sea-Level Rise Amplified by Internal Climate Variability*, 14 Nat. Commc'ns 1935 (2023), https://doi.org/10.1038/s41467-023-37649-9; Harvey et al., *Ocean Mass, Sterodynamic Effects, and Vertical Land Motion Largely Explain US Coast Relative Sea Level Rise*, 2 Commc'ns Earth & Env't 233 (2021), https://doi.org/10.1038/s43247-021-00300-w; Burgette et al., *Interseismic Uplift Rates for Western Oregon and Along-Strike Variation in Locking on the Cascadia Subduction Zone*, 114 J. Geophysical Rsch.: Solid Earth B01406 (2009), https://doi.org/10.1029/2008JB005679; Hamlington et al., *Understanding of Contemporary Regional Sea-Level Change and the Implications for the Future*, 58 Revs. Geophysics e2019RG000672 (2020), https://doi.org/10.1029/2019RG000672.

	CWG's core conclusion that natural variability is a dominant factor challenging simple attribution. • *Regional non-acceleration explicitly attributed to local factors*: The commenters dismiss the West Coast data (which aligns with the CWG report) as being due to "other factors." The "other factors" identified by these studies are precisely the local, non-climatic, and natural-variability drivers that the CWG report highlights. Burgette (2009) is a study of vertical land motion, specifically "interseismic uplift rates" on the Cascadia subduction zone, which causes the land to rise and *counteracts* relative sea level rise. Harvey (2021) attributes the suppression of sea level rise on the West Coast to "Decadal climate variability ... represented by the Pacific Decadal Oscillation (PDO)." Hamlington (2020) is a review study that explicitly discusses the challenge of separating sea level trends from "natural internal climate modes" and notes that "gaps in the understanding ... remain". The commenters' own citations confirm the CWG report's central thesis: U.S. regional sea level trends are a complex composite of local land motion and internal ocean variability, and they do not show a clear, uniform anthropogenic acceleration when viewed in "aggregate" over the historical record. **Out of Scope:** Further, many of the harms in the studies are experienced outside of the United States or are global in nature rather than specific to U.S. domestic interests. Otosaka et al. (2023) analyze ice sheets in "Greenland and Antarctica", and Hugonnet et al. (2021) analyze "all of Earth's glaciers," noting that "seven glacierized regions account for 83% of the global mass loss," including the Russian Arctic, Svalbard, and High Mountain Asia. Guérou et al. (2023) focuses on "global mean sea level." As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or

	contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
Model Inputs and Assumption	
eNGO Endangerment Comment 133: The Draft CWG Report inappropriately suggests that studies of model performance undercut the attribution of climate changes to anthropogenic drivers and the projections of future climate changes under potential future emission scenarios. For example, while CMIP6 models show larger tropospheric warming trends than several observational products for particular periods, several independent studies demonstrate that this is explained by (a) observational uncertainties and dataset versions (radiosonde and satellite homogenization, diurnal-cycle corrections, and stratospheric contamination of tropospheric retrievals), (b) internal	**Misrepresentation (Conclusion Overreach / False Certainty):** The commenters assert that Chapter 5 of the Draft CWG Report inappropriately minimizes the reliability of climate models by highlighting model-observation discrepancies, suggesting these are fully explained by observational uncertainties, internal variability, and forcing uncertainties. This assertion overstates the degree to which the cited factors reconcile model outputs with observations and mischaracterizes the CWG Report's analysis. Chapter 5 explicitly acknowledges these factors but correctly concludes that significant discrepancies persist across multiple metrics, raising valid questions about model fidelity for attribution and projection. *Persistent Discrepancies Despite Corrections:* While corrections for observational issues (like diurnal drift and stratospheric contamination) reduce the mismatch, they do not eliminate it. For instance, Santer et al. (2017), cited by commenters, analyzed CMIP5 models and found that even after applying corrections, simulated mid-to-upper tropospheric warming trends remained systematically larger than observed trends, with average model/observation ratios of approximately 1.7 globally and 2.1 in the tropics. The authors noted these remaining differences are "sufficiently large to be of scientific concern." Chapter 5 of the CWG report accurately reflects this persistent discrepancy, particularly citing McKitrick and Christy (2020), which found *every* CMIP6 model examined exhibited a statistically significant warm bias in tropospheric warming trends compared to multiple observational datasets. *Pervasiveness of Model Biases:* The CWG Report's critique is not based solely on tropospheric trends. Chapter 5 documents a pattern of model-observation mismatches across various

decadal variability and the distinction between ensemble means versus individual realizations, and (c) uncertain historical forcings, especially aerosols and post-2000 forcing updates.[948]	domains: surface warming (Section 5.2), the vertical temperature profile (Section 5.4, showing observations often fall *below* the entire model range), stratospheric cooling trends post-2000 (Section 5.5, citing Santer et al. 2023), snow cover (Section 5.6), hemispheric albedo symmetry (Section 5.7), and regional warming, particularly in the U.S. Corn Belt (Section 5.8). This broader pattern suggests systemic issues in models that cannot be dismissed solely by invoking observational uncertainty or internal variability phasing in one specific metric. *Acknowledging Limitations:* The commenters' reference to observational uncertainties, internal variability, and forcing uncertainties as explanations does not negate the CWG report's findings. Chapter 5 itself acknowledges these factors. For example, it directly quotes the IPCC AR6 assessment regarding the tropospheric discrepancy, which mentions these contributing factors. However, the CWG report correctly emphasizes that the *magnitude* and *consistency* of the warm bias across the model ensemble, even considering these factors, remain significant challenges for model-based attribution and projections, a concern consistent with warnings from within the modeling community about models potentially being "not fit for purpose" for certain applications *Insufficiency of Cited Studies:* None of the studies cited by the commenters undermine the Draft CWG report's conclusions about model-observation discrepancies. Po-Chedley et al. (2015) primarily addresses uncertainties and biases within observational satellite datasets, specifically focusing on removing errors caused by satellites drifting through the diurnal cycle.

[948] Po-Chedley et al., *Removing Diurnal Cycle Contamination in Satellite-Derived Tropospheric Temperatures: Understanding Tropical Tropospheric Trend Discrepancies*, 28 J. Climate 2274 (2015), https://doi.org/10.1175/JCLI-D-13-00767.1; Santer et al., *Comparing Tropospheric Warming in Climate Models and Satellite Data*, 30 J. Climate 373 (2017), https://doi.org/10.1175/JCLI-D-16-0333.1; Santer et al., *Exceptional Stratospheric Contribution to Human Fingerprints on Atmospheric Temperature*, 120 Proc. Nat'l Acad. Scis. e2300758120 (2023), https://doi.org/10.1073/pnas.2300758120.

	While their new observationally-based correction method yielded results more consistent with climate model expectations for tropical amplification compared to the UAH dataset, the study's main contribution is refining the observational record. It demonstrates that different processing choices significantly impact satellite trends but doesn't resolve the broader issue highlighted by the CWG report—that even corrected observational datasets often show less warming than climate models predict. Indeed, the authors concede "[i]n general, it is impossible to conclude which dataset is most accurate when comparing two potentially biased measurements." Santer et al. (2017) directly confronts the model-observation comparison for tropospheric warming, applying corrections for stratospheric cooling influences on TMT satellite retrievals. Crucially, while these corrections brought models (CMIP5 in this study) and observations into better agreement, they did not eliminate the discrepancy. As noted above, the study found that models still warmed significantly faster than observations, with average simulated/observed trend ratios of approximately 1.7 globally and 2.1 in the tropics after corrections. The authors explicitly state these remaining differences are "sufficiently large to be of scientific concern" and acknowledge multiple potential causes, including model errors in forcing or response, alongside residual observational errors and internal variability. This study thus actually supports the CWG report's finding of a persistent model warm bias, rather than refuting it. Santer et al. (2023) focuses on "fingerprint" detection, showing that including temperature data from the mid-to-upper stratosphere (25–50 km) dramatically increases the signal-to-noise ratio for attributing observed atmospheric temperature structure changes to human influence. While it makes a strong case for the *detectability of the overall pattern* (tropospheric warming combined with stratospheric cooling), it simultaneously identifies significant discrepancies in

	the magnitude of change, noting that CMIP6 models predict substantially *more* stratospheric cooling than satellites observe. This mismatch in magnitude, potentially linked to model forcing errors, reinforces the CWG report's concerns about model accuracy, even if the broad human fingerprint is clear.
eNGO Endangerment Comment 134: The Draft CWG report is wrong to express skepticism of climate models because studies support a large anthropogenic contribution to observed global warming consistent with model results.[949]	**Misleading Omission (Conflating Attribution with Model Accuracy):** The commenters' reliance on the IPCC chapter is a misleading omission. They conflate that source's high-level attribution conclusion (that human influence is the "main driver" of warming) with a separate, unsubstantiated claim that model projections are "consistent" in their magnitude. In fact, that chapter explicitly confirms the central model discrepancy highlighted in the CWG report. The chapter explains states there is "**medium confidence that most CMIP5 and CMIP6 models overestimate observed warming in the upper tropical troposphere by at least 0.1 °C per decade**." The chapter further notes that "studies continue to find that CMIP5 and CMIP6 model simulations warm more than observations in the tropical mid- and upper-troposphere." Thus, the source validates the Draft CWG Report's critique of persistent model warm biases. **Exaggeration / Overclaiming (Misrepresenting "Accuracy"):** The claim that Hausfather et al. (2020) found models "accurately forecasted" future warming is a significant exaggeration. The study's finding that "14 of 17 model projections were consistent with observations" is based on a metric ("implied TCR") specifically designed to evaluate model physics by correcting for the models' incorrect forcing assumptions. This metric does not mean the models' forecasts were accurate; it means their underlying physics were deemed

[949] IPCC AR6 WGI (Ch. 3: Human Influence on the Climate System) (Eyring et al.); Hausfather et al., *Evaluating the Performance of Past Climate Model Projections*, 47 Geophysical Rsch. Letters e2019GL085378 (2020), https://doi.org/10.1029/2019GL085378.

	plausible after accounting for their flawed (and often overstated) projections of future emissions. The commenters omit the study's more direct finding: on a simple temperature-vs-time basis, only 10 of the 17 model projections were consistent with observations. **Irrelevant Source (Outdated Models):** Furthermore, Hausfather et al. (2020) is largely irrelevant to the CWG report's critique of *current* models. The CWG report (Chapter 5) focuses on the known warm biases of the modern CMIP6 ensemble. Hausfather et al. (2020) analyzes obsolete models published between 1970 and 2007, including projections from the IPCC's First, Second, and Third Assessment Reports. This study's conclusions about simpler, older models do not refute the documented performance failures of the specific "hot" models in the modern CMIP6 ensemble that the CWG report correctly identifies as problematic.
Attribution to anthropogenic emissions	
eNGO Endangerment Comment 135–36: There is unequivocal evidence that the observed warming trend since the pre-industrial period is driven primarily by contributions from greenhouse gas emissions from human activities and the effects of other contributors, like solar radiation, are small compared	The commenters' assertion that the contribution of solar radiation to 20th-century warming is "small" compared to the contribution from greenhouse gases relies on a fundamental misrepresentation of the cited literature, specifically Ziskin and Shaviv (2012). Furthermore, the commenters' claim of "unequivocal evidence" that greenhouse gases are the "primary" driver minimizes profound uncertainties regarding the climate system's sensitivity to solar activity, relying instead on models that may systematically underestimate the total solar influence. **Misrepresentation (Exaggeration/Overclaiming):** The commenters cite Ziskin and Shaviv (2012) alongside an IPCC chapter and Meehl et al. (2004) to support the proposition that the solar contribution to 20th-century warming is "small." This fundamentally mischaracterizes the findings of Ziskin and Shaviv (2012), which explicitly finds the opposite.

to the contribution from greenhouse gases.[950]	The study sought to model 20th-century temperature anomalies using an energy balance model optimized to determine the relative contributions of anthropogenic and solar forcing without "any prior biases towards particular sensitivities nor the net size of the solar forcing." The authors conclude that a significant, non-thermal solar component is "necessarily present," leading to a total solar contribution that "is much larger than can be expected from variation in the total solar irradiance alone." While the study finds that the "largest contribution" comes from anthropogenic sources, it attributes a substantial 40% of the 20th-century warming to solar activity, leaving 60% to anthropogenic causes. This 40/60 split indicates that the solar role, according to the study, is a primary driver rather than a negligible factor. The commenters improperly exaggerate the difference between these contributions to support their characterization of the solar role as merely "small." Further, the study provides central estimates and error margins for the respective contributions to 20th-century warming: an anthropogenic contribution of 0.42 ± 0.11 °C and a solar contribution of 0.27 ± 0.07 °C. While the nominal anthropogenic contribution is larger, the statistical uncertainties reveal a critical overlap: the lower bound of the anthropogenic contribution is 0.31 °C while the upper bound of the solar contribution is 0.34 °C. Because the upper bound of the solar contribution exceeds the lower bound of the anthropogenic contribution, the study does not statistically rule out the possibility that the solar contribution is comparable to, or even slightly larger than, the anthropogenic contribution. By omitting

[950] IPCC AR6 WGI (Ch. 3: Human Influence on the Climate System) (Eyring et al.); Ziskin & Shaviv, *Quantifying the Role of Solar Radiative Forcing Over the 20th Century*, 50 Advances in Space Rsch. 762 (2012); Meehl et al., *Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate*, 17 J. Climate 3721 (2004), https://doi.org/10.1175/1520-0442(2004)017%3C3721:CONAAF%3E2.0.CO;2.

	these error margins, the commenters present a misleading picture of the study's findings, treating a nominal difference as definitive proof that the solar contribution is "small." **False Certainty:** The commenters rely on the IPCC to assert "unequivocal evidence" that greenhouse gases are the primary driver of warming, attributing negligible change to natural forcings. However, this claim is derived from General Circulation Models (GCMs) that largely assume solar influence is limited to variations in Total Solar Irradiance (TSI). This methodological choice is directly challenged by Ziskin and Shaviv (2012), a study the commenters themselves cite. The significant solar contribution found by Ziskin and Shaviv (2012) relies on the inclusion of an "Indirect Solar Effect" (ISE), a non-thermal component of solar activity that amplifies the climate's response beyond what TSI alone can explain. While TSI variations account for only a small radiative forcing (estimated in the study at 0.1–0.2 W/m^2, the authors' analysis identifies a necessary total solar forcing of 0.8 W/m^2. To model this discrepancy, the authors use the geomagnetic index as a proxy for non-thermal solar activity. Although the model does not distinguish between specific physical mechanisms—such as hypersensitivity to stratospheric UV variability or solar-wind modulated cosmic ray flux—it provides statistical evidence that, within their framework, such an amplification mechanism is necessary to accurately reproduce the 20th-century temperature record. If these amplification mechanisms (ISE) exist, the attribution derived from standard GCMs (such as those underlying the IPCC and Meehl et al., 2004) inherently overestimates the anthropogenic role. By excluding the ISE, these models must compensate for the missing warming by increasing the sensitivity to greenhouse gases or adjusting the highly uncertain

	aerosol cooling effects. The claim of "unequivocal evidence" is therefore an overstatement, as it depends on the assumption that such solar amplification mechanisms do not exist. The divergence between the cited studies further highlights the lack of unequivocal consensus regarding climate drivers. The models used by the IPCC generally assume significant positive climate feedbacks (high climate sensitivity) to amplify the effects of greenhouse gases. In contrast, Ziskin and Shaviv's analysis finds that the "best fit [to the 20th-century record] is obtained with a negligible net feedback." This implies a low climate sensitivity. If climate sensitivity is indeed low, the observed warming requires a larger direct forcing—such as the amplified ISE proposed by the authors—to explain the observed solar-climate correlations. These contrasting findings regarding climate sensitivity—one of the most critical and uncertain parameters in climate science—underscore that the attribution of warming remains dependent on fundamental assumptions about how the climate system operates.
eNGO Endangerment Comment 136: The commenters argue that the Draft CWG Report misunderstands and misrepresents attribution science, making two primary arguments: *Attribution science is precise and reliable.* They contend that science can now precisely quantify the extent to which climate change	**Misrepresentation (Misleading Omission / False Certainty):** The commenters' core proposition—that attribution science can precisely quantify the human contribution to individual extreme events—is a significant overstatement that is undermined by the sources they cite. The commenters treat the outputs of attribution studies (e.g., "15–20% heavier" rainfall for Hurricane Harvey, "2–4°F hotter" for the 2021 Pacific Northwest heatwave) as if they were direct physical measurements, rather than the results of statistical or dynamical models laden with assumptions. By omitting the profound methodological limitations, wide confidence intervals, and contradictory findings acknowledged within the studies themselves, the commenters fundamentally misrepresent the state of attribution science. As the Draft CWG Report correctly notes, and as explained above, *see supra*, Response to Endangerment

exacerbates individual extreme weather events. *The Draft Report uses a logical fallacy.* The commenters accuse the report of falsely framing attribution as an "all or nothing" proposition, arguing this is a "misunderstanding" of the science. The correct view, they claim, is that climate change exacerbates the frequency, severity, and destructiveness of events that might have occurred anyway.[951]	Comment, Sec. 3.1.5.4, this science remains highly dependent on specific modeling assumptions and evolving physical interpretations, rather than being a precise accounting tool. **Flawed Study (Conclusion Overreach / Contradictory Sources):** Furthermore, the commenters' specific claims are based on a selective reading of the cited studies, which are themselves methodologically weak and, in some cases, contradictory. • *On Hurricane Harvey:* The commenters' "15-20%" rainfall is cherry-picked and implies a consensus that clearly does not exist. One cited source, van Oldenborgh et al. (2017), provides a best estimate of 15% (8%–19 but they ignore the authors' admission that their own models conflict (showing different scaling factors) and that the 15% figure is an extrapolation from this complex data. Crucially, they ignore the findings of their other cited source, Risser & Wehner (2017), which provides a best estimate of 37.7% (with a lower bound of 19%). The fact that these two studies provide such divergent best estimates (15% vs 37.7%) underscores the lack of precision in the science. Moreover, the commenters omit that Risser & Wehner explicitly characterize their finding as being "[i]n a Granger causality sense," a statistical measure that

[951] Mantua & Hare, *The Pacific Decadal Oscillation*, 58 J. Oceanography 35 (2002); Knight et al., *Climate Impacts of the Atlantic Multidecadal Oscillation*, 33 Geophysical Rsch. Letters L17706 (2006); Wang et al., *El Niño and Southern Oscillation (ENSO): A Review*, *in* Coral Reefs of the Eastern Tropical Pacific 85 (2016); Philip et al., *Rapid Attribution Analysis of the Extraordinary Heat Wave on the Pacific Coast of the US and Canada in June 2021*, 13 Earth Sys. Dynamics 1689 (2022); Risser & Wehner, *Attributable Human-Induced Changes in the Likelihood and Magnitude of the Observed Extreme Precipitation During Hurricane Harvey*, 44 Geophysical Rsch. Letters 12,457 (2017); Van Oldenborgh et al., *Attribution of Extreme Rainfall from Hurricane Harvey, August 2017*, 12 Env't Rsch. Letters 124009 (2017); Kimutai et al., *Human-Induced Climate Change Increased 2021–2022 Drought Severity in Horn of Africa*, 47 Weather & Climate Extremes 100745 (2025); Patiño Arias et al., *Interplay Between Climate Change and Climate Variability: The 2022 Drought in Central South America* (2023); Ciavarella et al., *Prolonged Siberian Heat of 2020 Almost Impossible Without Human Influence*, 166 Climatic Change 9 (2021).

	motivates further dynamical studies rather than providing definitive proof of physical causation. • *On the 2021 PNW Heatwave:* The commenters cite Philip et al. (2022) for the "2–4°F" (i.e., 2 °C) claim but omit the study's central caveat, stated clearly in the abstract: the event was so extreme it lay "far outside the range of historical temperature observations," making it "hard to state with confidence how rare the event was." The authors explicitly note their analysis required the assumption that this unprecedented heatwave was part of the same statistical distribution as past events, recognizing that the validity of this assumption is questionable for such an extreme outlier. By presenting the 2 °C figure without this essential context, the commenters profoundly mislead the reader about the certainty of the finding. • *On Natural Variability:* The commenters engage in contradictory citation practices to dismiss natural factors. They cite the IPCC to claim the natural contribution to warming is negligible (–0.1 °C to +0.1 °C). Yet, just one footnote before cite Ziskin & Shaviv (2012). Ziskin & Shaviv is a direct challenge to the consensus, arguing that the solar contribution is much larger (0.27 °C) than standard models assume. It is scientifically incoherent to cite a study that argues for large solar forcing to support the claim that solar forcing is negligible. By doing so, the commenters inadvertently prove the Draft CWG Report's point that significant scientific debate on the magnitude of natural factors remains. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States. Several studies cited by the commenters to illustrate the precision of attribution science focus exclusively on foreign impacts, including droughts in the Horn of Africa (Kimutai et al. (2025)) and Central South America (Patiño Arias et al. (2023)), and a

	heatwave in Siberia (Ciavarella et al. (2021)). As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the 'cause or contribute' analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
Erroneous claims on benefits of greenhouse gases.	
eNGO Endangerment Comment 137–38: The proposal ignores or downplays the severe and negative consequences of elevated greenhouse gas emissions on the Earth's environment, documented by an extensive body of scientific evidence.[952]	**Flawed Study (Underlying Methodological Contrasts):** The commenters cite Chapter 1 of the NCA5 not as a direct analysis or refutation of the specific points within the Draft CWG Report, but rather as a presentation of a contrasting viewpoint regarding climate risks and impacts. By presenting the NCA5 findings as definitive and comprehensive, the commenters omit the significant scientific uncertainties, methodological debates, and alternative interpretations highlighted in the CWG report. These are limitations that the CWG report plausibly and critically analyzes. For instance: • *Certainty and Attribution:* NCA5 1 frequently uses high-confidence language to attribute observed negative impacts and extreme event trends directly to human-caused climate change. For example, the study asserts that "The number and cost of weather-related disasters have increased dramatically over the past four decades, in part due to the increasing frequency and intensity of extreme events" and claims that "Current climate changes are unprecedented over thousands of years." This contrasts sharply with the CWG report's assessment, which finds limited evidence for robust

[952] Jay et al., Ch. 1: *Overview: Understanding Risks, Impacts, and Responses*, *in* Fifth National Climate Assessment (Crimmins et al. eds., 2023), https://doi.org/10.7930/NCA5.2023.CH1.

	long-term trends in most US extreme weather events and emphasizes the significant role of natural variability. • *Scenario Use:* NCA5 incorporates projections based on a range of Shared Socioeconomic Pathways (SSPs), relying on high-emissions scenarios (e.g., SSP3-7.0 and SSP5-8.5) to frame future risks, noting that the world could see more than 7.2°F of warming under the very high scenario. This reliance is methodologically questionable given the study's own admission that "US emissions have decreased" and fell 12% between 2005 and 2019. The CWG report critiques the over-reliance on high-end, potentially implausible scenarios (like SSP5-8.5) that diverge from current emission trends, arguing it leads to exaggerated projections of future harm. As documented above, these critiques are reasonable. • *Normalization of Economic Costs:* NCA5 highlights the rising costs of billion-dollar disasters, stating that between 2018 and 2022, the US experienced 89 such events. While the study briefly acknowledges that costs increase "in part due to increases in assets at risk (through population growth, rising property values, and continued development in hazard-prone areas)," it fails to properly normalize for these factors to isolate the climate signal. Furthermore, the study aggregates disparate event types with varying levels of scientific attribution confidence—combining "4 droughts, 6 floods, 52 severe storms, 18 tropical cyclones, 5 wildfires, and 4 winter storm events" —into a single metric, which obscures the lack of robust trends in specific sub-categories.
eNGO Endangerment Comment 138: The Draft CWG Report focuses only on CO_2 fertilization	**Misrepresentation (Exaggeration / Overclaiming):** The claim that the Draft CWG Report fails to address or properly characterize the harmful overall impacts in the areas it does cover is incorrect. Regarding CO_2 fertilization, the report explicitly discusses benefits like global

and ocean changes but fails to address or properly characterize the harmful overall impacts CO_2 emissions have in those areas.	greening and enhanced agricultural productivity but also addresses potential negative aspects, such as nutrient dilution in crops, and discusses adaptive strategies to mitigate such effects. Regarding ocean changes, the report discusses decreasing pH and potential impacts on coral reefs but places these changes in the context of natural variability, evolutionary history, observed reef resilience, and potential publication bias towards negative findings. Beyond these specific areas, the report critically examines purported harmful impacts related to warming trends, extreme weather, sea level rise, and economic costs, frequently finding that claims of significant harm or clear attribution to CO_2 emissions are not well-supported by historical data, are exaggerated by model limitations or implausible scenarios, or fail to adequately account for natural variability and adaptation. The report does not ignore potential harms; rather, it provides a critical analysis of the evidence cited for those harms, often finding it less robust than typically portrayed.
eNGO Endangerment Comment 138: Increased temperatures drive increased water stress (regardless of drought) by increasing rates of evapotranspiration and overall vapor pressure deficit, drying soils.[953]	**Misleading Omission (Ignoring Confounding Variables):** The commenters cite Grossiord et al. (2020), a literature review, for its general theme while omitting the authors' own significant, repeated caveats. The commenters' claim of water stress "regardless of drought" is an oversimplification that the study itself warns against. The authors explicitly state that it is "difficult ... to disentangle VPD effects from temperature, radiation and other climate drivers" and that "impacts of VPD on vegetation cannot always be discussed independently of other parameters." The authors explain that "Long-term changes in VPD are still

[953] Grossiord et al., *Plant Responses to Rising Vapor Pressure Deficit*, 226 New Phytologist 1550 (2020), https://doi.org/10.1111/nph.16485; Flores et al., *Critical Transitions in the Amazon Forest System*, 626 Nature 555 (2024), https://doi.org/10.1038/s41586-023-06970-0.

	uncertain as they will depend both on [] and on the extent of water movement limitation from the land surface to the atmosphere under future climate." **Flawed Study (Conclusion Overreach & Speculative Model):** The commenters' claim also relies on the findings of Flores et al. (2024). The study's headline claim that "10% to 47% of Amazonian forests will be exposed to compounding disturbances" by 2050 is not a finding from established, consensus climate models but the result of the authors' "simple additive approach"—a non-standard model that linearly extrapolates observed 40-year temperature and rainfall trends (1981–2020) out to 2050. A linear extrapolation of complex, non-linear climate phenomena is a speculative exercise, not a reliable forecast. And the authors state clearly that "Most CMIP6 models agree that a large-scale dieback of the Amazon is unlikely in response to global warming." The study's premise is a speculative attempt to invalidate this consensus, primarily by arguing that the widely recognized, resilience-enhancing fertilization effect is "still poorly understood" and may be "neutralize[d]." The commenters are thus citing a speculative, and self-acknowledged outlier study as if it represents a consensus finding. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States. As noted above, see *supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited geographically to the United States. The Flores et al. (2024) study relied upon by the commenters focuses exclusively on ecosystem transitions within the Amazon forest system in South America. The study's projections regarding forest collapse, rainfall reduction, and carbon emissions are specific to the Amazon basin and do not represent damages to domestic ecosystems or public health within the United States. Consequently, these projected foreign damages are outside the appropriate scope of this rulemaking.

eNGO Endangerment Comment 138: The Draft CWG Report fails to consider potential harmful effects of elevated carbon dioxide concentrations, such as the spread of nuisance plants, increased allergen production, and decreased nutritional value, incorrectly suggesting greening is categorically good.[954]	**Misrepresentation:** The commenters mischaracterize the Draft CWG Report by claiming it "fails to consider potential harmful effects" of elevated CO_2 and "incorrectly suggest[s] greening is categorically good." The Report explicitly discusses potential nutrient loss in crops due to CO_2 fertilization in Section 9.4, outlining both the concern and potential adaptation strategies like selective breeding, fortification, and dietary supplements. Furthermore, the Report emphasizes the net positive effects of CO_2 on global greening and agricultural productivity, based on extensive satellite observations and experimental data, rather than claiming these benefits are "categorically good" without nuance. The commenters elevate specific potential downsides mentioned in their sources—such as increased pollen from certain plants or nutrient dilution—while omitting the CWG Report's broader context of observed global-scale benefits and its discussion of adaptation. **Flawed Study (Conclusion Overreach / Context):** The sources cited by the commenters, while pointing to specific potential downsides of elevated CO_2, do not negate the CWG Report's overall conclusions. The Albertine et al. (2014) study focuses on increased pollen and allergen production in a single species (Timothy grass) under specific experimental conditions (chamber study, 800 ppm CO_2). Extrapolating this specific result to a general refutation of the benefits of global greening is a significant overreach. The Ziska (2020) review acknowledges complexities, including potential range expansion for plants like ragweed and increased allergenicity for some species, but also notes the challenges in separating CO_2

[954] Albertine et al., *Projected Carbon Dioxide to Increase Grass Pollen and Allergen Exposure Despite Higher Ozone Levels*, 9 PLoS One e111712 (2014), https://doi.org/10.1371/journal.pone.0111712; Ziska, *An Overview of Rising CO_2 and Climatic Change on Aeroallergens and Allergic Diseases*, 12 Allergy, Asthma & Immunology Rsch. 771 (2020), https://doi.org/10.4168/aair.2020.12.5.771; Kellie Schmitt, *Less Nutritious Crops: Another Result of Rising CO2*, Hopkins Bloomberg Pub. Health (Sept. 27, 2024), https://magazine.publichealth.jhu.edu/2024/less-nutritious-crops-another-result-rising-co2; Hatfield et al., Ch. 6: *Agriculture*, *in* Climate Change Impacts in the United States: The Third National Climate Assessment (Melillo et al. eds., 2014).

	effects from other climate factors and calls for further research. It does not present a case that these effects outweigh overall greening. The Schmitt (2024) article is a popular magazine piece, not peer-reviewed research. While it discusses potential nutrient declines, it also acknowledges adaptation strategies like fortification, consistent with the CWG Report's discussion. Hatfield et al. (2014) explicitly notes that while climate change poses challenges, the U.S. agricultural sector has a long history of successful adaptation through technological innovation and management changes. The commenters elevate specific downsides while ignoring the Report's consideration of these adaptive capacities and the net positive effects of CO_2 on global agricultural productivity. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. For example, the Schmitt article focuses heavily on nutrient deficiencies in developing nations, specifically citing risks to populations in Mali and South Asia. Additionally, the Albertine study relies on CO_2 concentrations of 800 ppm to model pollen increases—a level projected for the year 2100, well beyond the relevant timeframe for this analysis. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 139: Studies have found CO_2 fertilization is limited by other factors, including increasing vapor	**Misrepresentation (Misleading Omission):** While the commenters accurately state that the cited studies discuss limitations on CO_2 fertilization, they omit context and uncertainties highlighted within those same sources, presenting an incomplete picture. The studies indicate that the *extent* and *interaction* of these limitations are complex, context-dependent, and subject to significant uncertainty, particularly regarding model projections versus real-world observations.

pressure deficit or nutrient limitations in many areas.[955]	Fleischer & Terrer (2022) is primarily a perspective piece noting that models, particularly CMIP6 Earth System Models, likely overestimate the CO_2 fertilization effect in tropical forests due to inadequate representation of nutrient cycles (especially phosphorus). They emphasize that empirical evidence from actual tropical forests is limited, often based on young plants or short durations, making definitive conclusions about mature forest responses difficult. Reich et al. (2014) demonstrates that joint limitation by low water and low nitrogen eliminated the CO_2 biomass enhancement in a specific temperate grassland experiment. This finding, while significant for that context, cannot be broadly extrapolated to imply that any single limitation (like nutrients or water alone) eliminates the effect everywhere, nor does it directly address forest ecosystems or the specific role of vapor pressure deficit. Its applicability is limited by ecosystem type and the requirement for simultaneous, severe limitation by multiple factors. Barningham (2023), a PhD thesis, uses modeling (BioCLUE) which simulates a significant positive trend in Amazonian GPP driven primarily by CO_2 fertilization, offsetting negative impacts from climate factors like increased VPD. While acknowledging potential nutrient limitations theoretically and finding some sensitivity to nitrogen in the PRI signal under

[955] Barningham, Detection of Forest Resilience to Environmental Change and Quantification of Contemporary Carbon Fluxes Over Amazonia Using Remote Sensing (2023) (Ph.D. dissertation, University of Exeter), https://hdl.handle.net/10871/136676; Fleischer & Terrer, *Estimates of Soil Nutrient Limitation on the CO2 Fertilization Effect for Tropical Vegetation*, 28 Global Change Biology 6366 (2022), https://doi.org/10.1111/gcb.16377; Reich et al., *Plant Growth Enhancement by Elevated CO2 Eliminated by Joint Water and Nitrogen Limitation*, 7 Nature Geoscience 920 (2014), https://doi.org/10.1038/ngeo2284; Li et al., *Vegetation Growth Due to CO2 Fertilization is Threatened by Increasing Vapor Pressure Deficit*, 619 J. Hydrology 129292 (2023), https://doi.org/10.1016/j.jhydrol.2023.129292.

	specific conditions, the model's primary output suggests the CO_2 effect is currently substantial in Amazonia. Li et al. (2023) is cited by the commenter to support the claim regarding vapor pressure deficit (VPD). However, the commenter omits the study's primary finding: that elevated CO_2 concentrations "dominated the long-term trends of [Gross Primary Productivity]" globally. While the study notes that increasing VPD exerts a negative influence that can "partly offset" the fertilization effect (specifically in the last two decades), it explicitly concludes that CO_2 fertilization contributed to a "sustained increase" in productivity over the long term. Thus, the source confirms that CO_2 fertilization remains the primary driver of vegetation growth, even when counteracting forces are present. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. For example, Fleischer & Terrer (2022) and Barningham (2023) focus exclusively on tropical vegetation and the Amazon basin, respectively. Additionally, the projections of vegetation structural loss in Barningham do not diverge significantly until after 2060, with the most severe impacts projected for 2100. As noted above, see supra, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 139: The Draft CWG Report misleadingly asserts there is "no evidence" of a slowing trend in global greening by relying on only two studies, when the scientific	**Flawed Studies (Methodological Limitations / Uncertainty):** The studies cited by the commenters, while suggesting a slowdown in global greening or the underlying CO_2 fertilization effect, employ methods with notable uncertainties and limitations. Pan et al. (2018) relies heavily on satellite-derived vegetation indices as proxies for vegetation health over decades. These datasets face challenges with sensor consistency, atmospheric

consensus provides contradictory evidence that a slowdown is occurring.[956]	corrections, and potential signal saturation in dense vegetation, making long-term trend detection less certain. Furthermore, the study relies on the GIMMS NDVI3g dataset, which spans only from July 1981 to December 2013. This excludes the most recent decade of vegetation data, meaning the study fails to capture more recent trends that might contradict or contextualize their findings of a browning acceleration in the 1990s. Additionally, the statistical techniques used to isolate trends and turning points can be sensitive to short-term data fluctuations and the specific time periods analyzed, potentially misinterpreting natural variability as a persistent trend shift. Chen et al. (2024) and Wang et al. (2020) incorporate outputs from Earth System Models (ESMs), particularly the CMIP6 ensemble, to disentangle direct CO_2 effects from indirect climate impacts. As discussed above, however, these models have well-documented limitations and biases, especially in simulating regional climate patterns, cloud feedbacks, and the complex interactions within biogeochemical cycles. Wang et al. (2020) explicitly found that the TRENDY models significantly underestimated the CO2 fertilization effect decline observed in satellite data, and Chen et al. (2024) also noted discrepancies between model and observational estimates, raising questions about the reliability of model-dependent attribution. Crucially, Chen et al. (2024) base their future projections exclusively on the SSP5-8.5 emissions scenario, noting they focused on it "because C4MIP simulations are available only

[956] Wang et al., *Recent Global Decline of CO2 Fertilization Effects on Vegetation Photosynthesis*, 370 Science 1295 (2020), https://doi.org/10.1126/science.abb7772; Chen et al., *Inhibitive Effects of Recent Exceeding Air Temperature Optima of Vegetation Productivity and Increasing Water Limitation on Photosynthesis Reversed Global Greening*, 10 Earth's Future e2022EF002788 (2022), https://doi.org/10.1029/2022EF002788; Chen et al., *Transition from Positive to Negative Indirect CO2 Effects on the Vegetation Carbon Uptake*, 15 Nat. Commc'ns 1500 (2024), https://doi.org/10.1038/s41467-024-45957-x; Pan et al., *Increasing Global Vegetation Browning Hidden in Overall Vegetation Greening: Insights from Time-Varying Trends*, 214 Remote Sensing Env't 59 (2018), https://doi.org/10.1016/j.rse.2018.05.018.

	for the highest emission trajectory." As noted above, SSP5-8.5 is widely considered an implausible, extreme worst-case scenario that diverges significantly from observed reality. Reliance on this extreme scenario exaggerates future "browning" risks and negative indirect CO_2 effects. Similarly, while Wang et al. (2020) report a "declining trend" in the CO_2 fertilization effect, it is important to clarify that this is a decline in the *rate* of fertilization sensitivity, which dropped from approximately 22% per 100 ppm to 13% per 100 ppm—meaning the effect remains positive. Thus, the authors conclude CO_2 is still driving greening, just potentially less efficiently than before. Finally, attributing observed vegetation changes specifically to a decline in CFE, as opposed to changing climate conditions, nutrient limitations, or natural variability, remains challenging. Wang et al. (2020), for instance, correlate declining CO2 fertilization effect with decreasing foliar nutrient concentrations and increased water stress sensitivity, but establishing definitive causality is difficult given the complex, interacting factors influencing plant growth. The inherent uncertainties in satellite proxies, statistical separation techniques, and climate model fidelity mean that claims of a robust, globally consistent slowdown or reversal driven specifically by reduced CO2 effects should be viewed with skepticism. **Out of Scope:** Further, many of the harms in these studies are experienced outside of the United States or will occur only long in the future. All four cited studies are global in nature, analyzing vegetation trends across all continents rather than isolating impacts to the U.S. flora or agriculture. Chen et al. (2024) relies on projections extending "until the year 2100" to demonstrate the transition to negative indirect effects, with significant negative impacts projected for the period 2086–2100. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis

	of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. The studies cited by the commenters, while suggesting a slowdown in global greening or the underlying CO_2 fertilization effect employ methods with notable uncertainties. Pan et al. (2018) relies heavily on satellite-derived vegetation indices as proxies for vegetation health over decades. These datasets face challenges with sensor consistency, atmospheric corrections, and potential signal saturation in dense vegetation, making long-term trend detection less certain. Further, the statistical techniques used to isolate trends and turning points, employed by the article, can be sensitive to short-term data fluctuations and the specific time periods analyzed, potentially misinterpreting natural variability as a persistent trend shift. Chen et al. (2024) and Wang et al. (2020) incorporate outputs from Earth System Models (ESMs), particularly the CMIP6 ensemble, to disentangle direct CO_2 effects from indirect climate impacts. As discussed above, however, these models have well-documented limitations and biases, especially in simulating regional climate patterns, cloud feedbacks, and the complex interactions within biogeochemical cycles. Wang et al. (2020) explicitly found that the TRENDY models significantly underestimated the CFE decline observed in satellite data, and Chen et al. (2024) also noted discrepancies between model and observational estimates, raising questions about the reliability of model-dependent attribution. Finally, attributing observed vegetation changes specifically to a decline in CFE, as opposed to changing climate conditions, nutrient limitations, or natural variability, remains challenging. Wang et al. (2020), for instance, correlate declining CFE with decreasing foliar nutrient concentrations and increased water stress sensitivity, but establishing definitive causality is

	difficult given the complex, interacting factors influencing plant growth. The inherent uncertainties in satellite proxies, statistical separation techniques, and climate model fidelity mean that claims of a robust, globally consistent slowdown or reversal driven specifically by reduced CO_2 effects should be viewed with skepticism.
eNGO Endangerment Comment 139: The Draft CWG Report ignores important negative effects of CO_2, such as impacts on crop yield and the net-negative impact of climate change on food security overall.[957]	**Flawed Study (False Certainty / Conclusion Overreach):** The Draft CWG Report explicitly addresses the direct biophysical impacts of CO_2 and the economic impacts on agriculture in Chapter 9 and finds the net direct effects of CO_2 on agriculture to be beneficial. Reaching a conclusion that the overall effects are net positive is not the same as neglecting negative effects. Furthermore, as evidence of net negative effects, the commenters rely on an IPCC chapter whose most alarming projections are predicated on extreme, implausible scenarios. The IPCC report's most severe conclusions regarding food insecurity—such as projections of 30% of crop and livestock areas becoming climatically unsuitable or the loss of 250 workdays per year to heat stress—are derived from the high-end SSP5-8.5 and RCP 8.5 scenarios. These scenarios are now widely considered to be low-probability, worst-case pathways, and not "business-as-usual." Relying on these extreme scenarios as the basis for projecting future food insecurity minimizes uncertainty and exaggerates projected impacts. The cited IPCC report chapter also presents its conclusions with a degree of certainty that is not fully supported by its own text. For example, the Executive Summary states with high confidence that "Human-induced warming has slowed growth of agricultural productivity." Yet, the body of the report caveats that high level statement, acknowledging that "detection and attribution of food insecurity to anthropogenic climate change is still limited by a lack of

957 IPCC AR6 WGII, (Ch. 5: Food, Fibre, and Other Ecosystem Products) (Bezner Kerr et al.).

	long-term data and complexity of food systems." The report's definitive summary claims are belief by the profound uncertainties it acknowledges elsewhere. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. The specific projection cited regarding 30% of food production areas becoming unsuitable is explicitly identified in the Supplementary Material as a global estimate occurring in the "end-century (2081–2100)." Additionally, the underlying data on crop yield impacts (Table SM5.1) indicates that severe negative impacts are concentrated in the Global South (e.g., Africa and South Asia), whereas impacts in Northern America are frequently mixed or neutral. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 140: Increased greenness is not unequivocally positive; in the Arctic, it can exacerbate warming through changes to albedo and water vapor, potentially accelerating permafrost thaw and increasing plant respiration,	**Flawed Study (Reliance on Mischaracterized Scenarios / Conclusion Overreach / Correlation Causation Error):** The commenters' claim is a synthesis of findings from three studies, each of which suffer from significant methodological flaws that render their conclusions unreliable for policymaking, relying on mischaracterized "worst-case" scenarios, flawed experimental designs that ignore confounding variables, and statistical models that mistake correlation for causation. The commenters' claims of accelerating permafrost thaw and massive future emissions are drawn from Schuur et al. (2022). That study's projections of future harm are predicated on high-end, "worst-case" emissions scenarios. The study explicitly bases its alarming estimates—projecting releases of 5 to 15% of the permafrost carbon pool—on RCP 8.5, which it describes as a "business-as-usual" trajectory. The study acknowledges that under lower warming scenarios (e.g., RCP 2.6), the loss of near-surface permafrost area is reduced by

resulting in additional greenhouse gas emissions.[958]	nearly two-thirds compared to the high-emissions baseline. By anchoring its primary warnings to an extreme, high-emissions baseline, the study exaggerates the inevitability of the projected damages. The claim of a dramatic increase in ecosystem respiration is drawn from Maes et al. (2024), but that finding relies on data from open-top chambers (OTCs) that create artificial growing conditions. While the authors attempted to control for methodological biases, the study admits that the warming observed inside these chambers was linked to changes in "mineral layer TN [total nitrogen] concentration" and pH. The authors concede that the experimental warming disproportionately stimulates microbial activity and nitrogen mineralization in deeper soil layers. This suggests that the 30% increase in respiration may be an artifact of the chamber's enclosed environment altering nutrient cycling dynamics in ways that do not perfectly replicate open-air warming. Consequently, extrapolating these chamber-induced biological responses to the entire Arctic tundra is methodologically unsound. The claim that Arctic greening "exacerbate[s] warming" by a specific amount is based on a statistical modeling exercise in Yu et al. (2025), not direct observation. This study attributes approximately 0.76 °C to 0.83 °C of warming specifically to vegetation greening. However, this model relies on a "positive feedback loop" assumption where greening is both a result of and a driver of warming. The study's reliance on path analysis and machine learning to "disentangle" these variables introduces significant uncertainty. By framing a feedback

[958] Yu et al., *Disentangling the Contributions of Water Vapor, Albedo and Evapotranspiration Variations to the Temperature Effect of Vegetation Greening Over the Arctic*, 646 J. Hydrology 132331 (2025), https://doi.org/10.1016/j.jhydrol.2024.132331; Schuur et al., *Permafrost and Climate Change: Carbon Cycle Feedbacks From the Warming Arctic*, 47 Ann. Rev. Env't & Res. 343 (2022), https://doi.org/10.1146/annurev-environ-012220-011847; Maes et al., *Environmental Drivers of Increased Ecosystem Respiration in a Warming Tundra*, 629 Nature 105 (2024), https://doi.org/10.1038/s41586-024-07274-7.

	mechanism as a primary driver, the model risks overstating the independent contribution of vegetation to temperature rise, which is fundamentally driven by broader climatic forcing. **Out of Scope:** Further, many of the harms in the cited studies are experienced outside of the United States and are projected to occur long in the future. The projections in Schuur et al. extend to the years 2100 and even 2300, well beyond the relevant time horizon for current regulatory analysis. Additionally, the geographic scope of all three studies is the "circumpolar north" or "Arctic," a region predominantly comprised of Russian and Canadian territory. For instance, Yu et al. explicitly focus on land areas including Chukotka, Yakutia, and Krasnoyarsk Krai, while Maes et al. rely on data sites primarily located in Europe and Russia. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 141–42: The Draft CWG Report focuses solely on evidence for impacts of ocean acidification (decreases in pH) and fails to consider ocean warming or its negative effects like stratification and deoxygenation.[959]	**Flawed Source (Conclusion Overreach and Reliance on Implausible Scenarios):** The CWG Report clearly states that it is *not* a comprehensive review of all climate topics. Instead, its objective is to "focus on topics ... that are downplayed in, or absent from, recent assessment reports." The commenters cited source is Chapter 3 of the IPCC's Sixth Assessment Report (AR6)—the assessment report the CWG is reviewing. The CWG report's decision to not reproduce this material is a stated editorial choice to avoid redundancy, not an oversight.

[959] IPCC AR6 WGII (Ch. 3: Oceans and Coastal Ecosystems and Their Services) (Cooley et al.).

	The commenters' reliance on the chapter as a definitive counterpoint is misplaced, as that chapter exemplifies the exact methodological weaknesses the CWG Report was assembled to critique. *Internal Contradiction on Attribution:* The chapter's Executive Summary makes sweeping, "very high confidence" claims that "Anthropogenic climate change ... has greatly impacted life in the ocean" and that marine heatwaves are "very likely attributable to anthropogenic climate change." However, the chapter's main text contradicts this certainty, conceding that "Detecting changes and attributing them to specific drivers has been especially difficult ... because drivers, responses and scales ... often overlap and interact." The study admits these difficulties are "exacerbate[d]" by "short, heterogeneous or geographically biased observational records" and confounded by numerous "non-climate drivers" such as "habitat degradation, marine pollution, overfishing and overharvesting, [and] nutrient enrichment." This gap between the qualified statements in the text and the definitive conclusions in the summary is a classic example of conclusion overreach. **Reliance on Implausible Scenarios:** The study's most alarming projections—such as the "near elimination of overlaps" in predator-prey pairs, a projected 15.5% loss in global marine animal biomass, and the "disappearance" of coral-dominated communities—are overwhelmingly or entirely dependent on high-end, worst-case emissions scenarios (e.g., RCP 8.5 and SSP5-8.5). As noted above, the widespread use of these implausible, low-probability scenarios as a baseline for projecting future harms is a critical flaw in the climate impacts literature. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. The primary projections for damages cited in the report—such as the 15.5% decline in biomass or major changes in phytoplankton phenology—

	are calculated for the period "2080-2099" or "by 2100" and occur across the world. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 144: The Draft CWG Report overstates CO_2 fertilization productivity increases by relying on non-peer-reviewed sources and data from greenhouse/open-top chamber experiments, which are not correlated with field-collected data. In reality, the CO_2 fertilization effect is expected to be more than offset by other harmful impacts of climate change (temperature, precipitation, pests, pathogens) that can be attributed to greenhouse gas emissions.[960]	**Misrepresentation (Misleading Omission):** The eNGOs' assertion that the CO_2 fertilization effect will be "more than offset" by other harmful impacts of climate change is a misrepresentation of the cited source, Ainsworth et al. (2025). That study explores the limitations of what we understand about CO_2 fertilization and other effects of atmospheric CO_2. The specific phrase "more than offset" appears in that article as a description of the findings of two studies on soybeans and lentils regarding water savings: "Early season stimulation in biomass at elevated [CO_2] more than offset lower stomatal conductance in crops, resulting in greater depletion of soil moisture, instead of water saving." The eNGOs fail to support this offset in any other way. **Misrepresentation (Omission of Key Findings):** The commenters cite Ainsworth et al. (2025) to imply that CO_2 fertilization is currently being outweighed by negative climatic factors. However, they omit the study's explicit finding that, thus far, CO_2 has been a net benefit. The study notes that "to date, studies have largely reported a benefit of rising [CO_2] on crop productivity" and that recent increases in CO_2 have "prevented further crop yield losses, counteracting the negative impacts of rising temperature and increased water stress".

[960] Ainsworth et al., *Crops and Rising Atmospheric CO2: Friends or Foes?*, 380 Phil. Transactions Royal Soc'y B 20240230 (2025), https://doi.org/10.1098/rstb.2024.0230; Ainsworth & Long, *30 Years of Free-Air Carbon Dioxide Enrichment (FACE): What Have We Learned About Future Crop Productivity and its Potential for Adaptation?*, 27 Global Change Biology 27 (2021), https://doi.org/10.1111/gcb.15375.

	The authors speculate that a shift toward net negative effects is a future risk "as climate change intensifies", rather than a current observation of offset benefits. **Flawed Argumentation (Strawman & Selective Acknowledgment):** The commenters attempt to invalidate the Draft CWG Report's conclusions by focusing on its inclusion of greenhouse/OTC data, which they correctly note Ainsworth & Long (2021) criticizes as having low correlation with field results. However, this argument ignores that the Draft CWG Report *also* cites the very Free-Air CO2 Enrichment (FACE) data the commenters prefer. Ainsworth & Long (2021) analyzes 30 years of FACE data to show an approximate 18% yield increase across C3 crops. By acknowledging that the Report cites Ainsworth & Long (2021) but treating the Report's conclusions as if they rely solely on "numbers from greenhouse... experiments," the commenters create a strawman. The Report synthesizes multiple lines of evidence, including the specific field data the commenters demand.
eNGO Endangerment Comment 145–46: Climate change will lead to agricultural water scarcity.[961]	**Misrepresentation (Misleading Omission):** The commenters' claim—that climate change will exacerbate water scarcity and lead to "reductions in the irrigated agricultural footprint"—is a misleading oversimplification that is undermined by the primary conclusions of the sources they cite. The commenters have selectively highlighted secondary findings (e.g., increased water demand) while ignoring the studies' main conclusions, which often frame irrigation as a successful and expanding adaptation strategy. For example, Partridge et

[961] Overpeck & Udall, *Climate Change and the Aridification of North America*, 117 Proc. Nat'l Acad. Sc. 11856 (2020), https://doi.org/10.1073/pnas.2006323117; Zhang et al., *Increased Irrigation Could Mitigate Future Warming-Induced Maize Yield Losses*, 362 Agric. & Forest Meteorology 110,531 (2025), https://doi.org/10.1038/s43247-025-02459-y; Partridge et al., *Irrigation benefits outweigh costs in more US croplands by mid-century*, 4 Comm. Earth Envir. 274 (2023), https://doi.org/10.1038/s43247-023-00889-0; Qin et al., *Agricultural Risks from Changing Snowmelt*, 10 Nature Climate Change 459 (2020), https://doi.org/10.1038/s41558-020-0746-8.

	al. (2023), cited for the proposition that there will be lower mean precipitation, also projects "significant increases in mid-century irrigated and rainfed yields throughout most of the Corn Belt." The commenters have thus cited a study for one of its inputs (water demand) while completely omitting its primary, optimistic conclusion about agricultural expansion and increased yields. Similarly, Zhang et al. (2025) is literally titled "Increased irrigation could mitigate future warming-induced maize yield losses." The study focuses on the *capacity* of irrigation to decouple heat stress from yield loss, finding that "each 100 mm increase in irrigation reduces heat sensitivity of maize by 7.6%." **Flawed Study (Reliance on Mischaracterized Scenarios):** The claim's points about future risks are based on studies that predicate their most alarming conclusions on implausible, "worst-case" emissions scenarios. The Overpeck & Udall (2020) commentary, a supporting opinion piece, bases its future projections of river flow decline explicitly on the RCP 8.5 scenario. Zhang et al. (2025) bases its headline projection of a "67% increase in irrigation" on the "high-emission scenario (SSP585)." Qin et al. (2020) derives its "at risk" basins from climate projections calculated from the "RCP 8.5 forcing experiment." **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. For example, the Qin et al. (2020) study is a global analysis that identifies "hotspots" of risk primarily in "high-mountain Asia (the Tibetan Plateau), Central Asia, western Russia," and the "southern Andes," in addition to the western U.S. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 146: Livestock producers also face	**Misleading Reliance (Omission of Adaptation Context):** The commenters cite Derner & Augustine (2016) to suggest that livestock producers face unavoidable productivity losses

increasingly challenging management decisions and productivity losses due to fluctuations in precipitation, rangeland forage conditions, and feed costs exacerbated by climate change.[962]	driven by climate change. This citation is misleading because it ignores the study's primary finding: that such losses are largely a function of inflexible, reactive management practices rather than the weather itself. The authors explicitly argue that "adaptive management" strategies—such as incorporating weather prediction tools and flexible stocking rates—can "reduce risk for the ranching enterprise associated with drought" and "increase resiliency.". This evidence demonstrates that the proximate cause of current productivity loss is not the change in weather, but the persistence of outdated management practices. A finding of endangerment cannot be predicated on harms driven by manageable inefficiencies. Furthermore, future projections that assume these inefficiencies will persist indefinitely—ignoring the rational economic adaptation of the sector—are economically baseless. Thus, the study serves as evidence that rangeland risks are manageable and mitigable through improved planning, rather than proof of inevitable endangerment.
eNGO Endangerment Comment 146: Increased temperatures can cause heat stress in livestock and reduce their productivity.[963]	**Flawed Study (Reliance on Mischaracterized Climate Scenarios):** The cited study's quantitative conclusions are methodologically flawed for policy use. The study's headline finding of a "$39.94 billion" annual loss is entirely dependent on projecting impacts from the high-end, worst-case SSP5-8.5 emissions scenario. Further, the study's economic calculations are based on a comparative approach that projects speculative 21st-century climate impacts onto the global livestock industry as it was in 2005. This method necessarily fails to account for any market-driven adaptation, technological improvements, genetic developments, or

[962] Derner & Augustine, *Adaptive Management for Drought on Rangelands*, 38 Rangelands 211 (2016), https://doi.org/10.1016/j.rala.2016.05.002.

[963] Thornton et al., *Impacts of Heat Stress on Global Cattle Production During the 21st Century: A Modelling Study*, 6 Lancet Planetary Health e192 (2022), https://doi.org/10.1016/s2542-5196(22)00002-x.

	breed switching (e.g., to more heat-tolerant *Bos indicus* cattle) that would realistically occur over the next 60–80 years should any negative effects occur. ***Out of Scope:*** Further, many of the harms in the study are experienced outside of the United States and will occur only long in the future. The study explicitly concludes that losses in tropical regions—such as South America, Africa, and Southeast Asia—are projected to be "far greater" than those in temperate regions like the United States. Additionally, the headline economic damage figures cited are derived from "end of the century (2085)" projections, well beyond the relevant timeframe for current regulatory analysis. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 146–47: Between 2000 and 2018, an increase of 1.023 degrees Celsius in average temperature resulted in a dairy sector loss exceeding $1.2 billion.[964]	**Misrepresentation (Misleading Omission / False Attribution):** The proposition is based on a fundamental misreading of the cited source. Wankar et al. (2021) is a literature review that fundamentally misapplies the primary data it synthesizes. The proposition quotes a single sentence that misleadingly synthesizes data from different sources and timeframes. The "$1.2 billion loss" figure is not a finding for the 2000–18 period; it is a citation to several separate, older studies ((St. Pierre et al. 2003; Ziggers 2012; Key et al. 2014). None of those sources support the proposition that the increase in temperature in that period created a $1.2 billion loss. Each of those studies is about annual dairy losses due to heat stress generally—not increases in heat stress due to climate change. Indeed, it should be obvious that because the

[964] Wankar et al., *Heat Stress in Dairy Animals and Current Milk Production Trends, Economics, and Future Perspectives: The Global Scenario*, 5 Tropical Animal Health & Production 21 (2021), https://doi.org/10.1007/s11250-020-02541-x.

	three studies were all published before 2018, that none of them could have calculated climate change induced heat stress losses in 2018.
eNGO Endangerment Comment 147: Increased incidence and intensity of heatwaves also pose a significant risk to farm workers who are increasingly suffering a variety of adverse health outcomes including heat stroke, kidney disease, and exacerbation of cardiovascular and respiratory diseases. Health-related impacts to outdoor workers since 1990 increased by at least 90% globally; in the U.S. that translates to annual labor productivity losses of over $90 billion from 2001–09.[965]	**Misrepresentation (Irrelevant Source):** The commenters' claim that risk is increasing due to heatwaves is not supported by the cited study, Jackson & Rosenberg (2010). That study is an occupational health and epidemiology review, not a climate trend analysis. It documents that heat illness is a significant, existing hazard for agricultural workers, using static data from periods like 1992–2006. It does not, however, analyze whether heatwaves are increasing in frequency or whether workers are "increasingly suffering" as part of a climate trend. Instead, the study's analysis focuses on proximate occupational safety failures—such as lack of acclimatization or water access—as the primary drivers of illness, not long-term climate change. The commenters cite a study about workplace safety to incorrectly substantiate a claim about climate-driven trends. **Misrepresentation (Direct Contradiction & Data Inflation):** The commenters' claim of a "90%" global increase in impacts since 1990 appears nowhere Parsons et al. (2022). That study found that "Over the last four decades, global heat-related labor losses increased by at least 9%"—a tenfold exaggeration by the commenters. Second, the commenters' claim that "$90 billion" in U.S. losses occurred as a result of an "increase" is false. That figure is an estimate of *total* annual heat and humidity-related losses (specifically utilizing the outlier "Laboratory ERF" model), not climate change-induced *increases*. Finally, even the timeline cited, "2001–09," is incorrect. The study's analysis occurs between 2001–2020.

[965] Jackson & Rosenberg, *Preventing Heat-Related Illness Among Agricultural Workers*, 15 J. Agromedicine 200 (2010), https://doi.org/10.1080/1059924x.2010.487021; Parsons et al., *Global Labor Loss Due to Humid Heat Exposure Underestimated for Outdoor Workers*, 17 Env't Rsch. Letters 014050 (2022), https://ui.adsabs.harvard.edu/link_gateway/2022ERL....17a4050P/doi:10.1088/1748-9326/ac3dae.

	Methodological Flaws (Cherry-Picking & Unrepresentative Data): The commenters not only misstate the data but also cherry-pick an outlier model from the Parsons study without context. The study compares a standard epidemiological model (LCHCC) against a new "Laboratory ERF" model, noting that the new model produces loss estimates "approximately 2.7 times as high" as the standard. The commenters rely exclusively on the aggressive model to generate the "$90 billion" U.S. figure. Furthermore, the study concedes in Section 2.3 that this aggressive model is derived from a study of "young, healthy, fit British participants who were not acclimatized to heat." The study's headline-grabbing economic loss figures are generated by applying a damage function derived from unacclimatized individuals to the entire global, outdoor workforce. This non-representative basis is a severe methodological flaw that makes the study's outputs highly speculative and virtually guaranteed to exaggerate the real-world impacts on workers who are accustomed to their local climate. **Out of Scope:** Further, the specific "trend" data cited by the commenters relies on global statistics that are inapplicable to a U.S.-specific endangerment finding. The Parsons et al. (2022) finding regarding the percentage increase in labor losses is a global figure; the study explicitly notes that these losses are "most pronounced in India, which accounts for almost half of the global total losses," and that the impacts are concentrated in tropical regions like Southeast Asia and Sub-Saharan Africa. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.

eNGO Endangerment Comment 147–48: A warming climate will cause more pest outbreaks which can damage crops, including anticipated losses of 18%, 1%, and 32% in wheat, rice, and maize, respectively, in North America, and crop losses of up to 50%.[966]	**Misrepresentation (Irrelevant Source and Misleading Omission):** The commenters' central claim for "anticipated losses of 18%, 1%, and 32%" in North America is incorrectly attributed to Subedi et al. (2023). Subedi et al. is a 2023 review study that presents no original data on this point. The study's Table 2, from which the commenters extract these figures, explicitly states the data is "adapted from" the 2018 study by Deutsch et al. (2018), which the commenters cite in the next sentence for a different proposition. That study's projections of crop loss are model outputs derived from feeding data into a model using what they call "a 'business-as-usual' emissions scenario (RCP 8.5)." This is a critical flaw. The RCP 8.5 scenario is not a "business-as-usual" or likely pathway but is now widely understood to be a low-probability, worst-case scenario. **Misrepresentation (Irrelevant Source):** The claim that Ainsworth & Long (2021) supports "crop losses increased by 50%" is also a significant misrepresentation of that studies. Ainsworth & Long is a review of Free-air Carbon Dioxide Enrichment (FACE) experiments; its primary focus is not on warming. In fact, the study reviews extensive data showing that elevated CO_2 *increases* crop yields, citing, for example, yield gains of 56% and 59% in some experiments. While the study does note that CO_2 can increase pest *damage* (e.g., "65% more lesions" [9]or a "fourfold" increase in crown rot), this is a separate mechanism from climate warming. The commenters' claim that crop losses increased by 50% appears nowhere in the text.

[966] Subedi et al., *The Impact of Climate Change on Insect Pest Biology and Ecology: Implications for Pest Management Strategies, Crop Production, and Food Security*, 14 J. Agric. & Food Rsch. 100781 (2023), https://doi.org/10.1016/j.jafr.2023.100733; Deutsch et al., *Increase in Crop Losses to Insect Pests in a Warming Climate*, 361 Science 916 (2018), https://doi.org/10.1126/science.aat3466; Ainsworth & Long, *30 Years of Free-Air Carbon Dioxide Enrichment (FACE): What Have We Learned About Future Crop Productivity and its Potential for Adaptation?*, 27 Global Change Biology 27 (2021), https://doi.org/10.1111/gcb.15375.

	Out of Scope: Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. The projections relied upon by the commenters are global in nature, creating significant uncertainty regarding specific domestic impacts. Furthermore, the modeled temperature increases driving these pest projections are not projected to occur until after 2050, well beyond the relevant timeframe for current vehicle standards.
eNGO Endangerment Comment 149: Integrating all climate change impacts on agriculture, a recent study on projected agricultural yields in 2100 found losses of roughly 6 to 20% in U.S. corn, soy, wheat, and sorghum under a moderate emissions scenario (RCP 4.5), with incorporation of the CO_2 fertilization effect. Under a high emission scenario (RCP 8.5), that range rises to roughly 20 to 35%.[967]	**Flawed Study (Reliance on Mischaracterized Scenarios):** The study's—and the commenters'—most alarming conclusions are predicated on projections using the "high-emissions scenario (RCP 8.5)." This pathway is widely understood in the scientific literature as an unlikely, "worst-case" scenario, not a "business-as-usual" or even a likely outcome. Relying on this low-probability, high-impact scenario as a primary basis for projections exaggerates the potential damages. **Flawed Study (Unrealistic Constraints on Adaptation):** The study's econometric model is also fundamentally limited in its ability to project impacts to 2100. The model is statistical, meaning it projects future adaptation based only on adaptive behaviors observed in the historical data. The authors concede this weakness: "Future producer adaptation to climate change may differ from the historically observed patterns we recover." The model cannot, by design, account for future technological innovations—such as genetically modified crops,

[967] Hultgren et al., *Impacts of Climate Change on Global Agriculture Accounting for Adaptation*, 642 Nature 644 (2025), https://doi.org/10.1038/s41586-025-09085-w.

	breakthroughs in fertilizer, or advanced water management—that are not present in its historical training data. This assumption makes its century-long projections highly speculative and likely overstates net negative impacts by failing to account for human innovation. The study also artificially inflates damages by assuming farmers will not expand irrigation infrastructure over the next 75 years. The authors rely on a single cross-section of irrigation data "centred around the year 2000" and explicitly "hold the values fixed in climate projections." This ignores a primary adaptive response—expanding irrigation—thereby forcing the model to project artificial crop failures in regions that would realistically adapt through water management. Further, the study's core yield projections assume farmers will stubbornly persist in growing the same crops in the same locations regardless of climate shifts. The authors admit: "Notably, our approach does not account for altering the area planted to a given crop (that is, crop switching)." In the real world, producers facing declining yields would switch to more suitable crops, significantly mitigating the losses projected by this rigid model. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States and will occur only long in the future. The study's primary projections extend to the "end of the century" (2089–2098), and it explicitly notes that "global impacts are dominated by losses to modern-day breadbaskets" globally, not just in the U.S., with specifically severe losses noted for regions such as "Sub-Saharan Africa" and "South America." As noted above, see *supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited temporally to the useful life of the vehicle and geographically to the United States.

eNGO Endangerment Comment 150: The Draft CWG Report's reliance on farmland value trends as a surrogate for climate change effects on yields is flawed and ignores direct yield impact studies showing negative impacts.	**Misrepresentation (Exaggeration / Overclaiming):** The commenters' claim that the Draft CWG Report only relies on "selective, indirect land value data" is factually incorrect. The commenters' critique is based on a selective reading of only Section 9.1 ("Econometric analyses") while ignoring the subsequent, more detailed sections on direct impacts: Section 9.2 ("Field and laboratory studies of CO_2 enrichment") and Section 9.3 ("Crop modeling meta-analyses"). The commenters also fundamentally misrepresent the report's treatment of the econometric studies: namely, that studies focusing only on temperature and precipitation (heat and water stress) while ignoring the direct, beneficial effects of CO_2 fertilization are incomplete and present a biased, overly pessimistic view. The report's inclusion of data from field studies and its re-analysis of crop models provides the necessary context that the commenters' preferred studies lack.
Overall assessment of costs of climate change.	
eNGO Endangerment Comment 150: The proposal fails to comprehensively assess the economic impacts of climate change, overlooking the extensive, peer-reviewed literature underpinning Social Cost of Carbon (SCC) estimates which are	**Misrepresentation (Misleading Omission / Exaggeration):** The commenters mischaracterize the cited literature regarding SCC. While the National Academies (2017), Rennert et al. (2022), and EPA (2023) reports affirm the importance of using peer-reviewed science to estimate the SCC, they do not support the commenters' assertion of a "comprehensive assessment" leading to a "clear scientific consensus supporting SCC values." Critically, the commenters omit that both Rennert et al. and the EPA report explicitly detail significant limitations in their own updated SCC estimates. **Flawed Study (Arbitrary Discount Rate):** The substantially higher SCC values reported in the Rennert et al. and EPA studies (e.g., a central estimate of $185/t$CO_2$) are heavily influenced by the selection of a low near-term discount rate (2%). This choice, justified primarily by reference to recent decades of declining real interest rates and "expert surveys," represents a significant departure from rates used historically or often recommended for

replicated across multiple methods.[968]	standard regulatory analysis. Using such a low rate mechanically inflates the present value assigned to highly uncertain, speculative damages projected centuries into the future. **Flawed Study (Speculative Damage Function):** The economic damage functions employed in the EPA and Rennert analyses, while incorporating newer research, remain highly speculative and demonstrably incomplete. The core "bottom-up" models (GIVE, DSCIM) quantify monetized damages across only 4–5 selected sectors (primarily mortality, agriculture, energy use, and coastal impacts), effectively assigning a value of zero to all omitted impact categories. Furthermore, converting empirical findings (often based on localized data or short-term weather effects) into global, multi-century damage functions necessitates significant extrapolation and reliance on controversial methods, such as international benefits transfer using income elasticities to estimate the value of non-market impacts (like mortality risk) in developing countries. **Out of Scope:** Further, the vast majority of the harms captured by the SCC are experienced outside of the United States and will occur only long in the future. Rennert et al. (2022), for example, rely on projections that extend out to the year 2300 and utilize a model that is "spatially resolved at the level of 184 countries" to capture global, not domestic, impacts. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.

[968] Nat'l Acads. of Scis., Eng'g, & Med., Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide (2017), https://doi.org/10.17226/24651; Rennert et al., *Comprehensive Evidence on the Social Cost of Carbon*, 610 Nature 687 (2022), https://doi.org/10.1038/s41586-022-05224-9; EPA, Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances (Nov. 2023), https://perma.cc/9VZR-DV8C.

eNGO Endangerment Comment 150: Metrics based on GDP share understate climate risk, as mortality and morbidity generate large welfare losses not reflected in such measures. Regardless, recent studies quantify macroeconomic damages as approximately six times larger than previously estimated.[969]	The commenters' proposition relies on two recent studies to claim that climate damages are dramatically higher than previously understood. However, neither study is representative of the broader literature. **Flawed Study (Speculative Damage Function / Confounding Variables):** The commenters' central claim of "six times larger" macroeconomic damages is drawn from Bilal & Känzig (2024). This study's finding is a significant outlier that contradicts the established literature. The authors achieve this result by rejecting the standard methodology (using local temperature changes) in favor of a novel model based on "global temperature" shocks. The authors concede that when they use the established, peer-reviewed methodology, their results are small and statistically insignificant. The study's "global temperature" variable appears to be a proxy for complex, naturally-occurring global cycles (like El Niño), which it notes as a driver of variability. These cycles are known to cause correlated global impacts like droughts and recessions. Mainstream research uses time-fixed effects to remove the confounding influence of these global cycles and isolate the impact of temperature. Bilal & Känzig's novel method removes this standard control, allowing it to improperly attribute damages from these natural cycles to climate change and manufacture its order of magnitude larger result. **Flawed Study (Conclusion Overreach / Speculative Extrapolation):** The study cited for mortality costs, Carleton et al. *Mortality Risk from Climate-Driven Wildfire Smoke* (2022), appears to be a hallucination by the eNGOs. A study by that name exists, but is not authored by Tamma Carelton, and has no bearing on the claim at hand. The hyperlink provided for the

[969] Carelton et al., *Mortality Risk from Climate-Driven Wildfire Smoke*, 137 Q.J. Econ. 2037 (2022), https://doi.org/10.1093/qje/qjad005; EPA SC-GHG Report; Bilal & Känzig, *The Macroeconomic Impact of Climate Change: Global vs. Local Temperature* (NBER Working Paper No. 32450, 2024), https://doi.org/10.3386/w32450.

	study (https://doi.org/10.1093/qje/qjad005) goes to yet a third (and also completely unrelated) article on "misdemeanor prosecution."
eNGO Endangerment Comment 151: Evidence demonstrates robust temperature-damage relationships across sectors, with adaptation proving only a partial and often costly solution. County- and sector-level studies reveal large health and labor losses overlooked by aggregate growth regressions, with mortality as a key driver.[970]	The commenters' claim—that evidence robustly demonstrates significant temperature-damage relationships across sectors, with mortality as a key driver, and that adaptation is only a partial and costly solution—is not supported by a critical analysis of the cited literature. **Misrepresentation (Contradiction regarding Adaptation Efficacy):** The commenters assert that adaptation is "proving only a partial" solution, implying it is occurring but is insufficient. The commenters' claim that adaptation is "partial" or "costly" ignores the historical reality of autonomous adaptation. As detailed in the Draft CWG Report (Section 10.3.1), technological improvements and economic growth have dramatically reduced vulnerability to climate extremes over the last century. The commenters rely on literature that fails to account for these autonomous, market-driven adaptations—such as the widespread adoption of air conditioning and improved agricultural cultivars—which have successfully decoupled climate variability from mortality and economic loss. They conclude that "the net effects of existing actions have largely not been successful in meaningfully reducing climate impacts in aggregate." The commenters misleadingly characterize a study documenting a widespread absence of effective aggregate adaptation as evidence that adaptation can only be partially effective in the future.

[970] Burke et al., *Climate and Labor Market Impacts* (NBER Working Paper No. 32985, 2024), https://www.nber.org/papers/w32985; Kalkuhl & Wenz, *The Impact of Climate Change on Economic Growth and Development*, 127 World Dev. 104749 (2020), https://doi.org/10.1016/j.worlddev.2019.104749; Gould et al., *Sectoral Damages of Climate Change in the United States*, 11 Sci. Advances eadr3070 (2025), https://doi.org/10.1126/sciadv.adr3070.

	Misrepresentation (Misleading Omission regarding Mortality): The commenters claim "large health ... losses" with "mortality as a key driver," implying that warming uniformly increases mortality risk. The commenters cite Gould et al. (2025) in support, but omit that study's central finding regarding the net impact of warming on mortality in the studied region (California). Gould et al. explicitly project that "while future warming will increase [emergency department] visits [morbidity], mortality will decrease due to fewer cold extremes." Citing this study to support a generalized claim about large, climate-driven mortality losses is misleading, as it ignores the crucial finding that warming may reduce net mortality by mitigating cold risks. Furthermore, the authors of Gould et al. explicitly warn against applying their findings to the rest of the United States. They state, "because the CA-specific response function is meaningfully different from the rest of the United States, we would urge some caution in any extrapolation of our response functions to the remainder of the country." Relying on this study for a nationwide endangerment finding violates the authors' own guidance on external validity. The commenters' reliance on Carleton et al. obscures that the study projects net mortality *benefits* for the United States under plausible scenarios. Table F.2 of the study shows that under RCP 4.5, the mortality risk for the USA is projected to be negative (meaning lives are saved) across multiple valuation metrics. The high damages cited are driven by global aggregate figures that mask these projected benefits within the United States. **Flawed Study (Reliance on Mischaracterized Climate Scenarios):** The high economic damage and mortality cost projections cited by the commenters are derived from studies predicated on the implausible RCP 8.5 high-emissions scenario. Kalkuhl and Wenz (2020) explicitly characterize RCP 8.5 as the "business-as-usual scenario" to generate their headline

	finding of a 7–14% reduction in global output. Similarly, the methodology detailed in the appendix of Carleton et al. (2022) confirms reliance on RCP 8.5 for their climate projections. This characterization of RCP 8.5 as a likely or baseline trajectory is contrary to the current scientific consensus, which views it as a low-probability scenario. By anchoring their analysis to this extreme trajectory, the studies generate inflated temperature projections, resulting in exaggerated estimates of economic damages and mortality costs. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States and will occur only long in the future. For example, Kalkuhl & Wenz (2020) use a "global panel of regions" to derive a "global damage function," explicitly aggregating damages worldwide rather than isolating U.S. impacts. Similarly, the Carleton et al. (2022) estimates rely on global data to project the "global mortality consequences" of climate change. Regarding temporal scope, both Kalkuhl & Wenz and Carleton et al. extend their damage projections through the year 2100, and Gould et al. (2025) projects damages out to 2099. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 151: Localized declines in cold-related deaths can mask substantial increases in heat-driven morbidity and health care demand.[971]	**Misrepresentation (Irrelevant Source):** The commenters cite Moore et al. (2024) to support the proposition that localized declines in cold-related deaths are masked by increases in heat-driven morbidity. This citation is irrelevant. Moore et al. is a meta-analysis focused exclusively on the methodologies used to calculate the SCC. It analyzes variations in economic models and discounting approaches. The study does not present any data, analysis,

[971] Moore et al., *Synthesis of Evidence Yields High Social Cost of Carbon Due to Structural Model Variation and Uncertainties*, 121 Proc. Nat'l Acad. Scis. e2410733121 (2024), https://doi.org/10.1073/pnas.2410733121.

	or findings regarding the specific impacts of temperature extremes on human health, mortality, or morbidity. Indeed, the words "cold," "hot," "death," "morbidity," "healthcare," and "mask" appear nowhere in the article.
eNGO Endangerment Comment 151: Comprehensive meta-analyses of climate economics consistently conclude the optimal policy is to reduce emissions, with no credible analysis finding inaction optimal.[972]	The commenters' argument that a universal consensus exists regarding the necessity of stringent emissions reductions, supported by the cited literature, is based on a misrepresentation of that literature and a reliance on studies with critical methodological flaws. **Flawed Study (Arbitrary Discount Rate):** The commenters rely heavily on the Stern Review (2006) and Rennert et al. (2022) to argue for aggressive emissions reductions based on a high SCC. However, these studies' alarming conclusions are not empirical discoveries but simply the result of using arbitrarily low discount rates. Rennert et al. explicitly base their 185/tCO_2 estimate on a 2% "risk-free" discount rate. The Stern Review used a near-zero rate of pure time preference (0.1%) based on controversial ethical judgments rather than observed market data. These extremely low rates violate standard economic practice for regulatory analysis, which typically utilizes rates reflecting the real-world opportunity cost of capital. By minimizing the discount rate, these studies guarantee high SCC estimates, predetermining their outcomes. When conventional discount rates are applied, the estimated SCC is substantially lower, invalidating the economic rationale for high-cost, immediate mitigation derived from these outlier studies.

[972] Rennert et al., *Comprehensive Evidence on the Social Cost of Carbon*, 610 Nature 687 (2022), https://doi.org/10.1038/s41586-022-05224-9;; Stern, *The Economics of Climate Change*, 98 Am. Econ. Rev. 1 (2008), https://www.aeaweb.org/articles?id=10.1257/aer.98.2.1; Tol, *Meta-Analysis of Climate Damages and Policy Implications*, 129 Energy Econ. 106901 (2024), https://doi.org/10.1016/j.eneco.2024.106901.

	Misrepresentation (Exaggeration / Overclaiming): The commenters misleadingly suggest a uniform consensus by citing Tol (2024) alongside Stern (2006) and Rennert (2022). This conflates studies with vastly different methodologies and conclusions, thereby misrepresenting both the literature and the findings of the CWG Report. While Tol (2024) finds that the central estimate of climate impacts is negative—which suggests that some action may be preferable to inaction—the magnitude of this impact is modest. As correctly noted in the CWG Report (Sec. 11.2.3), Tol's meta-analysis finds an average welfare loss of only 1.7 percent of income for a 2.5 °C warming. This modest finding contrasts sharply with the catastrophic damages projected by Stern and Rennert. The commenters exaggerate the implications of Tol's work, improperly using a finding of non-zero impact to imply justification for drastic, high-cost mitigation policies that the study itself does not support. **Misrepresentation (Misleading Omission):** The commenters assert "consistent conclusions" across the literature while omitting the central findings of the very study they cite, Tol (2024). Tol's meta-analysis explicitly emphasizes that the uncertainty surrounding the economic impacts of climate change is now "much wider" than previously understood and highlights sharp methodological divides within the field (e.g., "Elicitation methods are most pessimistic, econometric studies most optimistic"). **Out of Scope:** Further, the vast majority of the harms captured by the SCC are experienced outside of the United States and will occur only long in the future. Rennert et al. (2022), for example, rely on projections that extend out to the year 2300 and utilize a model that is "spatially resolved at the level of 184 countries" to capture global, not domestic, impacts. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States

eNGO Endangerment Comment 151–52: Diverse methodologies (structural models, empirical studies, expert elicitation) converge on consistent SCC values, and across modern damage functions and discounting approaches, central estimates remain robustly above zero.[973]	**Misrepresentation (Exaggeration / Overclaiming):** The commenters fundamentally mischaracterize the cited literature by claiming that diverse methodologies "converge on consistent SCC values." In fact, the cited sources explicitly demonstrate the opposite: wide variation, profound uncertainty, and high sensitivity to modeling assumptions. The meta-analysis by Moore et al. (2024) concludes that the distribution of published SCC values is "wide and substantially right-skewed," and note that findings in the literature are "scattered," with their own synthetic estimate showing a 5th to 95th percentile range spanning \$32 to \$874. Similarly, Rennert et al. (2022) presents a preferred range of \$44 to \$413. Additionally, these recent studies represent a divergence from, not a convergence with, prior estimates; Rennert et al. notes its estimates are 3.6 times higher than the previous federal figure. The literature clearly shows that SCC estimates do not "converge." **Flawed Study (Arbitrary Discount Rate):** The high central estimates relied upon by the commenters (e.g., \$185 in Rennert et al., \$190 in the EPA Report) are not robust empirical findings but are driven primarily by the adoption of exceptionally low discount rates. Both studies use a central near-term rate of 2.0%. Applying this low rate to highly uncertain, intergenerational climate damages is methodologically controversial, as it departs from rates reflecting the opportunity cost of capital and mechanically inflates the present value of distant damages. The sensitivity is extreme: Rennert et al. (2022) show that simply increasing the near-term discount rate from 2.0% to 3.0% cuts their mean SCC estimate by more than half,

[973] Moore et al., *Synthesis of Evidence Yields High Social Cost of Carbon Due to Structural Model Variation and Uncertainties*, 121 Proc. Nat'l Acad. Scis. e2410733121 (2024), https://doi.org/10.1073/pnas.2410733121; Rennert et al., *Comprehensive Evidence on the Social Cost of Carbon*, 610 Nature 687 (2022), https://doi.org/10.1038/s41586-022-05224-9; EPA SC-GHG Report; Howard & Sterner, *Few and Not So Far Between: A Meta-Analysis of Climate Damage Estimates*, 68 Env't & Res. Econ. 197 (2017), https://ideas.repec.org/a/kap/enreec/v68y2017i1d10.1007_s10640-017-0166-z.html.

	from \$185 to \$80. This confirms that the SCC value is primarily a function of this contested assumption rather than the underlying damage estimates. **Flawed Study (Speculative Damage Function and Ignoring Contrary Evidence):** The "modern damage functions" and syntheses relied upon by the commenters are highly speculative and contested. For instance, Moore et al. (2024) generate their high SCC estimate (\$283/ton) not by synthesizing the literature as it exists, but by creating a "synthetic" distribution that reweights the literature to match the subjective opinions of surveyed experts, elevating opinion over the empirical record. Moreover, the commenters ignore prominent contrary evidence, such as Tol (2024), which they cite positively elsewhere, which finds much wider uncertainty and suggests far more modest damages overall. **Out of Scope:** Further, the vast majority of the harms captured by the SCC are experienced outside of the United States and will occur only long in the future. Rennert et al. (2022), for example, rely on projections that extend out to the year 2300 and utilize a model that is "spatially resolved at the level of 184 countries" to capture global, not domestic, impacts. Similarly, Moore et al. (2024) explicitly define the SCC as the present value of "all future impacts" affecting the welfare of people "around the world" for "centuries into the future". Howard & Sterner (2017) likewise focus exclusively on "global climate damage estimates". As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States
eNGO Endangerment Comment 152: SCC values are generally understood to be lower-bound	**Misrepresentation (False Certainty and Overclaiming):** The commenters' assertion that SCC values are "generally understood to be lower-bound estimates" because some impacts are unquantified is an analytical fallacy that presents a one-sided view of the literature. While Integrated Assessment Models necessarily omit certain future impacts, this does not

estimates because many climate impacts remain unquantified.[974]	automatically render the resulting estimate a "lower bound." This conclusion requires the unsubstantiated assumptions that all omitted impacts are negative (ignoring potential benefits of warming or CO_2 fertilization) and that the most significant damages have not yet been quantified. As noted in the literature, this argument assumes that "over 40 years of impact research has somehow missed the most important effects of climate change" Tol (2024). **Flawed Study (Ignoring Countervailing Upward Biases):** The commenters' argument fails to acknowledge the significant upward biases inherent in current SCC methodologies, which likely outweigh the effect of omitted damages. The net direction of bias in SCC modeling is at best indeterminate, if not definitively upward. Key upward biases include: • *Underestimation of Adaptation:* The Integrated Assessment Models used in the literature systematically underestimate future human adaptation and technological innovation. By projecting current vulnerabilities onto future populations that are expected to be wealthier and more resilient, the models overestimate net future damages. • *Arbitrary Low Discount Rates:* Recent high SCC estimates are driven primarily by the adoption of exceptionally low discount rates (e.g., 3.0% or lower). This subjective economic assumption mechanically inflates the present value of long-term damages and exerts a far greater quantitative influence on the SCC than the modeled physical impacts.

[974] Moore et al., *Synthesis of Evidence Yields High Social Cost of Carbon Due to Structural Model Variation and Uncertainties*, 121 Proc. Nat'l Acad. Scis. e2410733121 (2024), https://doi.org/10.1073/pnas.2410733121.

	• *Speculative Damage Functions:* Most modern damage functions rely on contested assumptions, such as persistent negative impacts on economic growth rates and extreme climate scenarios, or employ econometric methods that have been criticized for producing spurious results Barker (2024).[975] **Flawed Study (Reliance on Subjective Opinion):** The cited study, Moore et al. (2024), does not empirically demonstrate that the SCC is underestimated. Instead, it reports the subjective beliefs of the authors' surveyed experts, stating that "experts believe the literature underestimates the SCC due to … incomplete characterization of damages." In other words, the study uses a model to predict what the SCC would be if the literature conformed to the experts' preferences. Since the experts were pre-disposed to believe the literature was "too low," the resulting synthetic distribution is simply a mathematical confirmation of that pre-existing bias, creating a circular feedback loop rather than an independent validation. **Out of Scope:** Further, the vast majority of the harms captured by the SCC are experienced outside of the United States and will occur only long in the future. Moore et al. (2024), for example, explicitly defines the SCC as the present value of "all future impacts" affecting the welfare of people "around the world" for "centuries into the future." As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.
eNGO Endangerment Comment 153: Even a small chance of	**Misrepresentation (Conflation of Concepts):** The commenters fundamentally misrepresent the source of the "6 to 200 times" multiplier. They attribute this increase to the risks of

[975] Barker, *Global Non-Linear Effect of Temperature on Economic Production: Comment on Burke, Hsiang, and Miguel*, 21 Econ J. Watch 35 (2024), https://econjwatch.org/articles/global-non-linear-effect-of-temperature-on-economic-production-comment-on-burke-hsiang-and-miguel.

extreme warming justifies strong climate action due to the possibility of catastrophic damages; accounting for this "fat tail" uncertainty could make SCC estimates 6 to 200 times higher.[976]	catastrophic physical climate damages. However, the study from which these figures are drawn, Dong et al. (2025), explicitly attributes this increase entirely to "preference heterogeneity" regarding the discount rate. The large multiplier found by Dong et al. (the "Weitzman premium") is a mathematical result of averaging diverse public opinions on how to value the distant future. It has nothing to do with climate sensitivity, tipping points, or physical damage uncertainty. The commenters misleadingly conflate uncertainty about climate outcomes with heterogeneity in ethical preferences for discounting. **Flawed Study (Arbitrary Discount Rate Methodology):** The findings of Dong et al. (2025) are not empirical measures of climate risk but are the result of their chosen discounting methodology. This approach (related to "Gamma discounting") causes the effective social discount rate to decline over time, increasingly ignoring the preferences of the majority and emphasizing the preferences of the minority who favor near-zero discount rates. This mathematically guarantees that the preferences of the most patient individuals dominate the calculation for long-term issues. The resulting high SCC is therefore not a measure of climate risk, but an artifact of a controversial ethical assumption that gives disproportionate weight to a small subset of preferences derived from an "unincentivized survey." **Misrepresentation (Exaggeration and Overclaiming):** The commenters drastically overstate the findings of Dietz et al. (2021), the study cited that actually models climate tipping points. Dietz et al. analyzed the economic impacts of eight climate tipping points and

[976] Dietz et al., *Economic Impacts of Tipping Points in the Climate System*, 118 Proc. Nat'l Acad. Scis. e2103081118 (2021), https://doi.org/10.1073/pnas.2103081118; Weitzman, *Fat Tails and the Social Cost of Carbon*, 104 Am. Econ. Rev. 544 (2014), https://ideas.repec.org/a/aea/aecrev/v104y2014i5p544-46.html; Wagner & Weitzman, *Potentially Large Equilibrium Climate Sensitivity Tail Uncertainty*, 168 Econ. Letters 144 (2018), https://doi.org/10.1016/j.econlet.2018.04.036; Dong et al., *The Weitzman Premium on the Social Cost of Carbon* (2025) (unpublished preprint), https://arxiv.org/pdf/2502.01394.

	found that collectively, they increase the SCC by approximately 25% in their main specification. The study found only a 10% chance that tipping points would more than double the SCC. Even in their most extreme sensitivity analysis (the 99.5th percentile), the increase is approximately a factor of 4.5 (347.8% increase). This is orders of magnitude lower than the 6 to 200 times suggested by the commenters. The commenters also fail to acknowledge that the Dietz et al. model found that certain tipping points act as negative feedbacks that actually *lower* the SCC. Specifically, the study found that a slowdown of the Atlantic Meridional Overturning Circulation (AMOC) "reduces the expected SCC by 1.4%." This nuance is entirely absent from the commenters' alarmist presentation. **Misrepresentation (Misleading Omission of Context):** The commenters cite Weitzman (2014) and Wagner & Weitzman (2018) to argue that "fat tail" uncertainty justifies drastically higher SCC estimates. This mischaracterizes the nature of these studies, which are theoretical explorations, not empirical findings. Weitzman (2014) demonstrated that under certain stylized mathematical assumptions, the SCC could theoretically become infinite. The commenters omit that Weitzman himself explicitly rejected that result as an empirical guide for policy, calling it an "absurd result" and a "reductio ad absurdum." He concluded it serves only as a "cautionary tale" because "we know hardly anything about extreme tail probabilities." The commenters misleadingly present this theoretical warning against complacency as empirical proof of impending catastrophe. **Out of Scope:** Further, the vast majority of the harms captured by the SCC are experienced outside of the United States and will occur only long in the future. Moore et al. (2024), for example, explicitly defines the SCC as the present value of "all future impacts" affecting the welfare of people "around the world" for "centuries into the future." As noted above, *see*

	supra, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States.

3. SECTION VI.D. "GREENHOUSE GAS EMISSIONS UNQUESTIONABLY ENDANGER PUBLIC HEALTH AND WELFARE"

Claim	Analysis
	Air Quality
eNGO Endangerment Comment 166: Worsening air quality due to greenhouse gas emissions causes significant negative health impacts.[977]	**Misrepresentation (Irrelevant Source):** The commenters cite a World Health Organization website that discusses negative health impacts of "ambient air pollution and household air pollution" due to airborne fine particulate matter, not from greenhouse gas emissions. The cited source does not mention greenhouse gas emissions, or suggest that greenhouse gas emissions worsen air quality, contribute to fine particulate matter, or contribute to deaths attributable to ambient or household air pollution.
eNGO Endangerment Comment 166: For example, pollution generated by wildfires—including particulate matter, carbon monoxide, and hazardous air pollutants—contributes to death,	The commenters cite the Wentz Conference Report to support their proposition that pollution generated by wildfires causes specific, severe health impacts, including death, respiratory disease, and cardiac events. This citation is entirely irrelevant. Page 17 of the report summarizes a legal panel discussion (Section 2.6) regarding "Fundamental Rights and Government Obligations," focusing on litigation strategies, climate justice, and the "rights of nature." The cited page contains no discussion of air quality, wildfires, particulate matter, or

[977] *Air Pollution* World Health Org., https://www.who.int/health-topics/air-pollution#tab=tab_2 (last visited July 10, 2025) (WHO estimates that ambient and indoor air pollution jointly cause approximately 7 million premature deaths annually).

respiratory disease, cardiac events, and negative birth outcomes.[978]	any of the specific health outcomes claimed by the commenters. Indeed, the words "air quality" and "particulate matter" appear nowhere in the document.
eNGO Endangerment Comment 166: Wildfire pollution, particulate matter pollution, and aeroallergens are all produced in heightened quantities with warmer ambient temperatures that result from greenhouse gas emissions.[979]	**Misrepresentation (Irrelevant Source):** The commenters again misrepresent the Wentz (2025) report. This document is not a scientific study establishing physical evidence but a conference report from Columbia Law School summarizing panel discussions on the legal applications of attribution science for climate litigation. The report does not contain the words "particulate matter," "pollen," or "aeroallergen." It offers no scientific support for the proposition that greenhouse gas emissions or warmer ambient temperatures heighten the production of these specific pollutants. The commenters also misrepresent the findings of Singh & Kumar (2022) by oversimplifying and muddling complex atmospheric and biological processes into a single, unsupported causal chain. The commenters claim GHGs result in "heightened quantities" of various pollutants. The cited study does not support this simplified narrative. Instead, the study discusses several distinct, and at times contradictory, interactions: • *Conflating Warming with Co-Pollutants:* The commenters attribute all effects to GHGs. However, the study discusses the effects of criteria pollutants (like NO_2, SO_2, and PM_{10}) which are not greenhouse gases, though they may share common sources. The study cites studies where these pollutants damage pollen or even decrease its protein content.

[978] J. Wentz, Conference Report: Attribution Science and Climate Law 17 (Mar. 2025), https://perma.cc/4M4X-J3FZ.

[979] J. Wentz, Conference Report: Attribution Science and Climate Law 17 (Mar. 2025), https://perma.cc/4M4X-J3FZ.; Singh & Kumar, *Climate Change and Allergic Diseases: An Overview*, 3 Front. Allergy 964987 (2022), https://doi.org/10.3389/falgy.2022.964987.

	• *Speculation vs. Fact:* The study's own language regarding the link between GHGs and pollen production is speculative, using qualified terms such as "may boost plant growth" and "may affect pollen dispersal." The study's causal chain is also tenuous, layering speculation on speculation (GHGs "may boost plant growth" which may "lead to increased pollen production, which may affect anther dehiscence patterns," which "may affect pollen dispersal and transport and increase the duration of the pollen season"). The commenters exaggerate these complex, qualified, and sometimes contradictory findings to present a simplified and misleading claim of direct causation.
eNGO Endangerment Comment: 166–67: Ground-level ozone (commonly referred to as "smog") is also associated with increased ambient temperatures and causes respiratory disease, obstructive pulmonary disease, asthma attacks, lung disease, preterm and low birthweight infants, cancer, harms to brain health, and premature death.[980]	**Flawed Study (Misleading Omission):** The commenters' reliance on Orru et al. (2013) to project future harms is misplaced, as the study is not a realistic forecast. The study's projections are predicated on the critical, non-realistic assumption that anthropogenic precursor emissions (like NO_X and VOCs) remain constant at year 2000 levels for all simulated future periods, including 2021–2050 and 2041–2060. The authors explicitly state that "the possible decrease of ozone precursor emissions ... were not taken into account." By methodologically ignoring decades of national and international emissions-reduction policies implemented after 2000, the study's model ensures an exaggerated projection of future ozone concentrations and, consequently, of future health impacts. Furthermore, the study relies on unrealist projections of future warming. The study relies on the SRES (Special Report on Emissions Scenarios), which were developed for the IPCC's 2001 Third Assessment Report. Specifically, it uses SRES A2:, a scenario characterized by

[980] Orru et al., *Impact of Climate Change on Ozone-Related Mortality and Morbidity in Europe*, 41 Eur. Respiratory J. 285 (2013), https://doi.org/10.1183/09031936.00210411; *Health Effects of Ozone Pollution*, U.S. Env't Prot. Agency, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution (last updated Mar. 13, 2025).

	high population growth, slow economic development, and continuously increasing greenhouse gas emissions, and SRES A1B, a scenario characterized by rapid economic growth, a global population that peaks mid-century, and "balanced" development across all energy sources (i.e., not exclusively fossil-fuel intensive). While there is no direct one-to-one mapping between SRES and Representative Concentration Pathway (RCP), the high-emissions SRES A2 scenario is often considered a precursor to or in a similar class of high-end, pessimistic scenarios as RCP 8.5 while the SRES A1B scenario is sometimes compared to RCP 6.0 or a pathway between RCP 6.0 and 8.5. Both scenarios significantly overpredict likely warming. **Misrepresentation (Exaggeration / Overclaiming):** The commenters also bundle a long list of severe health ailments, but their own cited sources fail to support the full list. Specifically, neither Orru et al. (2013) nor the EPA fact sheet mentions "cancer" or "harms to brain health" as health effects of ground-level ozone. The commenters also exaggerate Orru et al. (2013)'s findings. The study did not conclude that climate change uniformly leads to increases in ozone-related mortality and disease, but that the "projected effects of climate change on ground-level ozone concentrations could *differentially* influence mortality and morbidity across Europe" (emphasis added). Specifically, the study found that mortality would increase in central and southern Europe but decrease in northern Europe.
Extreme Weather Events	
eNGO Endangerment Comment 167: Emissions of greenhouse gas raise ambient temperatures, which in turn heightens the frequency and	**Misrepresentation (Irrelevant Source / Exaggeration and Ignoring Contrary Evidence):** The commenters fail to substantiate their proposition because the cited source material is irrelevant to the claim. The commenters assert that greenhouse gas emissions "heighten the

severity of extreme weather events, including extreme heat, precipitation, and flooding.	frequency and severity of extreme weather events," citing the "IPCCC, AR6" [sic]. It is unclear what specific section of that report they are referring to. Furthermore, the commenters' assertion that emissions universally "heighten the frequency and severity" of extreme heat, precipitation, and flooding ignores significant contrary evidence within the U.S. historical record and oversimplifies complex, regionally variable phenomena. The commenters ignore data demonstrating that many critical metrics for extreme weather show no adverse trends in the United States. As detailed in the Draft CWG Report, most extreme weather events in the U.S. do not show long-term trends. For example: • *Extreme Heat:* The commenters' claim regarding extreme heat ignores the historical context that the frequency of intense heatwaves and extreme hot days in the U.S. was significantly higher during the 1930s than it is today. If a decrease in extreme cold days is accounted for, temperatures in the U.S. are becoming less extreme. See CWG Report, Sections 6.3.1, 6.3.3. • *Flooding:* The assertion regarding increased flooding is unsubstantiated by observational data. The CWG report demonstrates that claims of increased frequency or intensity of floods are not supported by U.S. historical data, and there is no clear evidence of an increasing trend in flood magnitude or frequency across the U.S. CWG Report, p. ix; Section 6.6. By generalizing global assessments and disregarding the specific U.S. historical record that contradicts their premise, the commenters significantly exaggerate the observed impacts of emissions on extreme weather.

eNGO Endangerment Comment 167: Extreme heat due to greenhouse gases contributes to more mortality than any other climatic hazard.[981] Conclusively, health impact studies have found that climate change induced by greenhouse gas emissions has contributed to rising ambient temperatures, increasing the pervasiveness of extreme heat exposure.[982]	**Misrepresentation (Exaggeration/Overclaiming and Irrelevant Source):** The commenters' assertion that extreme heat contributes to "more mortality than any other climatic hazard" is a superlative claim wholly unsupported by the cited materials. First, the commenters exaggerate the findings of Vicedo-Cabrera et al. (2021), Puvvula et al. (2022) and Romanello et al. (2023). While those reports document modeled increases in heat-related mortality, they do not conduct the comparative analysis required to rank heat as the deadliest climatic hazard globally compared to others such as flooding or storms. Indeed, Vicedo-Cabrera found that heat-related mortality risks were actually *less* than 1.0 in 28 locations, and that attribution estimates were below zero for 23 locations. This variability undermines the eNGOs' presentation of a uniform, conclusive global catastrophe. The commenters mistake the studies' analyses of heat impacts for a definitive comparative conclusion that none of the studies make. Second, the citation to Wentz (2025) is irrelevant. This document is merely a conference report summarizing presentations; it is not peer-reviewed research and presents no empirical data. Furthermore, the specific page cited summarizes discussions on labor and food security, not mortality statistics. **Flawed Study (Conclusion Overreach / Failure to Account for Confounding Factors):** Furthermore, the analysis in Romanello et al. (2023) regarding observed mortality trends likely overstates the role of climate change by failing to adequately isolate the climate signal

[981] Vicedo-Cabrera et al., *The Burden of Heat-Related Mortality Attributable to Recent Human-Induced Climate Change*, 11 Nature Climate Change 492 (2021), https://doi.org/10.1038/s41558-021-01058-x. *See also* Puvvula et al., *Estimating the Burden of Heat-Related Illness Morbidity Attributable to Anthropogenic Climate Change in North Carolina*, 6 GeoHealth e2022GH000636 (2022), https://doi.org/10.1029/2022GH000636.

[982] *See* Wentz (2025) at 12; Romanello et al., *The 2023 Report of the Lancet Countdown on Health and Climate Change*, 402 Lancet 2346, 2360 (2023).

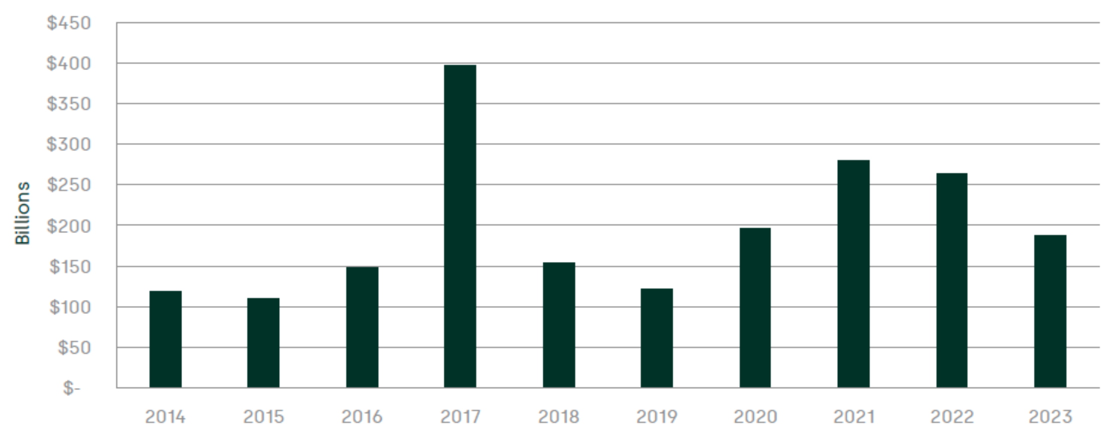
	from dominant, confounding factors. The report highlights an 85% increase in heat-related deaths among older adults compared to 1991–2000. While the authors acknowledge that population aging alone accounts for a 38% increase, they attribute the remaining difference entirely to temperature increases. This methodology is incomplete as it fails to account for other critical factors that changed over the thirty-year period, such as increased urbanization (the Urban Heat Island effect) and the rising prevalence of underlying health conditions, both of which independently increase heat vulnerability. These factors are likely very important. As the authors explain: > However, potentially due to wildfire management and control, reduced availability of vegetation or other forms of fuel following previous fires, land use change (including urban expansion), or rural–urban migration continuing to concentrate populations in cities, **56 countries saw a statistically significant reduction in the days each person was exposed to active wildfires annually in 2018–22 compared with 2003–07, whereas only seven countries saw a statistically significant increase**. Romanello et al. (2023), at 18 (emphasis added). Finally, the study's alarming future projections (e.g., a 370% increase in heat-related deaths by midcentury) are unreliable for regulatory use as they are explicitly predicated on the assumption of "no substantial progress on adaptation." Projecting public health impacts decades into the future while assuming societies will remain static—failing to adopt new technologies, infrastructure, or behaviors—is contrary to historical evidence of human adaptation and systematically inflates the modeled harms. The analyses in Vicedo-Cabrera et

	al. (2021) and Puvvula et al. (2022) suffer from the same flaws, as they fail to account for confounding factors and potential adaptations. The commenters' argument fails on two fronts. First, in regions like the U.S. warming hole, the absence of warming trends negates the alleged increase in heat mortality. Second, in regions that *are* warming, the commenters ignore the net-mortality benefit. **As noted in above and established by Gasparrini et al. (2015), cold temperatures are a far greater killer than heat. Furthermore, Gasparrini et al. (2017) found that the reduction in cold deaths outweighs increases in heat deaths in most reasonable scenarios.** To the extent warming occurs, the reduction in cold-related mortality offsets heat-related increases, resulting in a net benefit that the commenters fail to acknowledge. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States or will occur only long in the future. As noted above, see *supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited, temporally to the useful life of the vehicle and geographically to the United States. • *Temporal Scope:* Puvvula et al. (2022) base their alarming projections on "Late century" data spanning 2070–2099. Similarly, Romanello et al. (2023) utilize projections extending to 2081–2100 for heat-related mortality and food insecurity. These time horizons far exceed the relevant regulatory timeline. • *Geographic Scope:* Romanello et al. (2023) is a global assessment where many of the cited impacts (e.g., food insecurity and malaria transmission) are concentrated in Africa, Asia, and South America. Vicedo-Cabrera et al. (2021) likewise draw data from

	43 countries, finding the highest heat-mortality burdens in Southern Europe, Western Asia, and South America, regions outside the EPA's regulatory jurisdiction.
eNGO Endangerment Comment 168: The climatic impacts resulting from greenhouse gas emissions increase severe precipitation, storm, and flooding events. These events threaten already fragile infrastructure, health services, and emergency response systems, resulting in high public and private costs.[983]	**Misrepresentation (Exaggeration / Overclaiming):** Again, the cited conference summary by Wenz is entirely irrelevant. Further, the commenters improperly rely on an economic report that merely *assumes* a climate link to substantiate a physical science proposition asserting that link. The Oxera report (2024), prepared for the International Chamber of Commerce, is an economic analysis focused on quantifying the costs of past weather events; it is not a climate science or attribution study. The authors explicitly disclaim any investigation into the physical drivers of these events, stating: "Importantly, this study does not seek to evaluate the validity of the causal relationship between climate change and these extreme weather events; instead, we take this link as given." **Flawed Study (Conflating Reporting Artifacts with Trends):** The commenters rely on the study to argue that average annual losses have been "broadly increasing," a claim heavily dependent on a visual inspection of the study's figures. However, the study's findings regarding increasing trends in economic loss and mortality are unreliable due to its reliance on the EM-DAT database, which the study acknowledges suffers from evolving reporting biases.

[983] *See* Wentz (2025) at 14; *New Report: Extreme Weather Events Cost Economy $2 Trillion Over the Last Decade*, Int'l Chamber of Com. (Nov. 11, 2024), https://iccwbo.org/news-publications/policies-reports/new-report-extreme-weather-events-cost-economy-2-trillion-over-the-last-decade/ (prepared by consultancy Oxera).

Figure 4.1 Economic impact of climate-related extreme weather events, 2014 to 2023



Note: all results expressed in terms of 2023 USD. The spike in 2017 is due to an active Atlantic hurricane season, causing significant destruction in the region. The year 2017 saw the first (Hurricane Harvey, US), third (Hurricane Maria, Puerto Rico), and fifth (Hurricane Irma, US) largest events by economic impact across all years. These three events alone accounted for 70% of the estimated economic impact recorded in 2017.
Source: Oxera analysis of EM-DAT dataset and publicly available data sources listed in section 4.2.1 above.

The report identifies a sharp rise in calculated human impact costs in 2022 and 2023 (see Figure 4.3 above), which accounts for nearly all the increase in economic loss the authors report when comparing the 2014–2021 and 2022–2023 timeframes. The authors admit this recent spike is "largely a result of the increased reporting and quantification of excess mortality in Europe."

In fact, a basic review of the authors' own data reveals that the alleged "trend" is a statistical artifact. The study notes that $80 billion (18%) of the losses in 2022 and 2023 are attributable to these climate-related deaths. If one removes this $80 billion distortion—which the authors admit is due to "increased reporting" rather than a change in weather severity —the

	remaining economic loss for those two years is $371 billion. This results in an annual average of **$185.5 billion**, which is actually *lower* than the $190 billion annual average cited for the prior period of 2014–2021. In other words, the observed trends in the study are driven by changes in European data collection, rather than an actual increase in the underlying frequency or intensity of weather events. **Flawed Study (Failure to Normalize Data):** Moreover, the study's methodology is flawed because it fails to normalize the economic loss data. The analysis relies on raw damage figures and does not account for the significant increases in population, wealth, and infrastructure development in hazard-prone areas over the decade. Without normalization, it is statistically impossible to distinguish whether rising costs are due to changes in the climate hazard or simply because there is more economic value exposed to risk. By failing to account for this increased exposure, the study conflates economic growth with climate impact. **Out of Scope:** Further, many of the harms in the study are experienced outside of the United States. As noted above, *see supra*, Response to Endangerment Comment, Sec. 2.1.3, EPA may reasonably determine that the "cause or contribute" analysis of Section 202 must be limited geographically to the United States. The Oxera report relies on a global dataset covering "six continents" to reach its $2 trillion figure. In fact, more than half of the economic damages cited in the report occurred outside of the United States. Moreover, the specific trend data relied upon by the commenters—the sharp rise in economic damages in 2022 and 2023—is driven primarily by data collected in Europe. Reliance on foreign disaster data to justify domestic endangerment findings is inappropriate.
eNGO Endangerment Comment 168: Emissions-induced climate change also increases the	**Misrepresentation:** Again, the cited study by Wentz is entirely irrelevant. The other cited studies are geographically and seasonally narrow and cannot support the general proposition. The two primary studies cited analyze wildfire conditions *only* within California. Turco et al.

occurrence of fire weather, which heightens the risk and potential severity of wildfires.[984]	(2023) is narrowly limited to summer (May–September) fires in forested areas of northern and central California. Goss et al. (2020) is limited only to the autumn (September–November) season in California. The dynamics of fire weather and wildfire risk are highly dependent on local climate, vegetation, and management practices. These highly specific, regional, and seasonal findings cannot support a general conclusion about emissions-induced climate change and wildfires globally or nationally. **Flawed Study (Conclusion Overreach):** The commenters rely on studies that significantly overstate the attribution of wildfire trends to climate change by minimizing or ignoring critical confounding variables, most notably the accumulation of hazardous fuel loads due to a century of fire suppression. Turco et al. (2023) conclude that "nearly all the observed increase in [Burned Area] is due to anthropogenic climate change." This conclusion is methodologically unsound because the study's statistical model links burned area almost exclusively to temperature, explicitly excluding the impact of land management and fuel density. The authors concede that "the twentieth-century buildup of fuels due to fire suppression" has heightened the "modern-day forest-fire extent and sensitivity to aridity." However, they dismiss the influence of these factors on the observed trend simply because their statistical climate-fire relationship remained stable over the study period (1971–2021). This ignores the

[984] *See* J. Wentz, Conference Report: Attribution Science and Climate Law 15 (Mar. 2025), https://perma.cc/4M4X-J3FZ (purportedly citing Turco et al., *Anthropogenic Climate Change Impacts Exacerbate Summer Forest Fires in California*, 120 Proc. Nat'l Acad. Scis. e2213815120 (2023), https://doi.org/10.1073/pnas.2213815120; Goss et al., *Climate Change Is Increasing the Likelihood of Extreme Autumn Wildfire Conditions Across California*, 15 Env't Rsch. Letters 094016 (2020), https://iopscience.iop.org/article/10.1088/1748-9326/ab83a7; Herring et al., *Explaining Extreme Events of 2016 from a Climate Perspective*, 99 Bull. Am. Meteorological Soc'y S1 (2018), https://journals.ametsoc.org/view/journals/bams/99/1/bams-explainingextremeevents2016.1.pdf).

	reality that the landscape possessed artificially high fuel loads throughout this period. The observed increase in burned area is the result of increased aridity acting upon this unnaturally flammable landscape. By attributing the increase solely to temperature changes, the study improperly conflates the effects of increased fuel availability with the effects of climate. Similarly, Goss et al. (2020) focus strictly on meteorological factors (Fire Weather Index) and explicitly state their investigation is "irrespective of changes in fire ignitions, vegetation, land use or management strategies." Consequently, the study analyzes the meteorological potential for fire in isolation, which cannot be equated with realized wildfire severity without accounting for fuels and ignitions. **Flawed Study (Reliance on Mischaracterized Climate Scenarios):** When projecting future wildfire risk, both studies utilize high-end, worst-case emissions scenarios (RCP 8.5 or SSP5-8.5). These scenarios are widely criticized in the literature as implausible for policy planning, as they rely on outdated assumptions about future energy use that do not reflect current trends. The most alarming projections in Goss et al. are contingent on the RCP 8.5 pathway, while Turco et al. use SSP5-8.5 to establish their upper bounds. The reliance on these extreme, low-probability scenarios systematically exaggerates the studies' projected future impacts.
Disease, water quality, and water quantity.	
eNGO Endangerment Comment 168: Ambient warming caused by greenhouse gas emissions increases the instances of infectious diseases, including vector-borne illnesses	**Misrepresentation (Irrelevant Source)** The commenters cite page 11 of IPCC AR6 report discusses mitigation policies and emissions gaps based on nationally determined contributions and finance flows. It contains no information regarding ambient warming, malaria, or diarrheal disease.

such as malaria and diarrheal disease.[985]	**Flawed Study (Reliance on Outdated Models and Scenarios / Small Sample Size / Failure to Account for Adaptation and Socio-economic Factors):** While there are portions of McMichael et al. (2004) that discuss infectious diseases, the reliance on that study is ill-founded, as the study is fundamentally obsolete and unsuitable for current regulatory purposes. The study's most extreme projections are based on the HadCM2 climate model and the IPCC's IS92a emissions scenario. Both originated in the 1990s and have long been superseded by multiple generations of climate science. The IS92a scenario, in particular, is known to overestimate emissions growth compared to observed trends and modern scenarios. Additionally, the study relies exclusively on a single, antiquated climate model. The authors explicitly acknowledged this limitation, noting that utilizing a range of models to capture uncertainty was "not possible" at the time. Furthermore, the methodology used to estimate the global impact of climate change on diarrheal disease is based on an insufficient evidentiary foundation, leading to conclusion overreach. The study extrapolates a global impact based on statistical relationships derived from only two specific locations: a single clinic in Lima, Peru, and national data from Fiji. The authors explicitly caution that these sites cover "only a small part of the spectrum of global climate variation" and "a small range of climatic and socioeconomic environments," and acknowledge the "substantial uncertainty" resulting from the "very small number" of underlying studies. Applying localized correlations uniformly across the entire developing world—ignoring vast differences in pathogens, climate zones, and infrastructure—is methodologically unsound.

[985] McMichael et al., *Global Climate Change*, *in* Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors 1606 (Majid Ezzati et al. eds., 2004), https://iris.who.int/handle/10665/42770.

	Finally, the study's modeling framework fails to realistically account for the dominant role of socio-economic development and adaptation in controlling infectious diseases. This omission mechanically exaggerates the role of climate. Indeed, the authors explicitly acknowledge that their models "make only crude adjustments" for socioeconomic factors "which may both determine the vulnerability of populations to potential health effects of climate change, and exert much larger independent effects on health." For example, when modeling the relative risk for malaria, the study explicitly assumes *no* socioeconomic adaptation. This is contrary to observed reality, where public health interventions and economic development are the primary drivers of disease reduction. Similarly, the study posits that economic development fundamentally mitigates climate-related risks, assuming that richer countries (defined as GDP >US$6,000/year) "suffer little or no additional risk of diarrhoea." This confirms that vulnerability is primarily driven by poverty and the lack of public health infrastructure, not climate suitability. As a result, the study is completely irrelevant to the United States (GDP per capita of $85,800/ year).
Other public health benefits	
eNGO Endangerment Comment 169: Regulation that decreases emissions is a cost-effective way to	**Misrepresentation (Exaggeration / Overclaiming):** The commenters fundamentally mischaracterize the studies by conflating distinct categories of benefits. The claim concerns averting "climate-related" harms (i.e., impacts from changes in climate, such as extreme weather or heatwaves). However, the cited studies derive their claims of cost-effectiveness almost exclusively from ancillary "co-benefits"—specifically, the near-term improvements in air quality resulting from reductions in conventional pollutants (like PM2.5 and ozone) that are co-emitted with GHGs. Gao et al. (2018), for example, explicitly defines these co-benefits as improvements in human health "independent" of the effects of climate change. West et al. (2013) found that 89% of the ozone-related health benefits they calculated were due to

avert premature climate-related morbidity and mortality.[986]	reductions in co-emitted pollutants, with only 11% attributable to changes in the climate. The commenters improperly attribute the benefits of conventional air pollution control to climate regulation. The commenters also selectively cite Shindell et al. (2016) while omitting that the study found that reducing emissions also reduces sulfate aerosols, which exert a cooling effect. The removal of these aerosols leads to "very strong positive aerosol radiative forcing over the US." Consequently, Shindell et al. concluded that the clean energy policies actually produce near-term national climate disbenefits, including "warmer summers." The commenters ignore evidence that the proposed regulations may exacerbate, rather than avert, certain climate-related harms in the short-to-medium term. **Flawed Study (Conclusion Overreach):** The claims of "cost-effectiveness" in Shindell et al. and West et al. are not empirical observations, but the output of models driven by controversial, non-obvious assumptions regarding the lethality of fine particulate matter (PM2.5). Shindell et al. inflated their modeled mortality by incorporating Concentration-Response Functions that were "80% higher" than standard estimates, justifying this inflation based on "expert elicitation." West et al. acknowledge that applying these functions globally and far into the future (to 2100) "entails large uncertainties." Gao confirms the lack of empirical grounding in this area, noting a "conspicuous gap" in the literature due to the "lack of intervention studies and assessments based on actual surveillance data." The claimed cost-effectiveness is therefore speculative and predetermined by these subjective modeling choices.

[986] *See* Gao et al., *Public Health Co-Benefits of Greenhouse Gas Emissions Reduction: A Systematic Review*, 627 Sci. Total Env't 388 (2018), https://pubmed.ncbi.nlm.nih.gov/29426161/; Shindell et al., *Climate and Health Impacts of US Emissions Reductions Consistent with 2°C*, 6 Nature Climate Change 503 (2016), https://doi.org/10.1038/nclimate2935; West et al., *Co-Benefits of Mitigating Global Greenhouse Gas Emissions for Future Air Quality and Human Health*, 3 Nature Climate Change 885 (2013), https://www.nature.com/articles/nclimate2009#citeas.

	Gao et al.'s literature review confirms this, observing that "there is little evidence in the scientific literature of cost-effectiveness analysis, in practice, of health-promoting interventions to reduce GHG emissions." Furthermore, the magnitude of the benefits calculated by Shindell et al. is exaggerated by the use of the RCP 8.5 scenario as the "baseline." RCP 8.5 is a high-end, worst-case emissions pathway, widely regarded as having a low probability of occurrence, rather than a likely "business-as-usual" future. By adopting this inflated baseline, the study maximizes the modeled emissions reductions—and thus the resulting calculated benefits—attributable to the proposed policies. Shindell et al. also significantly underestimated costs, assuming their "clean transportation" scenario would cost economy-wide only $100–210 billion, a fraction of the cost of EPA's regulations.
eNGO Endangerment Comment 169: Additionally, because of the co-emittance of harmful pollutants—such as nitrous oxide and particulate matter—with greenhouse gas, there are significant health co-benefits from emissions-reducing regulation.[987]	**Flawed Study (Conclusion Overreach / False Certainty):** The cited source's generalized conclusions regarding co-benefits are severely limited by a lack of empirical data, a limitation the authors themselves acknowledge. They identify "a conspicuous gap" in the scientific research, specifically the "lack of intervention studies and assessments based on actual surveillance data." This admission confirms that the alleged "significant" co-benefits are hypothetical projections rather than observed results from implemented policies. Furthermore, the quantification of these alleged co-benefits relies on methodologies that the authors describe as uncertain and unreliable. The review highlights numerous challenges in the modeling process, pointing specifically to the "controversial aspects of key parameters such as discount rates and the terms involved in the concentration-response functions." The

[987] Gao et al., *Public Health Co-Benefits of Greenhouse Gas Emissions Reduction: A Systematic Review*, 627 Sci. Total Env't 388 (2018), https://pubmed.ncbi.nlm.nih.gov/29426161/.

	magnitude of the claimed co-benefits is thus highly dependent on non-empirical, “controversial” assumptions regarding the valuation of future benefits and pollutant impacts, rendering the results speculative and unsuitable for substantiating the commenters’ claims.