

C O M M E N T

THE USES OF CLIMATE CHANGE ATTRIBUTION SCIENCE: THE NGO PRACTITIONER'S VIEW

by Joanne Spalding and Daniel Hales

Joanne Spalding is the Acting Legal Director and Chief Climate Counsel at Sierra Club. Daniel Hales is an Associate Attorney at Sierra Club.

Climate advocates are fortunate to have the benefit of the thorough assessment of climate change attribution science and its application to climate policy and litigation that Michael Burger, Jessica Wentz, and Radley Horton have undertaken in their article. Attribution science has expanded dramatically during the past two decades, becoming increasingly nuanced and complex. Burger, Wentz, and Horton have helped unlock this resource by providing an explanation of the types of attribution research, a survey of the research, an analysis of its legal and policy applications, and suggestions for future developments. Their work will help policymakers and courts understand the challenges that climate change presents and develop strategies and remedies to address those challenges.

I. Establishing Priorities Based on Source Attribution Research

For environmental organizations, climate change attribution science has formed the foundation of climate advocacy since the issue first gained traction. Source attribution research has been essential in prioritizing which sources to target for emission reductions. Sierra Club focused on fuel economy standards for light-duty vehicles throughout the 1990s based on source attribution research showing that the most effective way to reduce greenhouse gases (GHGs) in the United States would be to make our cars go farther on a gallon of gas.¹ In 1999, that same vein of attribution research led the International Center for Technology Assessment to petition the U.S. Environmental Protection Agency (EPA) to regulate GHG emissions from motor vehicles,² which ultimately led to the U.S. Supreme Court's decision in *Massachusetts v. EPA* confirming that GHGs

can be regulated as air pollutants under the federal Clean Air Act (CAA).³ In the early 2000s, Sierra Club began targeting fossil fuel-fired power plants, the other largest source of U.S. GHG pollution.

Those targets made sense because motor vehicles and fossil fuel-fired power plants each emit more GHGs than the next largest source category by an order of magnitude.⁴ After EPA finally began working on vehicle and power plant standards, a coalition of states and environmental and public health groups set their sights on GHGs from that next category—oil and gas-sector methane emissions. The general wisdom is that the lower the emissions are from a given category, the more difficult it is to justify regulating those emissions. Yet, in a world in which the science demands that we rapidly reduce climate pollution and reach net zero by 2050, reducing emissions from smaller source categories is imperative.

In the waning days of the Donald Trump Administration, EPA adopted a rule designed to preclude regulation under §111 of the CAA of GHG emissions from any stationary source category other than power plants.⁵ Section 111 requires EPA to list categories of sources that “cause[], or contribute[] significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare,” and then to set standards of performance for air pollutants emitted from new sources in those categories.⁶ The language of the statute directs the Agency to make a finding of significant contribution as a prerequisite to its decision to list a source category as an initial matter, not as

New Motor Vehicles Under §202 of the Clean Air Act (Oct. 20, 1999), http://ciel.org/Publications/greenhouse_petition_EPA.pdf.

1. See, e.g., Dan Becker, *Sierra Club vs. Global Warming: Film at 11*, PLANET (Sierra Club, San Francisco, Cal.), May 1996, available at <https://vault.sierraclub.org/planet/199605/globalwrm.asp>.
2. See Int'l Ctr. for Tech. Assessment et al., Petition for Rulemaking and Collateral Relief Seeking the Regulation of Greenhouse Gas Emissions From

3. 549 U.S. 497, 518, 37 ELR 20075 (2007); 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.

4. *Sources of Greenhouse Gas Emissions*, U.S. EPA, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions> (last updated Dec. 4, 2020).

5. See Pollutant-Specific Significant Contribution Finding for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources, 86 Fed. Reg. 2542 (Jan. 13, 2021) (to be codified at 40 C.F.R. pt. 60).

6. 42 U.S.C. §7411(b)(1).

a prerequisite to set a standard for any particular pollutant it emits. Nevertheless, in Administrator Andrew Wheeler's midnight rule, he concluded that EPA must make a significant contribution finding for each pollutant before setting a standard. While it reaffirmed that GHG emissions from electric generating units were subject to §111, the final rule sought to bar EPA from issuing performance standards for any other source category "by articulating a framework under which source categories are considered to contribute significantly to dangerous air pollution due to their GHG emissions if the amount of those emissions exceeds 3 percent of total U.S. GHG emissions."⁷ EPA determined that "source categories that are less than [3 percent] are necessarily insignificant without consideration of any other factors."⁸

The Trump EPA finalized this decision despite never having raised it in the rule proposal, a textbook example of legally inadequate notice. Shortly after taking office, the Joseph Biden Administration conceded in a federal lawsuit brought in the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit that the rule had been unlawfully promulgated and sought vacatur,⁹ which the court promptly granted.¹⁰ While this rule was short-lived, its rationale demonstrates the crucial role of source attribution research. The Trump EPA first acknowledged that the most important consideration is the *quantity* of emissions from a source category:

Under this framework, the EPA is determining that the quantity of GHG emissions from a source category is the primary criterion in determining significance for purposes of regulation of GHGs from a source category under CAA section 111(b). Gross GHG emissions are important for this set of pollutants because GHGs are global long-lived pollutants GHGs' impact (i.e., climate change) is based on a cumulative global loading¹¹

EPA then illogically concluded that significance should be based not on absolute *quantity* of emissions, but on the *percentage* of total U.S. GHGs that a source category emits.¹² While that relative value may serve as a useful guide to prioritize limited resources, source attribution data reveals that a relatively small source category by U.S. standards exceeds the GHG emissions of numerous whole nations.

For example, according to EPA's Greenhouse Gas Reporting Program, petroleum refineries emitted approximately 177 million metric tons of carbon dioxide equiva-

lent (CO₂-eq) in 2019.¹³ While this reflects just 2.7% of total 2019 U.S. GHG emissions reported in EPA's most recent *Inventory of Greenhouse Gas Emissions and Sinks*,¹⁴ it is nonetheless greater than the total national emissions of nearly four-fifths of the world's countries.¹⁵ Similarly, EPA's *Inventory* reports that methane emissions from livestock-related enteric fermentation were nearly the same, totaling 179 million metric tons CO₂-eq in 2019.¹⁶ Despite these startling figures, EPA has thus far taken no steps to regulate any form of GHG emissions from either petroleum refineries or enteric fermentation from livestock, and the Trump EPA's late-breaking regulatory action would have actually *barred* the Agency from doing so had it not been struck down in court.

Given the massive historical and current GHG pollution attributable to the United States and the urgent need for dramatic reductions, a broad definition of significance is vital. As Burger, Wentz, and Horton point out, detection and attribution research can help define a "significant contribution," but legal and policy judgments are also embedded in that determination.¹⁷ In advocating for a broad definition, it is helpful to point to studies that explain that every feasible pathway to achieve the necessary GHG emissions reductions requires cutting pollution from even relatively modest sources. Source attribution studies form a critical component of that analysis.

II. Demanding and Defending Climate Regulation Through Litigation

Environmental groups have used litigation to attempt to force government agencies to take action to reduce climate pollution and have intervened in federal lawsuits to defend the resulting actions. As Burger, Wentz, and Horton suggest, one of the biggest impediments to filing lawsuits demanding government action on climate is the need to establish Article III standing.¹⁸ Climate impact attribution studies can provide evidence critical to establishing all elements of standing: that the plaintiff has suffered an injury or heightened risk of an injury linked to climate change; that the conduct of the defendant constitutes a "meaning-

7. 86 Fed. Reg. at 2542-43.

8. *Id.* at 2552-53.

9. Resp. EPA's Unopp. Mot. for Voluntary Vacatur and Remand, *California v. EPA*, D.C. Cir. No. 21-1035, Doc. No. 1890321, 1-2 (Mar. 17, 2021); see also Rachel Frazin, *EPA Asks Court to Toss Trump Rule That Could Prevent Emissions Limits on Polluting Industries*, THE HILL (Mar. 17, 2021), <https://thehill.com/policy/energy-environment/543731-epa-asks-court-to-toss-trump-rule-that-could-prevent-emissions>.

10. Per Curiam Order, *California v. EPA*, D.C. Cir. No. 21-1035, Doc. No. 1893155 (Apr. 5, 2021).

11. 86 Fed. Reg. at 2551.

12. *Id.*

13. *Greenhouse Gas Reporting Program, GHGRP Refineries*, U.S. EPA, <https://www.epa.gov/ghgreporting/ghgrp-refineries> (last updated Nov. 9, 2020).

14. See U.S. EPA, *INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2019*, at ES-7, Table ES-2 (2021) (listing total U.S. GHG emissions in 2019 as 6,558.3 million metric tons CO₂-eq, not accounting for land use, land use change, and forestry).

15. This figure reflects country-by-country emissions data from 2017 derived from the WRI/CAIT data set. See *Historical GHG Emissions, CLIMATE WATCH*, https://www.climatewatchdata.org/ghg-emissions?end_year=2017§ors=total-excluding-lucf&source=CAIT&start_year=1850 (last visited Mar. 31, 2021).

16. U.S. EPA, *supra* note 14, at Table ES-2. This figure reflects EPA's longtime use of a 100-year global warming potential for methane of 25. A 20-year global warming potential of 87—which would reflect the need for deep and immediate emission cuts to avoid the worst impacts of climate change—corresponds to enteric fermentation methane emissions of approximately 622 million metric tons CO₂-eq, which would reflect approximately 7.6% of total U.S. emissions in 2019.

17. Michael Burger et al., *The Law and Science of Climate Change Attribution*, 45 COLUM. J. ENV'T L. 57, 162 (2020).

18. *Id.* at 225-26.

ful contribution” to global climate change; and that the requested relief is within the court’s ability to grant and would help remedy the alleged injury.

Burger, Wentz, and Horton’s comprehensive review of attribution science leaves little doubt that a compelling (and growing) body of research can support litigation for climate harms. Generally, these lawsuits do not fail for lack of scientific evidence, but for failure of that evidence to fit neatly into the necessary legal elements. The more detailed, accessible, and *localized* source and impact attribution research becomes, the more direct its bearing on judicial inquiry. But clearing legal hurdles by weight of scientific evidence alone is unlikely. Additional strategies include alleging a procedural injury along with the primary environmental- or health-related injury; litigating a case alongside one or more state government plaintiffs (who have additional avenues for establishing standing not available to private parties); and alleging localized health injuries or environmental degradation resulting from conventional pollutants emitted (and potentially abated) alongside GHGs. These steps can be as dispositive in proving standing in climate litigation as attribution science.

Satisfying the closely related prongs of causation and redressability is complicated by the number of anthropomorphic activities that contribute to climate change. Both causation and redressability hinge on whether a plaintiff’s injury is “fairly traceable” to the challenged action.¹⁹ That is, a plaintiff must show a sufficient connection to convince the court the requested relief is substantially likely to reduce the pollution causing the alleged injuries.²⁰ The Supreme Court in *Massachusetts* established that to be “fairly traceable” in the climate change context, emissions must represent a “meaningful contribution” to global climate change.²¹ As yet, no court has articulated a clear rule for what constitutes a “meaningful contribution,” and courts taking up this question have issued a patchwork of inconsistent rulings, relying on qualitative comparisons of emissions rather than applying a clear standard. A lack of statistical certainty, or at least the judicial perception of one, leads to a less-than-empirical assessment of whether particular emission quantities reflect “meaningful contributions,” making climate attribution claims vulnerable to the individual biases of the judge parsing the data.

Fortunately, the *Massachusetts* decision provides a road map to lower the burden on climate plaintiffs. States are given a special status in the standing inquiry as a product of their semi-sovereign status, direct interests in state property and natural resources, and role as trustees of their residents’ interests.²² Further, when a plaintiff alleges a procedural injury, the imminence and redressability requirements of standing are relaxed for all plaintiffs, state and nonstate actors alike.²³ In *Massachusetts*, the state estab-

lished standing on both of these grounds. Massachusetts asserted a sovereign interest in protecting its coastal territory—threatened by rising sea levels caused by climate change—as well as its procedural right to challenge EPA’s rejection of a rulemaking petition as arbitrary and capricious.²⁴ With regard to causation, the Court held that the GHG emissions at issue, over 6% of global carbon emissions, were “by any standard” a significant contribution to climate change.²⁵ While this holding allowed Massachusetts to prevail on the question of standing, it left open the question of what standard should apply going forward, particularly with regard to nonstate litigants.

Environmental groups learned a difficult lesson in *Washington Environmental Council v. Bellon*,²⁶ which illustrates the obstacles to proving standing without a procedural injury or state plaintiff. Environmental nongovernmental organizations (NGOs) sued Washington State regulators for failure to limit GHG emissions from five oil refineries, attempting to establish harm based on the refineries’ climate impacts alone.²⁷ The NGOs provided numerous declarations from members alleging property damage, negative health impacts, and aesthetic injuries resulting from climate change—none of which were challenged by the defendants, nor questioned by the court.²⁸ Yet, the court dismissed the case for failure to establish causation and redressability, holding that even were the relaxed standard from *Massachusetts* applied, plaintiffs did not present evidence that the GHG emissions at issue (5.9% of *Washington State’s* total emissions compared to 6% of *global* emissions in *Massachusetts*) amounted to a meaningful contribution to climate change, or that the alleged climate-related harms could be attributed to those emissions.²⁹ *Bellon* demonstrates the role attribution research could play in establishing causation, though other standing deficiencies in the case make it difficult to know if it would have been dispositive.

The up-or-down assessment of “meaningful contribution” applied in climate cases following *Massachusetts* provides little guidance for the application of attribution science in standing inquiries. In *WildEarth Guardians v. Jewell*, however, the D.C. Circuit sanctioned an alternative approach, holding that litigants had standing to challenge an agency’s climate analysis issued under the National Environmental Policy Act (NEPA) by alleging injuries from co-pollutants and related impacts.³⁰ In that case, environmental groups alleged a procedural injury from the Bureau of Land Management’s (BLM’s) failure to adequately address climate impacts resulting from coal

19. See *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560, 22 ELR 20913 (1992).

20. See Burger et al., *supra* note 17, at 150.

21. 549 U.S. 497, 525, 37 ELR 20075 (2007).

22. *Id.*

23. See *Lujan*, 504 U.S. at 572.

24. See *Massachusetts*, 549 U.S. at 520; see also 42 U.S.C. §7607(b)(1).

25. See *Massachusetts*, 549 U.S. at 524-25.

26. 732 F.3d 1131, 43 ELR 20231 (9th Cir. 2013).

27. *Id.* at 1135.

28. *Id.* at 1140-41.

29. *Id.* at 1145-46; see also *Amigos Bravos v. U.S. Bureau of Land Mgmt.*, 816 F. Supp. 2d 1118, 1136, 41 ELR 20261 (D.N.M. 2011) (finding that the oil and gas leases approved by BLM would produce “just 0.0009% of global GHG emissions” and were not a “meaningful contribution” in light of *Massachusetts*).

30. 738 F.3d 298, 306, 44 ELR 20001 (D.C. Cir. 2013); 42 U.S.C. §§4321-4370(h), ELR STAT. NEPA §§2-209.

leases permitted on public lands in the environmental impact statement (EIS) for the project.³¹ *WildEarth Guardians* did not involve a state plaintiff, but alleged injuries to environmental groups' members due to BLM's failure to adequately consider both the local impacts from climate change *and* from local ozone emissions.³² While the court held the alleged climate change injury could not support standing, it nonetheless granted standing based on the project's anticipated increase in localized ozone precursors.³³ Moreover, redressability was satisfied because a decision vacating the agency's action would address the procedural injury—the deficient EIS—regardless of whether the deficiency related to the global impacts of climate change or the local impacts of co-pollutants.³⁴ The holding in *WildEarth Guardians* allows NEPA plaintiffs an opportunity to challenge an agency's climate analysis based on non-climate injuries that arise directly from the project at issue.

More recently, and in contrast to *Bellon* and *WildEarth Guardians*, the D.C. Circuit had little trouble in finding that an environmental group had standing based on climate injuries in *Natural Resources Defense Council v. Wheeler*.³⁵ In that case, the court held that the Natural Resources Defense Council (NRDC) had standing to challenge an EPA rule that would increase hydrofluorocarbons (HFCs)—a climate super-pollutant—based on “a declaration from a member averring that he owns coastal property in New Jersey that is especially vulnerable to weather events caused or worsened by climate change”³⁶ The declaration at issue had been carefully crafted to incorporate downscaled impact attribution research. As for source attribution, the court did not discuss whether the increase in HFCs would constitute a “meaningful contribution” to climate change. Rather, it relied on a straightforward and concise explanation of its ruling: “Petitioners then have adequately linked the 2018 Rule to an injury-in-fact: the 2018 Rule will lead to an increase in HFC emissions, which will in turn lead to an increase in climate change, which will threaten petitioners' coastal property.”³⁷ The court held that partial reinstatement of the prior rule would redress that injury.³⁸ The petitioners in the case included state governments, and while the court separately found that New York had standing, it did not rely on state standing to conclude that NRDC had its own climate-based standing.

Practitioners who represent environmental groups in challenges to climate regulations have grown accustomed to submitting voluminous member and expert declarations to establish climate-based standing, often relying on impact and source attribution research. Demonstrating injury is most likely to be successful with detailed attribution research showing localized impacts. Showing a “meaningful contribution” to establish causation and redressability

depends on the quantity of GHG emissions at issue and the judges' individual assessment. Given the litigation risk, however, and the differing case outcomes, it is prudent to allege co-pollutant harms or procedural injury where possible, or to invite a state to be co-litigant. None of these approaches are a substitute for detailed climate attribution, but they are practical strategies to maximize the effectiveness of climate litigation.

In future climate change litigation, attribution science will be the “connective tissue tying particular impacts resulting in particular costs and anthropogenic influence on climate change.”³⁹ Increasingly, it will be a necessary tool for developing a factual record to apply to the concepts of foreseeability, causation, and the judiciary's role in government, legal concepts that evolved in response to factual scenarios that are an order of magnitude less complex than the reality of climate change. To that end, we endorse the authors' exhortation to researchers to craft climate attribution studies that are accessible to a lay audience and to take care when communicating the levels of scientific uncertainty, while also highlighting another crucial consideration: by speaking the language of the judiciary and attempting to frame a scientific concept of “meaningful contribution,” attribution science can enhance its already substantial benefit to climate litigation.

III. Using Climate Impact Attribution Studies to Direct Resources

While most climate litigation brought by environmental groups to date has focused on mitigation efforts, the goals of our legislative advocacy include climate adaptation as well. Given the scale of the solutions required to mitigate and adapt to climate change, substantial public investments to decarbonize our economy and upgrade our infrastructure are essential. The Biden Administration is proposing “a generational investment in infrastructure” of three to four trillion dollars, a primary goal of which is to address climate change.⁴⁰

Climate change impact attribution research can help guide these infrastructure investments. Burger, Wentz, and Horton point out that, in the international context, attribution science can improve decisionmaking about how to allocate funds for adaptation.⁴¹ The same is true for domestic investments. Downscaled studies showing which regions and local areas will be most affected by hurricanes, flooding, wildfires, and other climate impacts can serve as a starting point.

Historically, infrastructure investments have favored the affluent. This bias even affects federal funding to help communities recover from climate disasters. An NPR investigation found that “across the country, white Americans and those with more wealth often receive more federal dol-

31. *Id.* at 305.

32. *Id.*

33. *Id.* at 307.

34. *Id.* at 307-08.

35. 955 F.3d 68 (D.C. Cir. 2020).

36. *Id.* at 77.

37. *Id.*

38. *Id.*

39. Burger et al., *supra* note 17, at 198.

40. Emily Cochrane & Pranshu Verma, *Buttigieg Asks Congress for “Generational Investment” in Infrastructure*, N.Y. TIMES (Mar. 25, 2021), <https://www.nytimes.com/2021/03/25/us/politics/buttigieg-infrastructure.html>.

41. Burger et al., *supra* note 17, at 144.

lars after a disaster than do minorities and those with less wealth.”⁴² The results of a recent academic study demonstrated that “as local hazard damages increase, so too does wealth inequality, especially along lines of race, education, and homeownership,” and that natural hazard damages continue to have a growing role in the United States’ widening wealth gap.⁴³ In his Executive Order on Tackling the Climate Crisis at Home and Abroad, President Biden established “a goal that 40 percent of overall benefits flow to disadvantaged communities.”⁴⁴ While many factors are relevant to ascertaining which communities are disadvantaged, low-income and minority communities that are particularly vulnerable to climate impacts should be included in programs that fund climate recovery and adaptation efforts. Climate scientists engaged in impact attribution research should consider performing downscaled studies to help identify such communities and characterize the risks they face.

IV. Conclusion

Environmental groups engaged in climate litigation and administrative and legislative advocacy depend on climate scientists to provide detailed research delineating climate change impacts and characterizing the contributions of GHG sources. As Burger, Wentz, and Horton suggest, that research has many uses and should be available in a form that is accessible to nonscientists—and, in particular, to judges. By doing so, climate researchers can enable advocates and proactive state governments to wield the available legal tools with greater efficacy in the fight to avoid the worst impacts of climate change. Just as importantly, broad accessibility will ensure that climate attribution research serves not only as a description of the unfolding climate catastrophe, but as a catalyst for crucial mitigation and adaptation measures.

42. Rebecca Hersher & Robert Benincasa, *How Federal Disaster Money Favors the Rich*, HOUS. PUB. MEDIA (Mar. 5, 2019), <https://www.houstonpublicmedia.org/articles/news/2019/03/05/324087/how-federal-disaster-money-favors-the-rich/>.

43. Junia Howell & James R. Elliott, *Damages Done: The Longitudinal Impacts of Natural Hazards on Wealth Inequality in the United States*, 66 SOC. PROBS. 448, 450 (2019).

44. Exec. Order No. 14008, 86 Fed. Reg. 7619 (Jan. 27, 2021).