

HOW PRESIDENT TRUMP'S WAR ON SCIENCE UNDERMINES COST-BENEFIT ANALYSIS OF CLIMATE POLICIES

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SUMMARY

This Article discusses the Trump Administration's main actions to undermine the role of science in public policy and the consequences for cost-benefit analysis involving climate change policies. It analyzes the specific attacks on science and their impact on relevant policies, namely, the rollbacks of the Clean Water Rule, the pesticides ban, the Clean Air Act, and the Clean Power Plan, as well as modification of the National Environmental Policy Act and regulations promoting fuel efficiency, and the flexibilization of environmental enforcement during the COVID-19 pandemic. All of these deregulatory cases were also illustrative of at least one modality of an attack on science. It concludes by examining the negative impact of the war on science and related unreasoned policymaking that transcends domestic borders.

The Donald Trump Administration's disregard for science is unprecedented in comparison with previous administrations,¹ which has resulted in climate policies that experts deem unsafe.² This is relevant because scientific knowledge is essential for reasoned public policymaking. That said, the Trump Administration has also neglected basic rules of administrative law, displaying rigged reasoning³ with political preferences consistently prevailing over sound cost-benefit analysis.⁴ The actual consideration of costs and benefits, however, is indicative

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of reasoned administrative action (i.e., action that is justified and not arbitrary).⁵ Assuming that cost-benefit analysis is a neutral check on administrative action, deregulatory policies should be restricted by such analyses in the same manner as regulatory ones.⁶

This Article reviews particular initiatives of the Trump Administration in light of the literature on attacks on science and their consequences for climate policies. It also discusses specific instances in which the cost-benefit analysis methodology of climate change policies was imperiled, focusing upon deregulatory efforts implemented through suspicious and/or nontechnical cost-benefit analysis that departs from scientific evidence. In aggregate, the cases considered show how the deregulatory policy choices of the Administration undermine reasoned administrative action (including sound cost-benefit analysis) and fail to maximize the well-being of the U.S. population. These policy choices also jeopardize the aim of the Paris Agreement on Climate Change to limit the global increase in mean temperature to well below 2°C (3.6°F) compared to pre-industrial levels.⁷

1. Emily Berman & Jacob Carter, *Scientific Integrity in Federal Policymaking Under Past and Present Administrations*, 13 J. SCI. POL'Y & GOVERNANCE 1, 2 (2018).
2. Michael Oppenheimer, a professor of geosciences and international affairs at Princeton, criticized the current Administration's approach to climate science, saying: "Nobody in the world does climate science like that. It would be like designing cars without seatbelts or airbags." See Coral Davenport & Mark Landler, *Trump Administration Hardens Its Attack on Climate Science*, N.Y. TIMES, May 27, 2019, <https://www.nytimes.com/2019/05/27/us/politics/trump-climate-science.html>.
3. Lisa Heinzerling, *Unreasonable Delays: The Legal Problems (So Far) of Trump's Deregulatory Binge*, 12 HARV. L. & POL'Y REV. 13 (2018).
4. Stuart Shapiro, *OIRA and the Future of Cost-Benefit Analysis*, REG. REV., May 19, 2020.

5. See, e.g., *Michigan v. Environmental Prot. Agency*, 135 S. Ct. 2699, 45 ELR 20124 (2015) (determining that consideration of costs is mandatory for executive agencies).
6. Daniel A. Farber, *Regulatory Review in Anti-Regulatory Times*, 94 CHI.-KENT L. REV. 383 (2019).
7. The Paris Agreement states:
This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable devel-

The comprehensive analysis developed in this Article offers relevant insights for the literature on climate change. It demonstrates that the United States' attacks on science, as well as its current disregard for cost-benefit analysis, have been detrimental to the United States⁸ and may jeopardize climate governance,⁹ owing to the fact that reductions in carbon dioxide and other greenhouse gas (GHG) emissions lie at the core of the Paris Agreement.¹⁰ This reduction of GHGs was informed by science.¹¹

The scientific data outlining the broad principles of climate change are undisputed.¹² This, of course, does not deny the existence of uncertainty, as in any field of scientific knowledge.¹³ This uncertainty may actually mean that the changes that can be brought about by climate change have few precedents in the history of the Earth.¹⁴ In this vein, regulatory efforts on climate change face additional hurdles, because the connection between the risks of climate change (storms, rising sea levels, fires, floods) and climate change itself is not immediately obvious to the public.¹⁵ Unsurprisingly, the current climate crisis was the focus of the recent World Economic Forum,¹⁶ and world-renowned economists are advocating for governments to become enablers in an economic policy that prioritizes overall well-being and sustainability.¹⁷

opment and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.

Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, art. 2, T.I.A.S. No. 16-1104, 54113 U.N.R.N. 88 [hereinafter Paris Agreement].

8. The costs involved are significant. According to the U.S. Environmental Protection Agency (EPA), natural disasters in 2017 (e.g., wildfires, floods, earthquakes, hurricanes, tornados, winter storms) caused \$306.2 billion in cumulative damages, making the year the most expensive on record. The report also emphasized that climate change is expected to increase the frequency and intensity of such events. U.S. EPA, PLANNING FOR NATURAL DISASTER DEBRIS 1 (2019), https://www.epa.gov/sites/production/files/2019-05/documents/final_pndd_guidance_0.pdf.
9. The United States' withdrawal from the Paris Agreement, for instance, contradicts the scientific findings of the panel of U.S. experts representing 13 agencies. U.S. GLOBAL CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT 35-72 (2018), <https://www.globalchange.gov/nca4>.
10. Paris Agreement, *supra* note 7, art. 2.
11. The scientific community overwhelmingly acknowledges the existence of climate change, and that GHG emissions are a primary cause. Richard S.J. Tol, *Quantifying the Consensus on Anthropogenic Global Warming in the Literature: A Re-Analysis*, 73 ENERGY POL'Y 701 (2014). See also RICHARD S.J. TOL, THE ELUSIVE CONSENSUS ON CLIMATE CHANGE 8 (Univ. of Sussex Business School, Working Paper No. 319, 2019) (emphasizing that 97% of scientific studies point to human activity as the most important factor in climate change after 1950).
12. ANTONY MILLNER ET AL., AMBIGUITY AND CLIMATE POLICY 3 (National Bureau of Economic Research, Working Paper No. 16050, 2010) (highlighting that empirical predictions based on sophisticated models may lead to different forecasts).
13. ANDREW E. DESSLER & EDWARD A. PARSON, THE SCIENCE AND POLITICS OF GLOBAL CLIMATE CHANGE 1 (2020).
14. *Id.* at 2.
15. Cary Coglianese, *Climate Change Necessitates Normative Change*, REG. REV., Jan. 27, 2020.
16. Larry Elliott, *Climate Crisis Fills Top Five Places of World Economic Forum's Risks Report*, GUARDIAN, Jan. 15, 2020, <https://www.theguardian.com/business/2020/jan/15/climate-crisis-environment-top-five-places-world-economic-forum-risks-report>.
17. Italian-American economist Mariana Mazzucato, for instance, contends that modern economies reward behavior that extracts value instead of creat-

If such a policy is to be achieved, the need for science and sound cost-benefit analysis is paramount. Within this framework, this Article conceptualizes science as “the knowledge produced in accordance with the scientific method, ideally involving controlling experimentation (hard science).”¹⁸ The Article does not distinguish between President Trump's war on science and his war on regulatory science,¹⁹ despite the more flexible standards applicable to the latter.²⁰ As the arguments advanced here show, both wars are intertwined, as the war against science fosters the antiregulatory agenda on climate change issues promoted by the Trump Administration.

Sound scientific evidence, defined in this Article as that based on the best evidence and science available,²¹ is particularly relevant to policymaking. It facilitates the process of setting an agenda for issues to be discussed, based on technical assessments; it also reduces the potential asymmetry of information among parties, because the government's proposal is made public and available to public scrutiny. This, in turn, fosters policy debates while generally avoiding bias. Science, after all, is grounded in objective assessments.²² Such assessments have significant consequences domestically as well as internationally; sound science is crucial for domestic regulations, as it fosters reasoned action (with cost-benefit analysis being essential for promoting reasoned regulations).²³

It is also of paramount importance in the international arena, as it promotes a common denominator with regard to the relevant causes of climate change, which itself advances cooperation among countries. It has long been observed that the relationship between law and science should foster cooperation among countries to protect the common good.²⁴ Accordingly, sound scientific evidence reduces transaction costs for domestic regulatory actions, as well as for international initiatives on climate policies.

The Article turns next to the necessity of cost-benefit analysis being properly reasoned (i.e., informed by scientific

ing it, and this valuation needs to change. MARIANA MAZZUCATO, THE VALUE OF EVERYTHING: MAKING AND TAKING THE GLOBAL ECONOMY 8 (2018).

18. Deborah M. Hussey Freeland, *Speaking Science to Law*, 25 GEO. INT'L ENVTL. L. REV. 289 (2013).
19. Albert C. Lin, *President Trump's War on Regulatory Science*, 43 HARV. ENVTL. L. REV. 247 (2019) (distinguishing regulatory science from research science based on the model of inquiry, i.e., research science seeks truth for its own sake, whereas regulatory science has to answer, within a specific time frame, the questions posed by administrative agencies and delimited by legal standards).
20. *Id.* at 253 (noting that regulatory science has a more flexible standard, because it can inform regulation within considerable margins of uncertainty).
21. PATRICIA PARK, INTERNATIONAL LAW FOR ENERGY AND THE ENVIRONMENT 11 (2013).
22. Freeland, *supra* note 18, at 296, explaining: “science proceeds under a positivistic supposition that the scientist is studying a phenomenon that has an objective reality (that is independent of the scientist's ideas about it)—and the scientist's boundary work can be understood in terms of her professional commitment to sorting the objectively real from the subject-dependent.” This is not to say that science is not subject to uncertainty or to some level of subjectivity. *Id.* at 301-10.
23. RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH 13 (2008) (specifically mentioning the importance of cost-benefit analysis in ensuring that “decisions are based on reasoned analysis and not . . . on the unaccountable whim of an official”).
24. David F. Cavers, *Science and the Law Symposium: Introduction*, 63 MICH. L. REV. 1325 (1965).

evidence). Considering the normative use of economics,²⁵ cost-benefit analysis is a regulatory tool for evaluating policies. As such, it depends upon scientific knowledge and related data to achieve a reliable evaluation. Curiously, cost-benefit analysis has been considered to promote a deregulatory agenda disguised as scientific objectivity.²⁶ As this Article demonstrates, this is not the Trump Administration's approach, as its deregulatory agenda on climate change matters²⁷ has discredited cost-benefit analysis, ultimately turning it into a "perversion of a neutral approach to policy making."²⁸ Hence, this approach contradicts not only sound scientific evidence, but also the normative use of economics.²⁹ It also conflicts with the basic tenets of cost-benefit analysis as a method used to determine the maximization of overall well-being,³⁰ as experts repeatedly contend that the Trump Administration's deregulatory policies disregard scientific criteria.³¹

At this point, a methodological note is required, as this Article does not distinguish between cost-benefit analysis and benefit-cost analysis.³² It builds on the use of cost-benefit analysis to improve the environment,³³ aiming at the maximization of overall well-being.³⁴ In addition, it assumes that rational administrative agencies should work

to maximize such well-being.³⁵ As a method, cost-benefit analysis fosters transparency,³⁶ and it can serve to isolate governmental decisions from interest-group politics.³⁷

This, of course, does not mean that cost-benefit analysis is a panacea. In light of intense political pressures, "references to costs and benefits might seem a bit fussy—even naïve."³⁸ Institutional design and presidential preferences are particularly relevant for cost-benefit analysis.³⁹ Ultimately, such analyses are predictions and sometimes they may be wrong.⁴⁰ These arguments are valid and relevant to instances in which the scientific evidence and the cost-benefit analysis' methodology were correctly informed.

The Article, however, focuses on the Trump Administration's persistent attacks upon scientific knowledge and cost-benefit analysis as a method, as the Trump Administration has a reputation for focusing on costs while neglecting benefits.⁴¹ Even when the Administration actually engages in cost-benefit analysis, research finds it to be significantly flawed.⁴² This is concerning, because according to economics, improving environmental quality is often connected to increasing marginal costs, which, in practice, means that the first steps are also the cheapest.⁴³

This Article's first contribution is to effective policymaking, which is predicated on the assessment of complete policy impacts (i.e., the consideration of ancillary costs as well as ancillary benefits⁴⁴ in relation to the Trump Administration's deregulatory policies on climate change). Its second contribution encompasses the specific attacks on science and their impact on cost-benefit analysis of relevant policies for climate change, namely, the (actual or proposed) rollbacks of the Clean Water Rule, the pesticides ban, the Clean Air Act (CAA),⁴⁵ and the Clean Power Plan, as well as the proposed modification of the National Environmental Policy Act (NEPA)⁴⁶ and of the regulations promot-

25. Cost-benefit analysis as a regulatory tool has different meanings, ranging from the normative use of economics to using the criterion of wealth maximization when evaluating a particular policy. RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 402 (2007).

26. FRANK ACKERMAN & LISA HEINZERLING, *PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING* 9 (2004).

27. JESSICA WENTZ & MICHAEL B. GERRARD, SABIN CENTER FOR CLIMATE CHANGE LAW, *PERSISTENT REGULATIONS: A DETAILED ASSESSMENT OF THE TRUMP ADMINISTRATION'S EFFORTS TO REPEAL FEDERAL CLIMATE PROTECTIONS 1* (2019) (noting the "sweeping deregulatory agenda" pursued by the current Administration regarding climate change).

28. Rena Steinzor, *Cost-Benefit Analysis According to the Trump Administration*, REG. REV., July 23, 2019.

29. POSNER, *supra* note 25, at 402-03.

30. For an overview concerning the tenets of cost-benefit analysis, see DAVID L. WEIMER & AIDAN R. VINING, *POLICY ANALYSIS: CONCEPTS AND PRACTICE* 399-434 (2017).

31. Experts have consistently claimed that the Trump Administration uses the methodology of cost-benefit analysis without scientific criteria. *See, e.g.*, Antonio M. Bento et al., *Flawed Analyses of U.S. Auto Fuel Standards*, 362 SCIENCE 1119 (2018) (detailing fundamental flaws and inconsistencies related to basic economic theory and empirical studies in such proposed rules). *See also* Richard L. Revesz, *Destabilizing Environmental Regulation: The Trump Administration's Concerted Attack on Regulatory Analysis*, 47 ENV'T L.Q. 63-82 (forthcoming 2020), available at [https://its.law.nyu.edu/faculty/profiles/representativeFiles/DestabilizingEnvironmentalRegulationsubmissiondraft\(E.LQ\)_9719FB05-E738-4EF3-0733A823E0A5CC7D.pdf](https://its.law.nyu.edu/faculty/profiles/representativeFiles/DestabilizingEnvironmentalRegulationsubmissiondraft(E.LQ)_9719FB05-E738-4EF3-0733A823E0A5CC7D.pdf) (specifically discussing topics relating to cost-benefit analysis).

32. The terms are commonly used interchangeably. RICHARD O. ZERBE JR., *THE LEGAL FOUNDATION OF COST-BENEFIT ANALYSIS* 1, 3 (Univ. of Washington Selected Papers, 2007).

33. This research is based on the assumption that, for governments to make good decisions, they must avoid "gut-level decisionmaking" and should not abandon reasoned analysis. REVEZ & LIVERMORE, *supra* note 23, at 3.

34. As explained by Matthew Adler and Eric Posner:

Cost-benefit analysis is best defended as a *welfarist* decision procedure. Cost-benefit analysis is justified as a decision procedure to the extent that it advances overall wellbeing—that is, the wellbeing of the public generally, if not necessarily every member of the public—relative to alternative decision procedures, including the null case of doing nothing.

MATTHEW D. ADLER & ERIC A. POSNER, *NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS* 6 (2006). "Public," for purposes of this Article, is the U.S. general population.

35. *Id.* at 25 (the authors also frame cost-benefit analysis as a procedure for maximizing overall well-being. *Id.* at 62).

36. Noting that cost-benefit analysis, as a procedure, fosters monitoring of errors and deterrence of opportunistic behavior because it facilitates the oversight by the public and elected officials. *Id.* at 101.

37. POSNER, *supra* note 25, at 402-03.

38. CASS R. SUNSTEIN, *THE COST-BENEFIT REVOLUTION* 211 (2018).

39. *See, e.g.*, Stuart Shapiro, *Unequal Partners: Cost-Benefit Analysis and Executive Review of Regulations*, 35 ELR 10433 (July 2005) (specifically assessing the institutional design of the Office of Information and Regulatory Affairs (OIRA) in executive reviews and cost-benefit analysis in presidential decisionmaking).

40. SUNSTEIN, *supra* note 38, at 213.

41. *Id.* at 159. *See also* MICHAEL A. LIVERMORE & RICHARD L. REVEZ, *REVIVING RATIONALITY: SAVING COST-BENEFIT ANALYSIS FOR THE SAKE OF THE ENVIRONMENT AND OUR HEALTH* 107-17 (2020) (discussing what the authors consider as an "illusion" by the Trump Administration, with its focus on costs while disregarding the benefits of regulations).

42. Farber, *supra* note 6, at 431.

43. Michael A. Livermore et al., *Global Cost-Benefit Analysis*, in *THE GLOBALIZATION OF COST-BENEFIT ANALYSIS IN ENVIRONMENTAL POLICY* 5 (Michael A. Livermore & Richard Revesz eds., Oxford Univ. Press 2013).

44. Jonathan B. Wiener, *Precaution and Climate Change*, in *THE OXFORD HANDBOOK OF INTERNATIONAL CLIMATE CHANGE LAW* 171 (Cinnamon P. Carlarne et al. eds., Oxford Univ. Press 2016) (emphasizing the need for cost-effectiveness in the application of the precautionary principle). For an in-depth discussion of ancillary harms and benefits, see REVEZ & LIVERMORE, *supra* note 23, at 151-70.

45. 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.

46. 42 U.S.C. §§4321-4370h, ELR STAT. NEPA §§2-209.

ing fuel efficiency, and the flexibilization of environmental enforcement during the COVID-19 pandemic.

All of these deregulatory cases were also illustrative of at least one modality of an attack on science, encompassing the following categories: (1) creating a hostile environment for scientific staff; (2) insufficiently appointing executive branch positions that manage, conduct, or disseminate science; (3) tampering with science or scientific reports; and, finally, (4) undermining science-based regulations.⁴⁷ Ultimately, the Article also advances the literature on climate governance, as it examines the negative impact of the war on science upon cost-benefit analysis and related unreasoned policymaking that transcends domestic borders.

The Article proceeds as follows. Part I addresses the principal efforts of the Trump Administration to undermine scientific knowledge in light of the literature about attacks on science. Part II discusses how attacks on science are also undermining cost-benefit analysis of climate change policies, presenting specific instances where the methodology of cost-benefit analysis has been tempered and how such actions have been disguised under a façade of scientific approach.

Part III analyzes how the Trump Administration's policies ultimately disregard the social costs of carbon. It also discusses how the lack of reasoned decisionmaking and the absence of scientific knowledge in informing policies fosters uncertainty and increases litigation. In addition, it assesses the impact of this war on science and its related advancement of unreasoned deregulatory policy choices in the context of climate governance. Part IV concludes that the actions of the Trump Administration are undermining cost-benefit analysis because they are unreasoned and uninformed by the best science available. Accordingly, President Trump's deregulatory actions are not welfare-maximizing, are detrimental to climate governance, and will have severe consequences long after his time in office ends.

I. The War on Science

This part contextualizes the universality of attacks on science and its most recent attacker, President Trump. This contextualization is followed by an overview of the literature that specifically addresses these attacks. This part proceeds to analyze the specific conduct of the Trump Administration in attacking science. By so doing, a pattern emerges: the Trump Administration consistently engages in practices that undermine the role of science (scientists included) in informing public policies related to climate change.

A. An Overview of the Literature of Attacks on Science

Attacks on science are nothing new; nor are they unique to the United States or to this Administration.⁴⁸ Opposing scientific researchers, fossil fuel corporations, conservative organizations, and celebrity bloggers have engaged in actions to discredit not only climate science, but also the international organizations and scientists advancing it.⁴⁹ The motivations of these engines of the denial machine vary, but they all share a strong opposition to regulatory efforts to ameliorate climate change, such as the restriction of carbon emissions.⁵⁰

Despite this history of attacks, experts have called the Trump Administration's disregard for scientific knowledge "pervasive" and "worse than ever,"⁵¹ with top government administrators, including at the U.S. Environmental Protection Agency (EPA) and the U.S. Department of the Interior (DOI), occupied by former lobbyists who are intimately linked to those agencies that they have become responsible for overseeing.⁵² Early in President Trump's term in office, renowned scientists censured the Administration, claiming that science and objective truth have never been more strained.⁵³ The president's disdain for science, perhaps, has never been more evident than in his handling of the COVID-19 pandemic and the staggering number of deaths the country faces.⁵⁴ Comparisons

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48. Brad Plumer & Coral Davenport, *Science Under Attack: How Trump Is Sidelining Researchers and Their Work*, N.Y. TIMES, Dec. 28, 2019, <https://www.nytimes.com/2019/12/28/climate/trump-administration-war-on-science.html> (noting that previous administrations have disregarded scientific evidence to different degrees, citing the example of how President Barack Obama overruled experts at the Food and Drug Administration who had concluded that over-the-counter emergency contraceptives were safe to minors. Nonetheless, the authors emphasize that the scope of such disregard is much wider under the Trump Administration). THOMAS O. MCGARITY & WENDT E. WAGNER, *BENDING SCIENCE: HOW SPECIAL INTERESTS CORRUPT PUBLIC RESEARCH* 128-79 (2008) (drawing on the public record to describe systematic actions to discredit scientists and their research, and examining how scientists have been bullied). For a detailed account of attacks on science during the presidency of George W. Bush, in particular, see CHRIS MOONEY, *THE REPUBLICAN WAR ON SCIENCE* 5 (2005) (noting that moderate Republicans such as Sen. John McCain (R-Ariz.) have fought the more conservative members of his party on science and noting that a Republican, namely President Dwight David Eisenhower, was the first to install a science-based apparatus).
49. Riley E. Dunlap & Aaron M. McRight, *Organized Climate Change Denial*, in *THE OXFORD HANDBOOK OF CLIMATE CHANGE AND SOCIETY* 144 (John S. Dryzik et al. eds., Oxford Univ. Press 2011). For an example of actions originating in the scientific community to discredit climate change in the United States, see NONGOVERNMENTAL INTERNATIONAL PANEL ON CLIMATE CHANGE, *CLIMATE CHANGE RECONSIDERED II: FOSSIL FUELS* 109 (Joseph L. Bast & Carol Bast eds., 2019) (arguing bias and lack of causation).
50. Dunlap & McRight, *supra* note 49, at 144-45 ("Viewed through a broader theoretical lens, climate change denial can be seen as part of a more sweeping effort to defend the modern Western social order which has been built by an industrial capitalism powered by fossil fuels.")
51. The quotes are from Prof. Michael Gerrard, who stated: "The disregard for expertise in the federal government is worse than it's ever been." Plumer & Davenport, *supra* note 48.
52. *Id.*
53. Jonathan Foley, *The War on Facts Is a War on Democracy*, SCI. AM., Jan. 25, 2017, <https://blogs.scientificamerican.com/guest-blog/the-war-on-facts-is-a-war-on-democracy/>.
54. Steve Coll, *Unscientific Method*, NEW YORKER, Apr. 6, 2020, at 8 (describing how the president considered reopening the country by Easter, against the recommendation of health experts, because he thought "it was a beautiful time"). See also Select Subcommittee on the Coronavirus Crisis: Staff

47. Berman & Carter, *supra* note 1, at 3.

with previous administrations have also found evidence of unprecedented behavior, including President Trump's disregard for the findings of his own scientists.⁵⁵ Attacks on science and related censorship of scientists have become common and started to spread to the state level, with initiatives replicating such actions at all levels of government.⁵⁶

Building upon previous literature, this Article comprehensively defines four categories of attacks on science.⁵⁷ The first category is creation of a hostile environment for scientific staff (unjust firing, transferring, restricting of staff communications, etcetera). The second is the appointment of insufficiently qualified individuals into executive branch positions that manage, conduct, or disseminate science (appointing unqualified and/or conflicted people to agencies as well as science advisory boards, and leaving scientist positions empty, among others). The third category is tampering with science or scientific reports (editing, misrepresenting, or deleting scientific reports, data, or websites containing scientific information). The final category is the undermining of science-based regulations (weakening, disregarding, revoking, or failing to enforce safeguards; reducing or terminating monitoring and enforcement systems).⁵⁸ The Trump Administration engages in all four of these categories, as detailed in the next section.

B. Specific Attacks on Science by the Trump Administration

This section discusses concrete examples of attacks on science that may adversely impact climate change policies. It focuses on the Trump Administration's attacks on science, and shows in turn how extensive they have been across each of the four categories.⁵⁹

The first category is the creation of a hostile environment for scientific staff. Examples abound. President Trump recently created a job category for government workers—including scientists involved in policymaking—to be easily fired.⁶⁰ During his presidency, several agencies, including

EPA, asked their scientists not to speak with the public.⁶¹ The current Administration has also engaged in obstructive actions to avoid expert testimony in the U.S. Congress,⁶² which amount to undue interference with access to sound scientific evidence by the legislative branch.

These censoring conducts are not restricted to the highest ranks of the Administration; on the contrary, lower-level appointees are following suit and starting to censor publications on climate change, for instance.⁶³ Unsurprisingly, an empirical study surveying scientists from five federal agencies during the Trump Administration has found that their current agency leadership lacks technical expertise and is not perceived as trustworthy with respect to scientific work.⁶⁴ Scientists at EPA and DOI were least likely to perceive their leadership as trusting scientific work in comparison with political interests.⁶⁵ Employees at these two agencies declared the highest degrees of censorship and self-censorship, specifically on climate change topics.⁶⁶

The second category is the appointment of insufficiently qualified individuals to executive branch positions that manage, conduct, or disseminate science. The Trump Administration took longer than any of its predecessors to fill the position of director of the Office of Science and Technology Policy—commonly known as the science advisor.⁶⁷ This position was vacant for almost two years during the Trump presidency.⁶⁸ Congress understands the need for a science advisor to provide the president with “independent, expert judgment and assistance on policy matters which require accurate assessments of the complex scientific and technological features involved.”⁶⁹

Analysis, *The Trump Administration's Pattern of Political Interference in the Nation's Coronavirus Response*, U.S. DEPT. OF HEALTH AND HUMAN SERVICES 1-2 (Oct. 2, 2020), <https://coronavirus.house.gov/sites/democrats.coronavirus.house.gov/files/10.2.20%20Political%20Interference%20Report%20%281%29.pdf> (documenting at least 47 independent incidents of political interference from February to September 2020. These incidents included criticism and firing of experts who insisted on sharing accurate scientific information with the public; suppression of guidance and scientific reports on testing, protecting children, reopening schools, voting safely, and other topics of public interest; authorization of unscientific treatments over the objections of scientists; resisting efforts to ensure the safe development of a vaccine; diverting \$265 million from the Centers for Disease Control and Prevention and the Food and Drug Administration for an ad campaign to “defeat despair and inspire hope” weeks before Election Day).

55. Berman & Carter, *supra* note 1, at 2.

56. See, e.g., Sabin Center for Climate Change Law & Climate Science Legal Defense Fund, *Silencing Science Tracker*, <https://climate.law.columbia.edu/Silencing-Science-Tracker> (last visited Oct. 12, 2020) (displaying, since November 2016, a comprehensive list of actions that may adversely impact science, including measures from federal, state, and local governments as well as their agencies).

57. Berman & Carter, *supra* note 1, at 3.

58. *Id.* (presenting all four categories).

59. *Id.*

60. Exec. Order No. 13957 §§4-5, 85 Fed. Reg. 67631 (Oct. 21, 2020).

61. The actions included refraining from sharing their expertise on social media. Valerie Volcovici & P.J. Huffstutter, *Trump Administration Seeks to Muzzle U.S. Agency Employees*, REUTERS, Jan. 24, 2017, <https://www.reuters.com/article/us-usa-trump-epa-idUSKBN15822X>.

62. Lisa Friedman, *White House Tried to Stop Climate Science Testimony, Documents Show*, N.Y. TIMES, June 8, 2019, <https://www.nytimes.com/2019/06/08/climate/rod-schoonover-testimony.html> (noting that the Trump Administration has been accused of stopping the congressional testimony of a State Department senior official regarding climate science).

63. Lisa Friedman, *A War Against Climate Science, Waged by Washington's Rank and File*, N.Y. TIMES, June 15, 2020, <https://www.nytimes.com/2020/06/15/climate/climate-science-trump.html> (highlighting how government experts are surprised at the speed with which federal works have internalized President Trump's antagonism to climate science specifically).

64. Gretchen T. Goldman et al., *Perceived Losses of Scientific Integrity Under the Trump Administration: A Survey of Federal Scientists*, 15 PLOS ONE 1, 2-6 (2020) (detailing that the study consisted of a 52-question survey administered in 2018 to 3,700 federal scientists).

65. *Id.* at 11.

66. *Id.* at 22.

67. Mythili Sampathkumar, *Donald Trump Has Not Had a Science Advisor for Longer Than Any Other President*, INDEPENDENT, July 27, 2018, <https://www.independent.co.uk/news/world/americas/us-politics/white-house-science-advisor-donald-trump-us-climate-change-global-warming-a8467076.html> (noting that when the president communicated that the United States would pull out from the Paris Agreement, the highest-ranked administrator associated with science was a 31-year-old with a bachelor's degree in political science).

68. The U.S. Senate confirmed the extreme-weather expert Kelvin Droegemeier as the director of the Office of Science and Technology Policy in early 2019. Tony Romm & Ben Guarino, *Senate Confirms Trump's Science and Tech Advisor After Lengthy Vacancy*, WASH. POST, Jan. 3, 2019, <https://www.washingtonpost.com/technology/2019/01/03/senate-confirms-trumps-science-tech-adviser-after-lengthy-vacancy/>.

69. 42 U.S.C. §6602.

The science advisor therefore provides the president with confidential and unbiased counsel.⁷⁰ Despite the vacancy of this post, the Trump Administration made complex domestic and international decisions on climate change that could have been more aligned with current scientific knowledge if such an expert had been heard.⁷¹ If nothing else, the presence of a science advisor may have prevented the Trump Administration from citing unsound studies as evidence in its decision to withdraw from the Paris Agreement, for instance.⁷²

Additional instances of attacks of the second category include the Administration's tampering with science advisory boards. Scientific committees have been a particular target of the Trump Administration on various fronts. Former EPA Administrator Scott Pruitt, for example, issued a 2017 directive barring scientists who have received grants from EPA from serving on its advisory committees⁷³ under the guise of avoiding conflicts of interest. Federal courts stepped in, ruling the change arbitrary and capricious under the Administrative Procedure Act (APA).⁷⁴ Another such attack came with the Administration's announcement of seven appointments to the President's Council of Advisors on Science and Technology, which was another clear victory for industry interests.⁷⁵ Among the appointees, only one worked at an academic institution at the time of appointment; two were without doctoral degrees; and one appointee was Attigal N. Sreeram, who is the chief technology officer at Dow Chemical.⁷⁶

More recent attacks on scientific committees have targeted the Science Advisory Board (SAB), which provides scientific advice to EPA and congressional committees.⁷⁷ A draft memo, circulated late in 2019, proposed centralizing power in SAB's chair and aiming to exclude other members

from determining which policies were worth reviewing.⁷⁸ The plan to concentrate such powers in the SAB's chair and with EPA's administration came after SAB, which comprises 44 members elected mostly under Pruitt and current EPA Administrator Andrew Wheeler, criticized four deregulatory actions by EPA: the proposed so-called "transparency in science" rule, the Clean Water Act (CWA),⁷⁹ the Clean Car rollback, and the deregulation of power plants' releases of mercury and other hazardous pollutants.⁸⁰

The third category of attacks encompasses actions that tamper with science or scientific reports. The Trump Administration has been quite active on this front. Attempts to remove scientific evidence of climate change from EPA's website were among its first steps taken.⁸¹ In addition, the Administration eliminated the projected effects of increased carbon dioxide pollution after 2040 from the estimates made by the U.S. Geological Survey Office.⁸² Worst-case scenario projections were removed from the National Climate Assessment, an interagency report produced every four years.⁸³

Another major example is EPA's proposed new rule on science.⁸⁴ The rule proposed in 2018, which was condemned by 1,000 scientists,⁸⁵ has recently been supplemented,⁸⁶ and now recommends that the Agency use scientific studies that solely rely on data that can be made public—essentially eliminating several sound scientific studies merely because they involve confidential patient information.⁸⁷ This is particularly pernicious because EPA justified it by claiming

70. Neal F. Lane & Michael Riordan, *Trump's Disdain for Science*, N.Y. TIMES, Jan. 4, 2018, <https://www.nytimes.com/2018/01/04/opinion/trump-disdain-science.html>.

71. *Id.*

The lack of good science advice has not slowed the president and his administration in their assaults on health and environmental policy and in weighing in on national-security issues involving science and technology. His decision to pull the nation out of the Paris climate agreement is one example. So was his appointment of Scott Pruitt, a lawyer with little real understanding of climate science, as administrator of the Environmental Protection Agency.

72. Rachel Becker, *Trump Used Misleading Job Stats to Justify Pulling Out of Paris Climate Agreement*, VERGE, June 1, 2017, <https://www.theverge.com/2017/6/1/15727398/donald-trump-paris-climate-change-agreement-us-pulls-out-million-jobs> (noting that the Trump Administration referred to a non-scientific study to justify its withdrawing decision).

73. Memorandum from E. Scott Pruitt, Administrator, U.S. EPA, Strengthening and Improving Membership on EPA Federal Advisory Committees 1 (Oct. 31, 2017), https://www.epa.gov/sites/production/files/2017-10/documents/final_draft_fac_directive-10.31.2017.pdf.

74. *Physicians for Soc. Responsibility v. Wheeler*, No. 19-5104, at 13-25, 50 ELR 20100 (D.C. Cir. Apr. 21, 2020).

75. Robert Gebelhoff, *Trump Isn't Even Hiding His Disdain for Science Anymore*, WASH. POST, Oct. 23, 2019, <https://www.washingtonpost.com/opinions/2019/10/23/trump-isnt-even-hiding-his-disdain-science-anymore/> ("the White House Council has symbolic significance and, since the Truman administration, the president's scientific advisory council has been an institution of good governance, mainly").

76. *Id.* (recalling that Dow Chemical has donated \$1 million to the president's inauguration, with its then-chief executive Andrew Liveris serving as an advisor to the president early in 2017, and how this corporation benefitted from the non-implementation of a ban on pesticides).

77. 42 U.S.C. §4365(a).

78. Sean Reilly, *EPA: Wheeler's Science Advisory Board Revamp Plan Sparks Concerns*, E&E NEWS, Dec. 10, 2019, <https://www.eenews.net/greenwire/stories/1061775673/>.

79. 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607.

80. Sean Reilly et al., *EPA: Advisory Panel Slams Trump's Regulatory Rollbacks*, E&E NEWS, Jan. 2, 2020, <https://www.eenews.net/greenwire/2020/01/02/stories/1061975927>.

81. Valerie Volcovici, *Trump Administration Tells EPA to Cut Climate Page From Website: Sources*, REUTERS, Jan. 25, 2017, <https://www.reuters.com/article/us-usa-trump-epa-climatechange/trump-administration-tells-epa-to-cut-climate-page-from-website-sources-idUSKBN15906G>.

82. The Trump Administration likely chose to do so due to the effects of global warming being particularly severe after 2050. Davenport & Landler, *supra* note 2.

83. *Id.* (reporting that Philip B. Duffy—then-president of the Woods Hole Research Center and former member of a National Academy of Sciences panel that reviewed the government's most recent National Climate Assessment—stated: "What we have here is a pretty blatant attempt to politicize the science—to push the science in a direction that's consistent with their politics. It reminds me of the Soviet Union.")

84. For the original proposed rule, see U.S. EPA, *Strengthening Transparency in Regulatory Science*, <https://www.epa.gov/osa/strengthening-transparency-regulatory-science> (last updated Apr. 2, 2020). More recently, an editorial in one of the most prestigious scientific publications called the updated rule misleadingly denominated as strengthening transparency, and strongly criticized it. See Editorial, *The Sustained Undermining of Science by the EPA's Leadership Is a Travesty*, 581 NATURE 7 (2020).

85. Letter from 985 Scientists, to E. Scott Pruitt, Administrator, U.S. EPA (Apr. 23, 2018) (Don't Restrict EPA's Ability to Rely on Science), <https://s3.amazonaws.com/ucs-documents/science-and-democracy/secret-science-letter-4-23-2018.pdf>. In 2018, this proposed rule was also condemned by law professors around the nation: Comment on Proposed Rule—Strengthening Transparency in Regulatory Science, 83 Fed. Reg. 18768 (Apr. 30, 2018) ("Proposed Rule") (Aug. 14, 2018), <https://legal-planet.org/wp-content/uploads/2018/08/FINAL-EPA-HQ-OA-2018-0259-Comment-Letter.pdf>.

86. Strengthening Transparency in Regulatory Science; Supplemental Notice of Proposed Rulemaking, 85 Fed. Reg. 15396 (Mar. 18, 2020), <https://www.govinfo.gov/content/pkg/FR-2020-03-18/pdf/2020-05012.pdf>.

87. Farber, *supra* note 6, at 411-12.

that the science used to inform regulations ought to require greater transparency.⁸⁸ Scientific groups overwhelmingly opposed this rule when it was proposed, because entire fields of research rely on the confidentiality of personal health information from subjects who agree to participate in the research.⁸⁹ In 2020, 100 environmental and administrative law professors signed a letter urging EPA to withdraw the revisited proposal for the so-called transparency rule.⁹⁰

The fourth (and last) category of attacks is actions undermining science-based regulations, including weakening, disregarding, revoking, and/or failing to enforce safeguards and reducing monitoring and enforcement systems. The proposed 2020 budget had significant cuts for the National Science Foundation and the Office of Science of the U.S. Department of Energy (DOE),⁹¹ which would have jeopardized science-based regulation to the extent that research funding would have been significantly reduced. DOE's Office of Energy Efficiency and Renewable Energy would have had its budget cut by 87% but for congressional intervention.⁹² Moreover, political considerations have consistently taken precedence over scientific knowledge under this Administration. Political officials at EPA have repeatedly overruled EPA's own career experts, including on a proposal to relax asbestos regulations.⁹³ Additional examples of such actions during the Trump Administration abound; for example, the president's handling of the coronavirus pandemic, often contradicting his own technical experts, has brought national and international criticism.⁹⁴

C. Contextualizing the Previous Findings

In light of the measures described above, it is clear that disregard for science has become a defining policy feature

88. Lisa Friedman, *Coronavirus Doesn't Slow Trump's Regulatory Rollbacks*, N.Y. TIMES, Mar. 25, 2020, <https://www.nytimes.com/2020/03/25/climate/coronavirus-environmental-regulations-trump.html>.

89. *Id.*

90. Comment on Supplemental Notice of Proposed Rulemaking ("SN-PRM")—Strengthening Transparency in Regulatory Science, 85 Fed. Reg. 15396 (Mar. 18, 2020) ("Proposed Rule") 1-2 (May 18, 2020), <https://legal-planet.org/wp-content/uploads/2020/05/Law-Prof-EPA-HQ-OA-2018-0259-Comment-FINAL-5-17-20.pdf> (100 law professors arguing that EPA lacks the authority to issue such rule, and that the proposal "bears no relationship with widely accepted principle and procedures of scientific review"). In the same vein: Comments From the Climate Science Legal Defense Fund and the Sabin Center for Climate Change Law, Supplemental Notice of Proposed Rulemaking Regarding EPA's Proposed Strengthening Transparency in Regulatory Science Rule (Docket ID No. EPA-HQ-OA-2018-0259 (May 18, 2020)).

91. Fred Krupp, *Trump's War on Science Is Hobbling the U.S. in the Global Innovation Race*, ENVTL. DEF. FUND, Sept. 6, 2019, <https://www.edf.org/blog/2019/09/06/trumps-war-science> (noting that last year, "the administration blocked submission of congressional testimony by a government scientist whose research revealed how climate change will undermine U.S. national security in the next twenty years. The scientist, Rob Schoonover, resigned his post and went public with the story for being muzzled.").

92. Marianne Lavelle, *Trump Budget Calls for Slashing Clean Energy Spending, Again*, INSIDECLIMATE NEWS, Mar. 12, 2019, <https://insideclimatenews.org/news/12032019/trump-budget-cuts-renewable-energy-efficiency-electric-vehicle-tax-credit-deficit> (also emphasizing that the proposed budget included more cuts than any president ever proposed).

93. Plumer & Davenport, *supra* note 48.

94. Including ridicule when the president suggested that injecting disinfectants might be helpful. Lisa Friedman & Brad Plumer, *Trump's Response to Virus Reflects a Long Disregard for Science*, N.Y. TIMES, Apr. 29, 2020, <https://www.nytimes.com/2020/04/28/climate/trump-coronavirus-climate-science.html>.

of the Trump Administration,⁹⁵ and will jeopardize the scientific capacity of the government in the long term.⁹⁶ A recent report emphasizes the importance of institutional capacity and building upon the existing regulatory framework, as regulatory stability provides the predictability needed for market and investment considerations.⁹⁷ As the previous sections show, such institutional capacity (let alone stability) is far from occurring.

Moreover, the Trump Administration's actions are undermining EPA's work environment, reputation, and regulatory capacity, which have historically been perceived as among the Agency's main strengths.⁹⁸ This is particularly worrisome as several environmental laws direct EPA to base its regulatory decisions on scientific evidence.⁹⁹ Thus, executive power is behaving dysfunctionally, negatively impacting the separation of powers because it imperils proper congressional oversight (due to the lack of access to sound scientific evidence and scientific testimonies by agencies), as well as the scrutiny of public opinion.

The scenario above is also concerning if contextualized in the international arena. As the Trump Administration cuts 70% of investments in clean energy,¹⁰⁰ impeding job creation and jeopardizing U.S. competitiveness in the renewable sector, China asserts its leadership.¹⁰¹ Meanwhile, Chinese scientists have started searching for collaborations in Canada, Europe, and Japan instead of the United States, due to the current immigration policies and overall concern around accusations of foreign interference in government-funded research.¹⁰² Recent immigration policies of the current Administration have been detrimental for attracting international researchers and collaborators from around the globe.

Such a scenario is a particular challenge now, as the United States is no longer the leading country in publishing science and engineering articles.¹⁰³ According to the 2020 biannual report of the U.S. National Academy of Sciences, the share of federally funded research and

95. *Id.*

96. Joel Clement, a former DOI top expert on climate policy who quit after being reassigned to collecting oil and gas royalties, said: "Regulations come and go, but the thinning out of scientific capacity in the government will take a long time to get back." Plumer & Davenport, *supra* note 48.

97. JOHN E. REEDER, AMERICAN UNIVERSITY SCHOOL OF PUBLIC AFFAIRS, MOVING FORWARD: FUTURE DIRECTIONS FOR EPA AND ENVIRONMENTAL PROTECTION 6 (2019), <https://www.american.edu/spa/cep/future-directions/upload/report-on-future-of-epa-dec-17-pdq.pdf>.

98. *Id.* at 30.

99. The CAA, for instance, determines that air quality criteria "accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare." 42 U.S.C. §7408(a)(2).

100. Varun Sivaram & Sagatom Saha, *Power Outage: Cutting Funding for Energy Innovation Would Be a Grave Mistake*, FOREIGN AFF., May 17, 2017, <https://www.foreignaffairs.com/articles/united-states/2017-05-17/power-outage>.

101. The U.S. policy choices are in sharp contrast with China, which invests significantly in renewables and is leading the race for innovation. See Peter Haas, *Parxit, the United States, and the World*, 15 CHINESE J. POPULATION RESOURCES & ENV'T 186 (2017).

102. Andrew Silver, *Scientists in China Say U.S. Government Crackdown Is Harming Collaborations*, NATURE, July 8, 2020, <https://www.nature.com/articles/d41586-020-02015-y> (highlighting that investigations into foreign interference on U.S. campuses have rattled researchers in both countries).

103. NATIONAL SCIENCE BOARD & NATIONAL SCIENCE FOUNDATION, SCIENCE AND ENGINEERING INDICATORS 2020: THE STATE OF U.S. SCIENCE AND ENGINEERING (2020), <https://ncses.nsf.gov/pubs/nsb20201/global-science-and-technology-capabilities>. *Id.* See also Figure 3 in the Appendix.

development (R&D) performance has been significantly reduced.¹⁰⁴ While the current U.S. Administration has proposed significant cuts to research, preliminary data shows that China has already surpassed the United States in R&D.¹⁰⁵ Meanwhile, countries that are members of the International Energy Agency are increasing their investment by an average of 4% for 2020.¹⁰⁶

Moreover, if research on climate change is undertaken by private parties, as seems to be the position of the current Administration,¹⁰⁷ the United States is on a path to lose innovation and its competitive advantage over other countries over time. A reliable indicator of this negative path is the number of patents granted per country, which is an internationally comparable index of innovation.¹⁰⁸ Of the patents granted worldwide in 2018, inventors in the United States earned 6.8%, behind China, the European Union, Japan, and South Korea, according to data from the National Academy of Sciences.¹⁰⁹

Accordingly, the Trump Administration's war on science and scientists has had significant costs domestically and internationally. It negatively interferes with the separation of powers, as the Trump Administration has precluded scientist experts from attending congressional hearings. It also imperils congressional and public oversight of the executive, because agencies are tampering with reports on climate change. The actions of the Trump Administration jeopardize the work of current scientists in national agencies and universities, as well as future collaborations abroad. This exposes the United States to the possibility of losing its innovative edge on cutting-edge research and fosters an environment of regulations that are not based on sound science.

II. How the Attack on Science Undermines Cost-Benefit Analysis of Climate Policies

The previous part discussed concrete examples of the Trump Administration's attacks on science and how they negatively impact climate change policy by disregarding the best science available and/or creating a hostile environment for scientists. This part turns its attention to how such attacks on science also undermine cost-benefit analysis of climate change policies. The legal justifications for cost-benefit analysis in the deregulatory context are introduced and specific instances where the methodology of cost-benefit analysis has been subject to tampering are presented, together with how such actions have been disguised under a façade of science. The part concludes that none of the proposed deregulatory measures analyzed withstand an accurate cost-benefit analysis test, as they are unreasoned, informed by unsound science, and subject to different modalities of attacks on science.

A. The Legal Background on Cost-Benefit Analysis and Deregulation

At the center of cost-benefit analysis is assessment of the positive and negative effects of government action, balancing competing social goals and acknowledging the difficult trade offs to be made.¹¹⁰ Cost-benefit analysis sheds light upon those trade offs, providing policymakers with the clearest picture possible of the consequences of their policy choices.¹¹¹ Cost-benefit analysis fosters transparency because it makes the decisionmaking process explicit.¹¹²

Despite the public not being well-versed in cost-benefit analysis methodologies, other actors (scholars, political commentators, civil society) can engage in such review in forms that would be impossible had policy decisions been made behind closed doors.¹¹³ Another advantage of cost-benefit analysis is that it provides a neutral language for criticizing unwise policy choices.¹¹⁴ It is also a universal standard that can be used to evaluate policies "without resorting to inflammatory political or moral attacks."¹¹⁵

Executive Order No. 12866 states that agencies can propose or enact a regulation solely when the benefits of said regulation justify its costs.¹¹⁶ Further, agencies are

104. NATIONAL SCIENCE BOARD & NATIONAL SCIENCE FOUNDATION, *supra* note 103, which concludes:

Since 2000, the expansion in U.S. Research and Development (R&D) has been driven primarily by the business sector, notwithstanding the temporary boost provided by the federal government in the wake of the 2008 financial crisis. Although the levels of federal R&D funding rose across performing sectors between 2000 and 2017, the share of total U.S. R&D funded by the federal government declined from 25% to 22%. This decline was observed across performing sectors including higher education institutions, other nonprofit institutions, and businesses. Among higher education institutions, where the federal government is a major source of R&D support, the share of federally funded R&D performance declined from 57% in 2000 to 51% in 2017.

105. Giuliana Viglione, *China Is Closing Gap With United States on Research Spending*, NATURE, Jan. 15, 2020, <https://www.nature.com/articles/d41586-020-00084-7> (highlighting that the United States is no longer the "uncontested leader" in science globally).

106. INTERNATIONAL ENERGY AGENCY, ENERGY TECHNOLOGY RD&D BUDGETS 2020 (2020), <https://www.iea.org/reports/energy-technology-rdd-budgets-2020> (the United States remains the country with the highest budget for research, development, and demonstration (RD&D) in absolute numbers, but it is worth noticing that China is not a member of the International Energy Agency).

107. Krupp, *supra* note 91 (noting that the president's acting chief of staff, Mick Mulvaney, has questioned: "Do we really need government-funded research at all?").

108. NATIONAL SCIENCE BOARD & NATIONAL SCIENCE FOUNDATION, *supra* note 103 (noting that the patents index is an imperfect one, as not all inventions are patented).

109. *Id.* For additional information, see also Figure 2 in the Appendix.

110. Livermore et al., *supra* note 43, at 5.

111. *Id.*

112. ADLER & POSNER, *supra* note 34, at 101.

113. Livermore et al., *supra* note 43, at 5.

114. *Id.*

115. *Id.*

116. Exec. Order No. 12866, §1(b)(6), 58 Fed. Reg. 51735 (Oct. 4, 1993). This Executive Order is complemented by Executive Order No. 13563, 76 Fed. Reg. 3821 (Jan. 21, 2011), which aimed at improving regulation and regulatory review, and by Executive Order No. 13771, 82 Fed. Reg. 9339 (Feb. 3, 2017). The latter, issued by President Trump, has the "one in, two out" requirement determining that any incremental costs produced by new regulation shall, to the extent as authorized by law, be offset by the elimination of existing costs of at least two prior regulations. In this context, Executive Order No. 13771 has been fiercely criticized for emphasizing costs and neglecting benefits. See, e.g., CASS R. SUNSTEIN, ON NEGLECTING REGULATORY BENEFITS (preliminary draft Feb. 20, 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3541782.

required to consider alternatives aimed at maximizing net benefits.¹¹⁷ Cost-benefit analysis, as a technique, is not mandatory for all administration policies because it carries its own costs.¹¹⁸ Reasoned decisionmaking, however, is a requisite for any administrative action under the APA.¹¹⁹ Cost-benefit analysis was not required when the APA was approved, and it is a relatively new practice.¹²⁰

The actual consideration of costs and benefits is indicative of a reasoned administrative action (i.e., one that is justified, rather than arbitrary).¹²¹ Reasoned analysis fosters uniform criteria for policies.¹²² Deregulation, which involves removing existing regulations in a particular market, needs to be reasoned.¹²³ Such reasoning does not need to be exhaustive, but should inform the administrative action. Accordingly, where regulatory norms exist, the administration is required to justify their revocation.¹²⁴ Assuming that cost-benefit analysis is a neutral check on administrative government initiatives, deregulatory policies should be restricted by cost-benefit analysis in the same manner as regulatory ones.¹²⁵

B. The Attacks' Impact on Cost-Benefit Analysis of Specific Matters Pertaining to Climate

The lack of a scientific approach to the cost-benefit analysis of climate change regulations under the Trump Administration has been condemned by scientists and law professors alike. In the scientific field, several scientists have condemned the Administration's efforts at undermining scientific knowledge¹²⁶ and advancing unreasoned deregulation.¹²⁷ On the legal front, several voices have con-

sistently denounced the Administration's efforts since its inauguration and called attention to how it has disregarded the basic rules of administrative law, putting on "a display of autocracy, impulsivity, and jerry-rigged reasoning."¹²⁸

Cost-benefit analysis during Trump's presidency, specifically, has been denounced as being concealed from the public and undertaken using "shoddy analysis."¹²⁹ Political preferences have consistently dominated over sound cost-benefit analysis.¹³⁰ Aggravating this scenario is the complexity of climate change and its impact.¹³¹ Estimations include market damages (infrastructure, tourism, and increased energy demand), and nonmarket damages (ecological impact and cultural values, often measured in terms of "willingness to pay").¹³² Predictions are perennially affected by uncertainty, speculation, and lack of information regarding future GHG emissions, the effects of past and future emissions upon the climate system, the impact of changes in climate upon the physical and biological environment, and the translation of such environmental effects into economic damage.¹³³ Helpful concepts for cost-benefit analysis, such as the value of statistical life (VSL),¹³⁴ are controversial¹³⁵ and often used politically.¹³⁶

117. For details on cost-benefit analysis, see OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR A-4, REGULATORY ANALYSIS (2003).

118. At the federal level, cost-benefit analysis is traditionally required for all policies considered *significant regulatory actions*. Executive Order No. 12866, §3(f), 58 Fed. Reg. 51735 (Oct. 4, 1993), defines a "significant regulatory action" as one with an annual effect on the economy of \$100 million or more. These rules are subject to OIRA. This provision is supplemented by Executive Order No. 13563, §1(B), 76 Fed. Reg. 3821 (Jan. 21, 2011), on improving regulation and regulatory review.

119. APA, 5 U.S.C. §706(2)(A) (judicial review mandates courts to invalidate actions found to be "arbitrary and capricious, abuse of discretion or otherwise not in accordance with the law").

120. Cass R. Sunstein, *Cost-Benefit Analysis and Arbitrariness Review*, 41 HARV. ENVTL. L. REV. 1, 8 (2017).

121. *Michigan v. Environmental Prot. Agency*, 135 S. Ct. 2699, 2706-08, 45 ELR 20124 (2015) (determining that consideration of costs is mandatory for executive agencies). See Sunstein, *supra* note 120, at 3 (discussing the rise of the cost-benefit state and the trend of judicial decisions requiring cost considerations as indicative of non-arbitrariness). See also Daniele Bertolini & Carolina Arlota, *Why Michigan v. EPA Requires That the Meaning of the Cost/Rationality Nexus Be Clarified*, 29 FORDHAM ENVTL. L. REV. 125, 155 (2017) (arguing, *inter alia*, that the U.S. Supreme Court neglected to consider cost as a relational concept).

122. REVESZ & LIVERMORE, *supra* note 23, at 13.

123. Daniel Hemel et al., *How Antonin Scalia's Ghost Could Block Donald Trump's Wall*, N.Y. TIMES, Jan. 25, 2017, <https://www.nytimes.com/2017/01/25/opinion/how-antonin-scalias-ghost-could-block-donald-trumps-wall.html>.

124. *Id.*

125. Farber, *supra* note 6, at 385.

126. Wendy Wagner et al., *Whose Science? A New Era in Regulatory "Science Wars,"* 362 SCIENCE 636, 636 (2018).

127. The bias against regulation is so significant in the Trump Administration that it enacted a catchall provision that each new regulation should repeal a minimum of two regulations aiming at offsetting the costs of the proposed

regulation. See Exec. Order No. 13771, §3, 82 Fed. Reg. 9339 (Feb. 3, 2017).

128. Heinzerling, *supra* note 3, at 15 (denouncing the Administration's decisions delaying or suspending rules issued by the previous administrations).

129. Stuart Shapiro, *A Recipe for Improving Regulatory Analysis*, REG. REV., Feb. 28, 2018.

130. Shapiro, *supra* note 4, at 4.

131. There is no consensus as to when climate change-related costs will incur, or the monetary amount of those costs. ERIC POSNER & ALAN O. SYKES, ECONOMIC FOUNDATIONS OF INTERNATIONAL LAW 230 (2013).

132. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE. CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 212 (O. Edenhofer et al. eds., 2014), https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter3.pdf.

133. INTERAGENCY WORKING GROUP ON THE SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866, at 3 (2016), https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.

134. The VSL is defined as "the local tradeoff rate between fatality risk and money. When the tradeoff values are derived from choices in market contexts the VSL serves as both a measure of the population's willingness to pay for risk reduction and the marginal cost of enhancing safety." The authors note that the VSL for the United States is around \$10 million (\$2017). Thomas J. Knesner & W. Kip Viscusi, *The Value of a Statistical Life*, OXFORD RES. ENCYCLOPEDIA ECON. & FIN., July 2019.

135. W. KIP VISCUSI, PRICING LIVES: GUIDEPOSTS FOR A SAFER SOCIETY (2018) (favoring the VSLs policy applications), *but see* James Broughel, *Rethinking the Value of a Statistical Life*, REG. REV., Feb. 10, 2020, <https://www.theregreview.org/2020/02/10/broughel-rethinking-value-statistical-life/> (arguing that VSL is intrinsically flawed). At this point, this Article acknowledges the legal discussion about VSL and the importance of the concept for estimations based on cost-benefit analysis. Nevertheless, a detailed discussion is beyond the scope of this Article, as EPA itself has been avoiding modification of the VSL due to previous backlashes. See Dave Merrill, *No One Values Your Life More Than the Federal Government*, BLOOMBERG, Oct. 19, 2017, <https://www.bloomberg.com/graphics/2017-value-of-life/>.

136. For an interesting investigation concerning the origins of the VSL and alternatives to its politicized and misguided interpretation, see Nathalie B. Simon et al., *What's in a Name? A Search for Alternatives to "VSL,"* 13 REV. ENVTL. ECON. & POL'Y 155 (2019), <https://academic.oup.com/reep/article/13/1/155/5288726>. EPA itself aimed to avoid such misunderstandings. The Agency explains:

The Value of Mortality Risk (VMR) and the Value of Statistical Life (VSL) are indeed related. The underlying theoretical concept is the same, and the estimated values for either metric would be based on

This section proceeds to address specific instances in which the methodology of cost-benefit analysis of climate change policies was imperiled. Each subsection addresses the protective goal that has been threatened by the deregulatory efforts implemented through suspicious and/or non-technical cost-benefit analysis departing from scientific evidence. The flaws of the cost-benefit analysis are pointed out in each subsection. The cases considered are the most relevant based on the cost-benefit analysis methodology and its impact on climate change.¹³⁷ A technical clarification is needed: the proposed rule modifying NEPA is primarily included due to its impact on climate change, despite not using strict cost-benefit analysis as a methodology (although NEPA's statute itself determines the assessment of pros and cons of policies submitted to its review, so it is based on the normative use of economics).¹³⁸

The cases are presented in different subsections and offer comprehensive snapshots of the dismissal of science-based evidence. Each subsection concludes with the specific attack on science (in light of the literature discussed in Part I of this Article) promoted by the Trump Administration in the context of the cost-benefit analysis discussed. In aggregate, the cases show how these policy choices undermine the main goals of the Paris Agreement, especially regarding the reduction of emissions of GHGs.¹³⁹

All subsections are directly related to climate change, despite such connection being more straightforward in those related to policies immediately targeting GHG emissions (i.e., the rollback of the CAA, the Clean Power Plan, the proposed rule flexibilizing NEPA, and the fuel efficiency regulations). The remaining subsections discuss issues including the regulatory rollback of air and water protections and the ban on pesticides, which affect climate change because they are likely to increase production of nitrous oxide (N₂O, another GHG). Indeed, curbing nitrogen pollution on its own has been noted to decrease GHG

emissions significantly.¹⁴⁰ After establishing these premises and justifying their inclusion, this part devotes individual subsections to analyzing specific instances showcasing unreasoned deregulation and/or proposed continuance or suspension of regulatory actions, including enforcement.

1. The Clean Water Rule

Significant flaws in cost-benefit analysis¹⁴¹ are present in the new rule addressing the scope of waters federally regulated under the CWA.¹⁴² Among the methodological flaws, EPA and the U.S. Army Corps of Engineers (the Corps) unreasonably fail to estimate the majority of the proposed rule's social harms while grossly undervaluing the few harms listed.¹⁴³ Both agencies substantially overestimate the compliance-cost savings of previous rules.¹⁴⁴

In 2017, Pruitt, then head of EPA, directed the Agency's economists to revise an analysis of wetlands protections used to advance the Clean Water Rule during the Barack Obama Administration.¹⁴⁵ As per Administrator Pruitt's directions, economists were told to list the benefits as unquantifiable—instead of the \$500 million accrued in economic benefits previously estimated.¹⁴⁶ This shows undue interference with cost-benefit analysis and exemplifies two categories of attacks on science introduced in Part I: tampering with scientific reports (as benefits were now considered “unquantifiable” when such benefits were previously computed), and undermining science-based regulation (because it unreasonably weakens previous norms).

2. Rollback of the Pesticides Ban

In a similar vein, a planned ban on pesticides, which also started during the previous administration, became subject to legal disputes based on the considered costs, as the Trump Administration proposed revoking this ban.¹⁴⁷

the same published literature. The difference lies in the choice of units used to aggregate and report the risk changes. The VSL is typically reported in units of dollars per statistical death per year. The VMR would be reported in units such as dollars per micro-risk per person per year, where a “micro-risk” represents a one in a million chance of dying. EPA is proposing using VMR because it should help to reduce the misunderstandings that are sometimes caused by the VSL terminology.

U.S. EPA, *Mortality Risk Valuation*, <https://www.epa.gov/environmental-economics/mortality-risk-valuation> (last updated Feb. 8, 2018).

137. The selection of deregulatory cases targeted those with direct relevance to the interplay between science and cost-benefit analysis. The point of departure was research conducted by the author on news websites as well as specialized websites, namely, in the *Regulatory Review* (available at <https://www.theregreview.org/>), the *Environmental Law Reporter* (available at <https://elr.info/articles/news-analysis>), and the comprehensive database from the Sabin Center for Climate Change Law & Arnold Porter, which is available at <http://climatecasechart.com/us-climate-change-litigation/>.

138. Technically it is not a cost-benefit analysis procedure, but in the normative use of economics and the weighting of such pros and cons of a given policy as determined by the statute itself (NEPA, 142 U.S.C. §4332). Therefore, the decision was made to include it in this section. For the use of cost-benefit analysis with such a normative meaning, see POSNER, *supra* note 25, at 402-03.

139. The Paris Agreement, *supra* note 7, Article 2, lists among the goals of this treaty: “[i]ncreasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development.”

140. David R. Kanter, *Nitrogen Pollution: A Key Building Block for Addressing Climate Change*, 147 CLIMATIC CHANGE 11, 11-15 (2018) (explaining that the reduction of nitrogen pollution could eliminate 5% to 10% of the remaining allowable GHG emissions consistent with the 2°C target of the Paris Agreement).

141. Derrick Z. Jackson, *The EPA's Dirty Water: New Rule Discards Science, Ignores Importance of Wetlands and Tributaries*, UNION CONCERNED SCIENTISTS, Apr. 25, 2020, <https://blog.ucsusa.org/derrick-jackson/the-epas-dirty-water-new-rule-discards-science-ignores-importance-of-wetlands-and-tributaries> (highlighting that all the major scientific societies and the Administration's own SAB warned EPA that the Agency did not incorporate the “best available science” on navigable waters).

142. The Navigable Waters Protection Rule: Definition of “Waters of the United States,” 85 Fed. Reg. 22250 (Apr. 21, 2020).

143. BETHANY A. DAVIS NOLL ET AL., INSTITUTE FOR POLICY INTEGRITY, BENEATH THE SURFACE: THE CONCEALED COSTS OF THE CLEAN WATER RULE ROLLBACK 6-18 (2020), https://policyintegrity.org/files/publications/Clean_Water_Rule_Policy_Report.pdf.

144. *Id.*

145. Plumer & Davenport, *supra* note 48.

146. This was the case, according to Elizabeth Plummer, who retired in 2017 after a 30-year career at EPA. When criticizing the implementation of policy changes under President Trump, she said: “Typically you would look for new studies and carefully redo the analysis. Instead they were sending a message that all the economists, scientists, career staff in the agency were irrelevant.” *Id.*

147. Corbin Hiar, *Agency Follows Industry Playbook to Attack Science*, E&E NEWS, Aug. 23, 2018, <https://www.eenews.net/greenwire/2018/08/23/stories/1060095095> (the pesticide is called chlorpyrifos, which has been

Pesticides and fertilizers have an adverse impact on climate change, as their production emits carbon dioxide.¹⁴⁸ This, however, was not comprehensively considered by the Trump Administration.

As with the Clean Water Rule, the rollback of the ban on pesticides provides evidence of how the current Administration has tampered with cost-benefit analysis. In addition, it constitutes two forms of attack named in Part I: tampering with scientific reports (as climate change-related benefits were disregarded) and undermining of science-based regulation (because it unreasonably revokes previous regulations).

3. The CAA

The refusal of EPA to enact stricter standards for national ambient quality, despite its own scientists recommending this,¹⁴⁹ also undermines cost-benefit analysis by neglecting recent scientific findings on air quality as a specific benefit during the COVID-19 pandemic.¹⁵⁰ Under the CAA,¹⁵¹ EPA must review the criteria every five years.¹⁵² Amid the COVID-19 pandemic, EPA announced that it would continue with the same standards for so-called particulate matter (PM_{2.5}) that were determined in 2012.¹⁵³

Following the announcement that the same standards will continue (and the backlash that ensued), Administrator Wheeler questioned a Harvard study linking long-term exposure to PM_{2.5} and COVID-19 deaths because, in his view, scientists seemed biased against the Trump Administration.¹⁵⁴ In this delicate scenario, EPA opted for continuing with the 12 micrograms per cubic meter (µg/m³)

standard, despite its own findings that a stricter standard of about 9 µg/m³ would present a risk reduction of 21% to 27% (i.e., saving up to approximately 12,150 lives per year).¹⁵⁵ Public health experts were vocal in opposing EPA's decision, because it “defies scientific research.”¹⁵⁶

Moreover, if there were uncertainties about the science, the statutory standard requiring an “adequate margin of safety” should point to more stringent standards—not the opposite.¹⁵⁷ Likewise, the precautionary principle, which states that action is required to avoid potential environmental and health threats in the absence of scientific certainty, will point to a similar conclusion.¹⁵⁸ This application of the precautionary principle, however, may be controversial, because it attempts to reconcile cost-benefit analysis and the precautionary principle encompassing the standard of regulations.¹⁵⁹

Importantly, all members of the Clean Air Scientific Advisory Committee were replaced between 2017 and 2018 and, with only a single medical expert among them, the committee ultimately reached a different conclusion. Nonetheless, in a study published in 2020 (and authored by the former members of this committee), the scientific evidence is conclusive: EPA's new standard is insufficient and particularly harmful to minorities.¹⁶⁰ This, of course, is particularly worrisome from a climate justice standpoint. It is also concerning from the standpoint of using the best scientific evidence available, as additional studies have shown that more stringent standards for PM_{2.5} (namely, a 10 µg/m³ standard) would save more than 143,000 lives in a decade.¹⁶¹ Accordingly, EPA's decision to maintain the

identified as jeopardizing children's health, including their IQ). The EPA recently issued draft proposals of human and environmental risk assessments. See U.S. EPA, PESTICIDE REGISTRATION REVIEW: DRAFT HUMAN HEALTH AND/OR ECOLOGICAL RISK ASSESSMENTS FOR CHLORPYRIFOS (Sept. 24, 2020), <https://beta.regulations.gov/docket/EPA-HQ-OPP-2008-0850/document?sortBy=postedDate>.

148. INTERNATIONAL ASSESSMENT OF AGRICULTURAL KNOWLEDGE, SCIENCE, AND TECHNOLOGY FOR DEVELOPMENT, SYNTHESIS REPORT 46-47 (Beverly D. McIntyre et al. eds., 2009), https://www.weltagrabericht.de/reports/Synthesis_Report/Synthesis_46.html.

149. OFFICE OF AIR QUALITY PLANNING AND STANDARDS, U.S. EPA, POLICY ASSESSMENT FOR THE REVIEW OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER, EXTERNAL REVIEW DRAFT (2019), https://www.epa.gov/sites/production/files/2019-09/documents/draft_policy_assessment_for_pm_2.5_09-05-2019.pdf (“[A] conclusion that the current primary PM_{2.5} [particulate matter] standards do provide adequate public health protection would place little weight on the broad body of epidemiologic evidence reporting generally positive and statistically significant health effect associations, particularly for PM_{2.5} air quality distributions likely to have been allowed by the current primary standards . . .”) *Id.* at item 3-98.

150. XIAO WU ET AL., EXPOSURE TO AIR POLLUTION AND COVID-19 MORTALITY IN THE UNITED STATES: A NATIONWIDE CROSS-SECTIONAL STUDY 1, 10-18 (2020), https://projects.iq.harvard.edu/files/covid-pm/files/pm_and_covid_mortality_med.pdf.

151. 42 U.S.C. §7408 (Section 108, which determines the establishment, review, and revision of the national ambient air quality standards (NAAQS)).

152. *Id.* §7409 (Section 109(d)(1)).

153. News Release, U.S. EPA, EPA Proposes to Retain NAAQS for Particulate Matter (Apr. 14, 2020), <https://www.epa.gov/newsreleases/epa-proposes-retain-naaqs-particulate-matter>.

154. Coral Davenport, “Unbelievable” Timing: As Coronavirus Rages, Trump Disregards Advice to Tighten Clean Air Rules, N.Y. TIMES, Apr. 15, 2020, <https://www.nytimes.com/2020/04/14/climate/coronavirus-soot-clean-air-regulations.html> (the accusation of bias was attributed to the authors of the study, probably because they have criticized previous presidential decisions).

155. OFFICE OF AIR QUALITY PLANNING AND STANDARDS, *supra* note 149, at item 3-91 (the findings resulted from calculating 27% of the 45,000 total deaths estimated to occur under the current standard).

156. Davenport, *supra* note 154.

157. Seth Jaffe, EPA Remains the “Anti-Environmental Protection Agency,” *Wheeler Refuses to Tighten PM_{2.5} NAAQS*, LAW & ENV'T, Apr. 15, 2020 (on file with author) (citing *Ethyl Corp. v. Environmental Protection Agency*, 541 F.2d 1, 6 ELR 20267 (D.C. Cir. 1976), as a landmark case determining that EPA should be prepared to regulate despite uncertainty if EPA is to fulfill its mission to protect the public).

158. John S. Applegate, *The Taming of the Precautionary Principle*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 13, 13 (2002).

159. See, e.g., David M. Driesen, *Cost-Benefit Analysis and the Precautionary Principle: Can They Be Reconciled?*, MICH. ST. L. REV. 771 (2013) (conceptualizing the precautionary principle as being determinative in relation to which risks should be regulated, but not the stringency of regulation itself). See also Daniel A. Farber, *Coping With Uncertainty: Cost-Benefit Analysis, the Precautionary Principle, and Climate Change*, 90 WASH. L. REV. 1659 (2015) (proposing different uses for the precautionary principle and cost-benefit analysis to avoid key economic uncertainties).

160. Independent Particulate Matter Review Panel, *The Need for a Tighter Particulate-Matter Air-Quality Standard*, 383 NEW ENG. J. MED. 680, 681-82 (2020), available at <https://www.nejm.org/doi/pdf/10.1056/NEJMsb2011009?articleTools=true>:

We unequivocally and unanimously concluded that the current PM_{2.5} standards do not adequately protect public health. An annual standard between 10 µg per cubic meter and 8 µg per cubic meter would protect the general public and at-risk groups. However, even at the lower end of the range, risk is not reduced to zero. The margin of safety increases as the level of the standard is lowered within this range. The choice of standard within this range is a policy judgment reserved for the EPA administrator. In the interest of environmental justice, we advised the administrator that disparities in health risk borne by minority communities need to be taken into consideration in choosing a margin of safety.

161. Xiao Wu et al., *Evaluating the Impact of Long-Term Exposure to Fine Particulate Matter on Mortality Among the Elderly*, 6 SCI. ADVANCES eaba5692 (2020).

2012 standard denies science and imposes extremely high costs upon the well-being of the U.S. population.

Moreover, EPA's refusal to increase the standards of the CAA represents an attack on science of at least three forms: it interferes with the functioning of scientific boards (as all members of the Clean Air Scientific Advisory Committee were replaced between 2017 and 2018 and only a single doctor was brought in), tampers with scientific reports (as social harms were disregarded in the decision), and undermines science-based regulations, because it unreasonably weakens regulations that should have been more stringent, according to EPA's own previous scientific findings.

4. The Repeal of the Clean Power Plan and Additional Threats to Air Quality

The Trump Administration has repealed the Clean Power Plan,¹⁶² which is crucial for achieving the U.S. national contributions determined under the Paris Agreement.¹⁶³ This policy decision illustrates another instance of the Trump Administration's complete disregard for the totality of costs involved in its deregulatory action.¹⁶⁴ More specifically, EPA claims that the repeal will save \$33 billion in compliance costs through 2030.¹⁶⁵ This calculation has been disputed.¹⁶⁶ Other recent changes relating to this cost-benefit analysis are also dubious.¹⁶⁷ Such changes are particularly concerning because the Clean Power Plan is an example of how stable regulation fosters voluntary climate action.¹⁶⁸

Also perplexing, the repeal of the Clean Power Plan embodies the use of a pervasive strategy based on "ignoring evidence that you don't like."¹⁶⁹ By using this strategy, EPA chose to rely on estimations that ultimately ignored key health benefits.¹⁷⁰ Due to this disregard for health ben-

efits in EPA's analysis, litigation against the rollback of the Clean Power Plan has been ongoing.¹⁷¹

A related rollback recently implemented refers to the oil and natural gas new source performance standards (NSPS), which was promulgated in 2012 and 2016.¹⁷² This rollback has been criticized because it significantly reduced the social cost of mercury emissions (from \$1,400 per metric ton, under the Obama Administration, to \$55).¹⁷³

The proposed new rule on limiting the mercury emissions from power plants¹⁷⁴ has also been subject to severe criticism regarding the computation of benefits, with its cost-benefit analysis being specifically condemned:

EPA argues that it is legally required to ignore evidence that the regulation would save thousands of lives. Why? Because those lives will be saved for the wrong reason: not directly from the reduction in mercury but because cutting mercury automatically cuts other deadly pollutants. Rather than seeing this as "two for the price of one," EPA proposes to close its eyes to the evidence. Another example is the proposal to reform the way that environmental impact statements are done. Based on some tenuous legal arguments, the proposal calls for ignoring serious impacts that happen to be delayed, at a distance, or due to complicated chains of causation. Again, the point is to eliminate consideration of evidence that any policy analyst would consider highly relevant.¹⁷⁵

There is precedent for the above-mentioned "two for the price of one" approach. In 1990, amendments to the CAA established a federal rule to reduce acid rain, which was implemented through a cap on sulfur dioxide emissions by electric utilities.¹⁷⁶ The existence of such a cap ultimately led many energy producers to cease coal use and adopt cleaner-burning fuels (natural gas, specifically). The change had the ancillary benefit of reducing GHG emissions compared to what they would have been in the absence of the sulfur dioxide limit.¹⁷⁷ As EPA currently refuses to include those co-benefits, its cost-benefit analysis is tainted.

It is worth mentioning that when the Clean Power Plan repeal was proposed, coal producers were in favor, but the overwhelming majority of electric utility companies had already spent financial resources complying with the

162. U.S. EPA, FACT SHEET: PROPOSAL TO REPEAL THE CLEAN POWER PLAN (2017), https://www.epa.gov/sites/production/files/2017-10/documents/fs-proposed-repeal-cpp-final_oct10.pdf.

163. Anna McGinn, *Understanding the Paris Agreement*, SCHOLARS STRATEGY NETWORK, Apr. 12, 2019, <https://scholars.org/contribution/understanding-paris-agreement> (explaining that the nationally determined contributions (NDCs) of the United States were based almost entirely on the Clean Power Plan).

164. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, VALUING CLIMATE DAMAGES: UPDATING ESTIMATION OF THE SOCIAL COST OF CARBON DIOXIDE 51 (2017).

165. U.S. EPA, *supra* note 162.

166. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, *supra* note 164, at 51 (disputing the Administration's focus on domestic contributions instead of considering the global impact of emissions and climate change). See also SUNSTEIN, *supra* note 38, at 159 (contending the change from global to domestic emissions is unjustified as "the height of arbitrariness").

167. EPA's fact sheet acknowledges other changes that differ from the Obama Administration, namely domestic costs are no longer compared to domestic benefits and energy efficiency is no longer viewed as a benefit, but rather as an avoided cost showing "the true magnitude of the Clean Power Plan's costs." U.S. EPA, *supra* note 162.

168. Lily Hsueh, *Credible and Stable Regulation Encourages Voluntary Climate Action*, REG. REV., Sept. 19, 2018 (arguing that, under the Clean Power Plan, companies increased transparency regarding their carbon emissions).

169. Daniel A. Farber, *The Flight From Evidence-Based Regulation*, LEGAL PLANET, Mar. 19, 2020, <https://legal-planet.org/2020/03/19/the-flight-from-evidence-based-regulation/>.

170. *Id.*

171. See, e.g., *American Lung Ass'n v. U.S. Env't. Prot. Agency*, No. 19-1140 (D.C. Cir. July 8, 2019).

172. See U.S. EPA, OIL AND NATURAL GAS SECTOR: EMISSIONS STANDARDS FOR NEW, RECONSTRUCTED, AND MODIFIED SOURCES REVIEW (Sept. 14, 2020), <https://www.federalregister.gov/documents/2020/09/14/2020-18114/oil-and-natural-gas-sector-emission-standards-for-new-reconstructed-and-modified-sources-review>.

173. See BROOKINGS INSTITUTE, TRACKING DEREGULATION IN THE TRUMP ERA: METHANE EMISSIONS STANDARDS (Nov. 2, 2020), <https://www.brookings.edu/interactives/tracking-deregulation-in-the-trump-era/>.

174. See Memorandum from EPA to Docket for Rulemaking: National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review (Dec. 14, 2018), https://www.epa.gov/sites/production/files/2018-12/documents/mats-an-cost-benefit_memo12-2018.pdf.

175. Farber, *supra* note 169.

176. REVESZ & LIVERMORE, *supra* note 23, at 64.

177. *Id.*

Obama-era requirements.¹⁷⁸ Hence, the Trump Administration's support for coal producers is advancing a race to the bottom, as it provides incentives for an inefficient source of energy (coal is the worst polluter when it comes to GHG emissions) to continue to be used instead of retired.¹⁷⁹ It also interferes with competition and may disincentivize or delay the flourishing of cleaner energy sources.¹⁸⁰

The repeal of the Clean Power Plan and the proposal to limit mercury emissions exemplifies at least two categories of attacks on science, as addressed in Part I. First, these actions tamper with scientific reports, as global climate harms were disregarded in the case of the Clean Power Plan and indirect causation was disregarded in the mercury rule. Both proposed deregulatory actions are oblivious to social costs. Second, both administrative actions undermine science-based regulation, because they unreasonably weaken regulations that were issued in accordance with sound cost-benefit analysis (with even part of the market acknowledging this in the case of electricity companies and the Clean Power Plan).

5. The Flexibilization of NEPA

NEPA, which was created by the Richard Nixon Administration in 1970, is a foundational law for environmental protection in the United States.¹⁸¹ As such, it was also a target for the deregulatory efforts of the Trump Administration. In this vein, the Council on Environmental Quality (CEQ), ostensibly aiming at enhancing efficiency and fostering economic growth, proposed to reform NEPA.¹⁸²

This Act, which currently ensures that “unquantified” environmental values should be considered in the assessment of decisionmaking, includes the weighing of costs and benefits in every major action significantly impacting the environment.¹⁸³ Hence, agencies are already able to exclude from environmental assessments or environmental impact statements those projects that are not expected to have a significant impact.¹⁸⁴

Alarmingly, when announcing the proposed flexibilization of NEPA, President Trump claimed that the statute hindered projects, contradicting a report by the U.S. Department of Transportation.¹⁸⁵ Among the main modifications enacted by the Trump Administration is the elimination of the consideration of cumulative and indirect impacts, such as climate change, as the rule clearly promotes expedited decisions at the expense of federal environmental reviews.¹⁸⁶ The final rule not only sets stricter deadlines on the environmental review process, but also allows private entities to review such decisions in place of federal agencies; it also significantly reduces the scope of federal actions that would trigger review under NEPA and restricts the public comment process.¹⁸⁷ Accordingly, the rule implements unreasoned modifications that jeopardize policy assessments, as it reduces deadlines and exempts projects from NEPA review, removing significant public

178. Lisa Friedman & Coral Davenport, *EPA Weakens Controls on Mercury*, N.Y. TIMES, Apr. 16, 2020, <https://www.nytimes.com/2020/04/16/climate/epa-mercury-coal.html> (noting that this specific rollback on mercury regulation is a victory for Robert E. Murray, the former chief executive of Murray Energy Corp. and a top fundraiser for President Trump. “In a written wish list,” Mr. Murray personally asked for the deregulation of mercury standards.).

179. For information on the carbon impact of coal in relation to other sources, see Table 1 in the Appendix.

180. “Race to the top” and “race to the bottom” are economic concepts based on game theory. This Article refers to different energy sources, as opposed to the most common “race to the bottom” framework in U.S. environmental law, namely, between federal or state regulations. This latter conception is beyond the scope of this Article, but it is noteworthy that this conception is controversial. See, e.g., Richard L. Revesz, *Rehabilitating Interstate Competition: Re-Thinking the “Race to the Bottom” Rationale for Federal Environmental Regulation*, 67 N.Y.U. L. REV. 1210 (1992) (contending that “race to the bottom” arguments are not based on sound theory, and criticizing federal regulations on environmental matters based on those arguments). But see, e.g., Peter P. Swire, *The Race to Laxity and the Race to Undesirability: Explaining Failures in Competition Among Jurisdictions in Environmental Law*, 14 YALE J. ON REG. 67 (1996); Daniel C. Esty, *Revitalizing Environmental Federalism*, 95 MICH. L. REV. 570 (1996); Kirsten H. Engel, *State Environmental Standard-Setting: Is There a “Race” and Is It “to the Bottom”?*, 48 HASTINGS L.J. 271 (1997) (defending the existence of “the race to the bottom”).

181. Richard J. Lazarus, *The Greening of America and the Graying of United States Environmental Law: Reflections on Environmental Law’s First Three Decades in the United States*, 20 VA. ENVTL. L.J. 75, 76-77 (2001) (emphasizing how environmental-protection law was essentially nonexistent in the United States before 1970 and that NEPA was signed into law on the first day of that year).

182. Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act; Notice of Proposed Rulemaking, 85 Fed. Reg. 1684 (Jan. 10, 2020), available at <https://www.govinfo.gov/content/pkg/FR-2020-01-10/pdf/2019-28106.pdf>. This proposal was updated on July 16, 2020, when CEQ issued its final rule overall maintaining CEQ’s previous proposed rule. For the final rule, which, as of this writing and until September 14, is still subject to congressional review, see Update

to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act; Final Rule, 85 Fed. Reg. 43304 (July 16, 2020), available at <https://www.govinfo.gov/content/pkg/FR-2020-07-16/pdf/2020-15179.pdf>.

183. 142 U.S.C. §4332 states the following:

The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall: (A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man’s environment; (B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations; (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on (i) the environmental impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved.

184. Lisa Sorg, *Pipelines, Roads, and Railways: This Is Why You Should Care About Trump’s Rollback of NEPA, a Key Environmental Law*, NC POL’Y WATCH, Jan. 14, 2020, <http://www.ncpolicywatch.com/2020/01/14/pipelines-roads-and-railways-this-is-why-you-should-care-about-trumps-rollback-of-nepa-a-key-environmental-law/> (explaining that environmental assessment encompasses simpler projects, whereas environmental impact statements, as a lengthier process, are used in complex projects).

185. *Id.*

186. Joseph DeQuarto, *Landmark Environmental Rules Slated for Overhaul*, REG. REV., Feb. 18, 2020.

187. *Id.*

participation at a time when the nation is calling for environmental justice.

Finally, the NEPA rule constitutes two categories of attacks on science; first, it potentially tampers with scientific reports, as the president incorrectly cited so-called unjustified delays in justifying the proposal. Second, the rule undermines science-based regulation by allowing private parties to review the actions (instead of agencies), and by restricting the scope of the NEPA review.

6. The Rollback of Regulations Promoting Fuel Efficiency

EPA's rule on unifying fuel economy standards¹⁸⁸ has sparked criticism¹⁸⁹ because it is estimated to cost more than \$400 billion by 2050 and may increase GHGs related to transportation emissions by 10%.¹⁹⁰ Key industry actors have vowed to follow California's more stringent standards.¹⁹¹ These actors faced investigation by the U.S. Department of Justice in retaliation for being against President Trump.¹⁹² California, 22 other states, and the cities of Los Angeles and New York are suing the Administration for the revocation of the California standards.¹⁹³

The cost-benefit analysis of the Clean Car Standards almost exclusively uses co-benefits to justify EPA's proposed deregulation.¹⁹⁴ Incidentally, it is noteworthy that

this calculation contradicts the analysis that EPA advanced in the rollback of the Mercury and Air Toxics Standards, where the Agency rejected co-benefits.¹⁹⁵ The Clean Car deregulatory measures have also underestimated climate damages due to the use of an arbitrary calculation of the social cost of carbon.¹⁹⁶

One economist from the University of Chicago was categorical in his assessment of the fuel rule: "They [the Trump Administration] are monkeying around with the numbers and the benefits, undermining a four-decade commitment to on-the-level cost-benefit analysis that has been in place since the Reagan administration."¹⁹⁷ The Administration's own estimates acknowledged that the rollback of car standards could range from a \$22 billion net cost for society to net benefits of \$6.4 billion.¹⁹⁸ This wide range was the result of using different discount rates: if a 3% discount rate is used (the typical rate used by the federal government), the new rule will be costly; it will have net benefits only if a 7% discount rate is used.¹⁹⁹

Litigation will continue. The U.S. Court of Appeals for the Second Circuit reversed an earlier district court decision, ruling that EPA shall disclose the components of its model for evaluating GHG vehicle standards.²⁰⁰ It also held that EPA stretched the deliberative privilege too far, and that the disclosure of the core model would not "contain or expose the types of internal agency communications that courts typically recognize as posing a risk to the candor of agency discussion such as advice, opinions, or recommendations."²⁰¹

188. U.S. EPA, *Final Rule: One National Program on Federal Preemption of State Fuel Economy Standards*, <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-one-national-program-federal-preemption-state> (last updated Mar. 31, 2020).

189. Consumer reports show that the proposed rule would be too costly and, significantly, not offer the security improvements that the president has claimed. CHRIS HARTO ET AL., CONSUMER REPORTS, *THE UN-SAFE RULE: HOW A FUEL-ECONOMY ROLLBACK COSTS AMERICANS BILLIONS IN FUEL SAVINGS AND DOES NOT IMPROVE SAFETY* (2019), <https://advocacy.consumerreports.org/wp-content/uploads/2019/08/The-Un-SAFE-Rule-How-a-Fuel-Economy-Rollback-Costs-Americans-Billions-in-Fuel-Savings-and-Does-Not-Improve-Safety-2.pdf>.

190. Megan Mahajan, *Trump's Clean Car Rollback Will Cost Up to \$400 Billion, Increase Transport Emissions 10%*, FORBES, Aug. 7, 2019, <https://www.forbes.com/sites/energyinnovation/2019/08/07/trumps-clean-car-rollback-could-cost-up-to-400-billion-increase-transport-emissions-10/#3b7617da3b46>.

191. Hiroko Tabuchi, *States Sue to Block Trump From Weakening Fuel Economy Rules*, N.Y. TIMES, May 28, 2020, <https://www.nytimes.com/2020/05/27/climate/lawsuit-fuel-economy-climate.html> (emphasizing that the auto industry is split over the measure, but Ford, Honda, BMW, and Volkswagen are against the pushback).

192. Catherine Rampell, *Trump Is All About Deregulation—Except When It Comes to His Enemies*, WASH. POST, May 28, 2020, https://www.washingtonpost.com/opinions/trump-is-all-about-deregulation—except-when-it-comes-to-his-enemies/2020/05/28/dcfb9638-a116-11ea-b5c9-570a91917d8d_story.html (highlighting how the Administration has "cooked the books" on its cost-benefit analysis and how the president's deregulatory agenda was never about maximizing the interest of the country, but to reward friends and punish enemies).

193. *California v. United States*, No. 1:19-cv-02826 (D.D.C. Sept. 20, 2019). An additional lawsuit that has been filed by California and 13 other states challenges the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, 85 Fed. Reg. 24174 (Apr. 30, 2020), and Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022-2025 Light-Duty Vehicles, 83 Fed. Reg. 16077 (Apr. 13, 2018); *California v. Wheeler*, No. 20-1167 (D.C. Cir. filed May 27, 2020), <https://oag.ca.gov/system/files/attachments/pressdocs/5.27.20%20Petition%20for%20Review.pdf>.

194. Richard L. Revesz, *Trump Shows His Cards on Environmental Protections—Or a Lack Thereof*, HILL, Apr. 30, 2020, <https://thehill.com/opinion/energy-environment/495457-trump-shows-his-cards-on-environmental-protections-or-lack-thereof>.

195. *Id.*

196. INSTITUTE FOR POLICY INTEGRITY, *KEY ECONOMIC ERRORS IN THE CLEAN CAR STANDARDS ROLLBACK* (2020), https://policyintegrity.org/files/media/Vehicles_Emissions_Rollback_-_Key_Economic_Errors.pdf (discussing additional faults in EPA's cost-benefit analysis).

197. According to Michael Greenstone, an economist from the University of Chicago. See Coral Davenport, *Trump Calls New Fuel Economy Rule a Boon. Some Experts See Steep Costs*, N.Y. TIMES, Mar. 31, 2020, <https://www.nytimes.com/2020/03/31/climate/trump-pollution-rollback.html>.

198. NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION & U.S. EPA, *FINAL REGULATORY IMPACT ANALYSIS: THE SAFER AFFORDABLE FUEL-EFFICIENT (SAFE) VEHICLE RULE FOR MODEL YEAR 2021-2026 PASSENGER CARS AND LIGHT TRUCKS 1807, 1809* (2020), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_fria_web_version_200330.pdf (for 3% and 7% discount rates, respectively).

199. Davenport, *supra* note 197.

200. *Natural Res. Def. Council v. U.S. Envtl. Prot. Agency*, No. 19-2896, at 16-18, 50 ELR 20078 (2d Cir. Apr. 1, 2020) (noting that the deliberations were already disclosed).

201. *Id.* at 7. The court considered:

In August 2018, EPA issued a notice of proposed rulemaking that recommended freezing the GHG emissions standards at MY [model year] 2020 levels for MY 2021-2026. See *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*. As with previous GHG emissions rules, the 2018 proposed rule was issued as a joint rulemaking between EPA and the National Highway Traffic Safety Administration ("NHTSA"). Unlike previous rules, however, EPA did not base its proposal on the OMEGA model's projection of automaker compliance, instead relying on a NHTSA modeling program. The record shows that approximately four months before the proposed rule was issued, EPA met with the Office of Management and Budget to express serious concerns about the results produced by the NHTSA model, including concerns that the model was consistently overestimating compliance costs and not prioritizing cost-effective technologies. Notwithstanding EPA's initial concerns, the NHTSA model was ultimately used to inform the GHG standards in the 2018 proposed rule.

In light of the factors discussed above, this subsection finds that EPA's deregulatory measure is unreasoned, as it uses flawed techniques in its cost-benefit analysis. Therefore, the fuel deregulation fails a sound cost-benefit test. Furthermore, it constitutes two categories of attacks on science (as described in Part I). First, it tampers with scientific reports, as climate harms were disregarded and an unreasoned change was made to the discount rate. Second, the regulation appears to be a vendetta against the state of California and, as such, it undermines science-based regulation, as it potentially arbitrarily and unreasonably revokes regulations issued in accordance with sound cost-benefit analysis (as acknowledged by key industry actors).

7. The Flexibilization of Regulatory Standards and Overall Enforcement During COVID-19

Another deregulatory measure implemented by the Trump Administration that neglects costs is the flexibilization of regulatory standards and enforcement that agencies consider to inhibit economic recovery in the aftermath of the coronavirus pandemic, which was implemented by Executive Order.²⁰² This Executive Order also appears to grant agencies the discretion to limit enforcement actions to willful violations, which will be harder to challenge in courts, as it falls within administrative discretion.²⁰³ Despite such discretion, litigation is expected, as this is another set of actions that appear unreasoned and enacted in patent disregard of cost considerations.

EPA's initial guidance implementing such flexibilization²⁰⁴ will be short-lived, as it expired on August 31, 2020.²⁰⁵ Nonetheless, the flexibilization of regulatory standards and related enforcement, which was done abruptly and in an ongoing environment of dismissal of science, does not appear to strike the proper balance of cost considerations. Moreover, it constitutes at least one category of attacks on science, as discussed in Part I. The flexibilization of regulatory standards and its enforcements clearly undermines science-based regulations, because it fails to enforce safeguards and reduces (and in some cases terminates) monitoring and enforcement systems.

202. Exec. Order No. 13924, §5(b) and (c), 85 Fed. Reg. 31353 (May 22, 2020).

Technically, this Executive Order, which was called Executive Order on Regulatory Relief to Support Economic Recovery, directs heads of federal agencies to temporarily or permanently relax or remove regulations that may impede economic recovery from the coronavirus pandemic.

203. Seth Jaffe, *Has President Trump Just Limited Enforcement to Willful Violations?*, AM. C. ENVTL. LAW., May 22, 2020 (on file with author) (defining this Executive Order as the most significant deregulatory measure taken by the Trump Administration).

204. Memorandum from Susan Parker Bodine, Assistant Administrator for Enforcement and Compliance, U.S. EPA, to All Governmental and Private-Sector Partners (Mar. 26, 2020) (COVID-19 Implications for EPA's Enforcement and Compliance Assurance Program), <https://www.epa.gov/sites/production/files/2020-03/documents/oecameemooncovid19implications.pdf>.

205. Memorandum from Susan Parker Bodine, Assistant Administrator for Enforcement and Compliance, U.S. EPA, to All Governmental and Private-Sector Partners (June 29, 2020) (COVID-19 Implications for EPA's Enforcement and Compliance Assurance Program: Addendum on Termination), <https://www.epa.gov/sites/production/files/2020-06/documents/covid19addendumontermination.pdf>.

8. Trump's Rollback of Climate Change Regulations Is Not Justified Under Cost-Benefit Analysis

The findings of the previous subsections demonstrate that a trademark of the deregulatory actions of the Trump Administration on matters relating to climate change is the disregard for environmental costs and the discredit of the benefits of regulating such matters. Five of the seven examples analyzed in the previous subsections—namely, the rollbacks of the Clean Water Rule, the pesticides ban, the CAA, the Clean Power Plan, and the regulations promoting fuel efficiency—clearly employed such tactics. The remaining instances, namely, the modification of NEPA and the flexibilization of environmental enforcement during COVID-19, although not technically addressing cost-benefit analysis methodology, also dismiss climate damages. These two policies accomplish similar results: to authorize actions that are significantly costly to the well-being of U.S. society (and beyond) in the medium and long run.²⁰⁶

The findings of the previous subsections are particularly relevant because cost-benefit analysis has traditionally been biased against regulation through the assumption that industries do not respond to regulations by becoming more efficient (i.e., by finding the cheapest possible way to comply).²⁰⁷ Moreover, industry representatives act in advocacy roles, which conflicts with the actual need for regulators to obtain accurate data on regulatory costs, hindering the accuracy of cost-benefit analyses.²⁰⁸ Hence, cost benefit-analysis has frequently overestimated the cost of compliance.²⁰⁹ Therefore, once regulations exist, they overcome systematic bias and have been proven necessary. Removing such regulations, as addressed earlier in Section A of this part, must also pass a science-based cost-benefit analysis. As the findings of this section demonstrate, this is simply not occurring.

The Trump Administration's war on science has been undermining scientific knowledge in the United States, with fear and lack of prestige becoming constant presences in the work environments of many scientists. Consequently, agencies are having a harder time recruiting scientists, while many of those with seasoned expertise have retired under the Trump Administration.²¹⁰

In this scenario, President Trump's deregulatory policies are often based in a zero-sum game.²¹¹ His policies, uninformed by sound science and agency expertise, are based on the assumption that there are winners (coal) and losers

206. DOUGLAS KYSTAR, REGULATING FROM NOWHERE: ENVIRONMENTAL LAW AND THE SEARCH FOR OBJECTIVITY 123-200 (2010) (arguing that environmental policy should include the interests of existing members of the political community, as well as those of people overseas, future generations, and even other species).

207. REVEZ & LIVERMORE, *supra* note 23, at 131.

208. *Id.* at 135.

209. *Id.* at 131.

210. Plumer & Davenport, *supra* note 48 (incidentally discussing the retirement of knowledgeable scientists).

211. Inara Scott, *Energy Policy: No Place for Zero-Sum Thinking*, in BEYOND ZERO-SUM ENVIRONMENTALISM 33 (Sarah Krakoff et al. eds., Env'tl. L. Inst. 2019).

(environmentalists), disregarding the complexity of climate policies. For instance, the declining cost of natural gas (because of fracking) coupled with the declining prices of renewables ended up jeopardizing the market for coal.²¹² Regulations (in this case, the CAA), often portrayed as the villains, seem not to have a significant impact in the potential debacle of coal.²¹³ Hence, our findings illustrate the uninformed and unreasoned approach taken by the Trump Administration to regulatory matters involving climate policies.

The findings mentioned above are coherent with previous claims asserting that the Trump Administration notoriously focuses on costs while neglecting benefits²¹⁴; and that when the Administration actually engages in cost-benefit analysis, research finds it to be significantly flawed.²¹⁵ This is quite disturbing as, in order for cost-benefit analysis to provide an accurate picture of the economic value of regulations, “[w]e must not privilege the investigation of adverse effects. If we look under the rug to find costs, we have to look between the couch cushions for the benefits.”²¹⁶ Hence, disregarding benefits clearly increases costs for the well-being of the U.S. population. For instance, two of the major actions of the current Administration analyzed above (namely, the continuance of the PM standard and the rollback of the Clean Power Plan) would result in more than 90,000 deaths²¹⁷; although this is less than the current death toll of the coronavirus in the United States,²¹⁸ once all the rollbacks by the Trump Administration are added, they may surpass those totals.

In aggregate, the findings of this section demonstrate the negative effects for the separation of powers of removing regulations and/or flexibilizing their standards. After all, the absence of definitive scientific evidence does not mean that regulation is inappropriate, as the congressional mandate to agencies asks them to regulate on the basis of potential risks to humans, rather than waiting for definitive evidence of substantial harm.²¹⁹ The findings mentioned

are also consistent with previous studies that have indicated that legal claims arguing the use of unsound science tend to be more successful when based on the Agency’s failure to provide reasoned decisionmaking.²²⁰ If unsound science is used and the cost-benefit analysis is flawed, there is a higher probability of the deregulatory measures being invalidated in court.

As presented earlier, the success rate of the Trump Administration’s climate policies is lowest, indicating that there is a causal link between the absence of a scientific approach and the reiterative invalidation of the Administration’s deregulatory agenda in the courts. The findings of this section are also concurrent with previous work noting the consistent disdain for regulatory science that permeates the Trump Administration.²²¹ It is noteworthy that the combination of these policies contributes to the increase of GHG emissions. Such negative effects are likely to endure.

The scenario above is more dire if contextualized in terms of the impacts of climate change. In the absence of climate mitigation (or human migration), the temperature experienced by an average human is expected to change more within the next 50 years than it has changed over the past 6,000.²²² Regions where average temperatures are currently 13°C are expected to reach around 20°C.²²³ In this vein, researchers urge that mitigation actions should be taken, and that avoidance of potential displacements should be computed within the benefits of climate mitigation when estimating economic gains and losses.²²⁴

In such a context, the findings of this section also show a constant effort by the Trump Administration to implement its deregulatory agenda on climate matters. This, however, is unreasoned policymaking. Deregulation, when properly justified and aimed at maximizing well-being, as discussed, is welcome. Importantly, in economics, improving environmental quality is often connected with increasing marginal costs, which, in practice, means that the first steps are also the cheapest.²²⁵ Therefore, the approach of the Trump Administration undermines cost-benefit analysis as a methodology and tool for effective policymaking aimed at maximizing the overall well-being of the U.S. population.

III. Consequences of Trump’s War on Science and Disregard for Cost-Benefit Analysis

As Parts I and II have clearly shown, the lack of a scientific approach to regulations by the Trump Administration and its related use of an inaccurate methodology for

212. *Id.*

213. CHARLES D. KOLSTAD, STANFORD INSTITUTE FOR ECONOMIC POLICY RESEARCH, WHAT IS KILLING THE U.S. COAL INDUSTRY? 1, 2 (2017), <https://siepr.stanford.edu/sites/default/files/publications/PolicyBrief-Mar17.pdf> (citing automation and financial markets, which may see coal as a risky future investment, as more relevant factors).

214. SUNSTEIN, *supra* note 38, at 159.

215. Farber, *supra* note 6, at 431 (“President Trump has placed agenda controls on agencies that focus primarily on eliminating regulatory costs rather than maximizing regulatory benefits. The Administration has also begun initiatives to limit the evidence that can be considered in EPA cost-benefit analysis and to eliminate an important class of regulatory benefits from consideration.”).

216. REVESZ & LIVERMORE, *supra* note 23, at 65.

217. Daniel A. Farber, *Trump’s EPA May Cause as Many Deaths as the Coronavirus*, LEGAL PLANET, Apr. 20, 2020, <https://legal-planet.org/2020/04/20/could-trumps-epa-cause-as-many-american-deaths-as-the-coronavirus/> (arguing that although President Trump’s measures are more gradual, deregulation can be as deadly as the pandemic).

218. The official deaths in the United States as of July 9 are 132,056. Centers for Disease Control and Prevention (CDC), *CDC COVID Data Tracker*, <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/us-cases-deaths.html> (last visited Oct. 12, 2020).

219. See Sidney A. Shapiro, “Political” Science: Regulatory Science After the Bush Administration, 4 DUKE J. CONST. L. & PUB. POL’Y 31, 37 (2009). See also Lin, *supra* note 19, at 253 (along the same lines, the latter highlights that statutes can empower agency action in the absence of the 95% certainty level required in science).

220. See, e.g., Emily H. Meazell, *Super Deference, the Science Obsession, and Judicial Review as Translation of Agency Science*, 109 MICH. L. REV. 733, 748-49 (2011).

221. See, e.g., Lin, *supra* note 19, at 301-02.

222. Chi Xu et al., *Future of the Human Climate Niche*, 117 PNAS 11350, 11350 (2020), available at <https://www.pnas.org/content/early/2020/04/28/1910114117>.

223. *Id.* at 11352.

224. *Id.* at 11354.

225. Livermore et al., *supra* note 43, at 5.

cost-benefit analysis are intimately connected. The war on science promotes decisions lacking reasoned justifications. These flawed (or absent) justifications are also incorporated into cost-benefit analyses, which in turn inform misguided policies in a vicious cycle. The war on science thus also undermines reasoned decisionmaking. By doing so, it fosters uncertainty and increases the transaction costs for negotiation.

In this vein, this part scrutinizes the particular consequences of the war on science and its promotion of unreasoned deregulatory policy choices on climate matters under the Trump Administration up to June 2020. First, it discusses how the Trump Administration's policies ultimately disregard the social costs of carbon. Second, it discusses how the lack of reasoned decisionmaking and the absence of scientific knowledge in informing policies fosters uncertainty and increases litigation. Third, it assesses the impact of this war on science and its related advancement of unreasoned deregulatory policy choices in the context of climate governance. It concludes that the combination of these policies is detrimental to U.S. well-being and contributes to the increase of GHG emissions, which also negatively affects climate governance.

A. *The Social Costs of Carbon and the Need for Phasing Out Coal*

This section discusses the disregard of the social costs of carbon, which have not been validly calculated in the cost-benefit analyses discussed in Part II. The social cost of carbon is commonly defined as the present measured value of the damages incurred by the presence of an additional ton of carbon dioxide in the atmosphere.²²⁶ The social cost of carbon should be considered by agencies,²²⁷ despite being notoriously difficult to estimate.²²⁸

EPA previously estimated the social cost of carbon as \$42 for 2020—assuming a 3% discount rate,²²⁹ which is disputable.²³⁰ Experts contend the social cost of car-

bon is typically underestimated in climate policies.²³¹ The National Academy of Sciences argues that global warming is subject to global emissions, so damages should be considered globally.²³²

The Trump Administration disagreed, although it did not provide a reason, and its proposed new rule on the Clean Power Plan, for instance, estimates the social cost of carbon as ranging from \$1 to \$6.²³³ This, of course, was criticized by regulatory experts, who contend that the Trump Administration's departure from the previous use of the global figure for the social cost of carbon in favor of the domestic figure is a decision that “may or may not be justifiable. But it was not justified. No explanation was given. That is the height of arbitrariness, and it should be invalidated in court.”²³⁴

Further evidence of President Trump's persistent disregard of the social cost of carbon comes with his direction of agencies to review (modify, suspend, or rescind) regulations that may “unduly burden” energy development—including those aimed at reducing GHG emissions.²³⁵ Likewise, the president flexibilized previous standards concerning the granting of licenses for pipelines and existing state powers in the CWA.²³⁶ These policies, when jointly analyzed with President Trump's policy choices specifically discussed in Part II, are incoherent with accurate consideration of the social cost of carbon and do not withstand a comprehensive cost-benefit analysis, as scientific research shows that investments in energy efficiency are more efficient than those in natural gas.²³⁷

In addition, recent scientific contributions advocate the importance of completely phasing out coal, contending that the benefits clearly outweigh the costs due to indirect social-cost savings, namely, co-benefits.²³⁸ Coal is, after all, the single biggest contributor of carbon dioxide, being responsible for more than one-third of global emissions while also being a major factor adversely affect-

226. William Nordhaus, *Revisiting the Social Cost of Carbon*, 10 PNAS 1518 (2017).

227. Center for Biological Diversity v. National Highway Traffic Safety Admin., 538 F.3d 1172, 1203, 38 ELR 20214 (9th Cir. 2008) (determining that agency regulations must consider the social cost of carbon). See also Farber, *supra* note 159, at 1708-09.

228. INTERAGENCY WORKING GROUP ON THE SOCIAL COST OF GREENHOUSE GASES, *supra* note 133, at 1 (highlighting that monetized damages associated with an incremental increase in carbon emissions per year are intended to include—but are not limited to—human health, net agricultural productivity, property damages from increased flood risk, and the value of ecosystem services due to climate change).

229. Values as of 2016. U.S. EPA, FACT SHEET: SOCIAL COST OF CARBON 3-4 (2016), https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf.

230. *Id.* at 1-2. EPA itself acknowledges that one of the most difficult challenges regarding estimation of the social cost of carbon is the calculation of discount rates. See also Lisa Heinzerling, *Regulatory Costs of Mythic Proportions*, 107 YALE L.J. 1981 (1998) (criticizing discounting assumptions, specifically the use of income-influenced economic methods of valuing life, and concluding that assuming an increase in future income implies that future lives are more worthy than current ones); Douglas A. Kysar, *Climate Change, Cultural Transformation, and Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555, 579 (2004).

231. Richard L. Revesz et al., *Global Warming: Improve Economic Models of Climate Change*, 508 NATURE 173 (2014) (discussing discounting rates and the fact that models tend to omit damages to labor productivity and growth productivity, among other factors).

232. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, *supra* note 164, at 50-51.

233. During the Trump Administration, scientists subjected EPA's proposed new regulation on the Clean Power Plan to significant criticism because it disregarded, for instance, the impact of global emissions. By considering only domestic emissions, it ultimately increased costs of such regulation while reducing the benefits of regulatory action, which contributed to lowering the social cost of carbon significantly. See, e.g., Jason Bordoff, *Trump vs. Obama on the Social Cost of Carbon—And Why It Matters*, WALL ST. J., Nov. 15, 2017, <https://blogs.wsj.com/experts/2017/11/15/trump-vs-obama-on-the-social-cost-of-carbon-and-why-it-matters/>. See also criticisms by the NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, *supra* note 164.

234. SUNSTEIN, *supra* note 38, at 159.

235. Exec. Order No. 13783, §1(c), 82 Fed. Reg. 16093 (Mar. 31, 2017).

236. Exec. Order No. 13868, §§2 and 3, 84 Fed. Reg. 15495 (Apr. 15, 2019).

237. STEVEN R. SCHILLER ET AL., LAWRENCE BERKELEY NATIONAL LABORATORY, COST OF SAVING NATURAL GAS THROUGH EFFICIENCY PROGRAMS FUNDED BY UTILITY CONSUMERS: 2012-2017, at 12-20 (2020), https://eta-publications.lbl.gov/sites/default/files/cose_natural_gas_final_report_20200513.pdf. See Table 1 in the Appendix.

238. Sebastian Rauner et al., *Coal-Exit Health and Environmental Damage Reductions Outweigh Economic Impacts*, 10 NATURE CLIMATE CHANGE 308 (2020).

ing public health and biodiversity.²³⁹ The same study also contends that those local co-benefits are not particularly sensitive to different discount rates, which favor the immediate adoption of policies phasing out coal.²⁴⁰ Moreover, the continuing use of coal produces significant externalities such as global warming²⁴¹ and increases the social cost of carbon.²⁴² Accordingly, should the United States persist in disregarding the accurate social cost of carbon (and continue to choose policies favoring coal), the country will only hasten the day on which it will need to cope with the consequences of climate change.

B. Regulatory Uncertainty and Related Litigation

As Parts I and II show, it is clear that the lack of a scientific approach to the rollback of climate change regulations by the Trump Administration and its related use of inaccurate methodology for cost-benefit analysis contribute to regulatory uncertainty. Importantly, the more that parties are uncertain about the existence or scope of a given rule, the more incentives they have to litigate.²⁴³ Climate science has long been litigated in courts in the United States. The U.S. Supreme Court, in their landmark decision *Massachusetts v. Environmental Protection Agency* (after reviewing findings by Congress, the federal government, EPA, and other federal agencies, as well as the Intergovernmental Panel on Climate Change), held not only that the climate is warming, but that this warming is anthropogenically caused.²⁴⁴

Research on deregulation efforts related to the environment and climate change shows that the Trump Administration has suffered significant and recurrent losses in courts since the presidential inauguration.²⁴⁵ As a matter of fact, the Trump Administration's success rate is, approximately, 9%,²⁴⁶ which is significantly lower than the common 70% winning rate for previous administrations.²⁴⁷ Such an unprecedentedly low success rate is unsurprising, due to the notorious lack of a scientific approach and unreasoned justifications for the deregulatory policy choices of the Trump Administration.

A recent analysis of litigation exclusively involving the Paris Agreement shows that standing is a major hurdle for plaintiffs.²⁴⁸ Likewise, a comprehensive report addressing primarily U.S. litigation involving science and climate concludes that the causes, urgency, and consequences of climate change are not questioned by the courts, but standing and political-question issues remain highly litigated, along with the competence of courts to issue remedies.²⁴⁹

Examples regarding the war on science and its impact on cost-benefit analysis abound. It is noteworthy that a top panel of government-appointed scientists, several of whom were selected by the Trump Administration, concluded that recent deregulatory actions were not supported by established science.²⁵⁰ This illustrates the vicious cycle between attacks on science, unreasoned regulations, and tainted cost-benefit analyses that was addressed earlier in this section. As such, in the absence of reasoned justifications for deregulatory policies (failing the “arbitrary and capricious” test²⁵¹ due to a lack of legal and scientific justification), litigation is poised to intensify and become more complex.²⁵²

C. Impact of Trump's War on Science and Disregard for Cost-Benefit Analysis on Climate Governance

This section considers climate governance as encompassing all purposeful mechanisms and related measures aimed at steering social systems toward preventing, mitigating, or adapting to the risks posed by climate change.²⁵³ In this context, scientific knowledge and accurate considerations of costs are crucial for climate change governance. Although discrediting state-of-the-art knowledge is not a new strategy in the United States,²⁵⁴ the discrediting of science has been meticulously planned by the industries that

239. *Id.*

240. *Id.* at 311-12.

241. *Id.*

242. See Table 1 in the Appendix (showing the percentage of carbon dioxide produced by type of fuel).

243. ROBERT D. COOTER & THOMAS S. ULEN, *LAW AND ECONOMICS* 400-04 (2016) (discussing how legal uncertainty is likely to foster litigation and therefore increase transaction costs for all involved parties).

244. 549 U.S. 497, 505-21, 37 ELR 20075 (2007).

245. Institute for Policy Integrity, *Roundup: Trump-Era Agency Policy in the Courts*, <https://policyintegrity.org/deregulation-roundup> (last updated Oct. 7, 2020) (for agency cases involving proposed rollbacks).

246. *Id.* According to the *Roundup*, the Administration won eight cases while losing 78. Thus, this Article infers that the success rate of the Trump Administration is 9.3% as of June 2020.

247. Kimberly Strawbridge Robinson, *High Court Rulings Highlight Trump's Administrative Law Stumbles*, BLOOMBERG L., June 19, 2020, <https://news.bloomberglaw.com/us-law-week/high-court-rulings-highlight-trumps-administrative-law-stumbles> (citing the 70% success rate of previous administrations, on average). For an empirical legal study arguing that, regardless of the standard of review, courts in the United States are likely to affirm agencies' actions more than two-thirds of the time: David Zaring, *Reasonable Agencies*, 96 VA. L. REV. 135, 177-84 (2010).

248. Carolina Arlota, *The Amazon Is Burning—Is Paris, Too? A Comparative Analysis Between the United States and Brazil Based on the Paris Agreement on Climate*, 52 GEO. J. INT'L L. (forthcoming 2020).

249. MARIA L. BANDA, ENVIRONMENTAL LAW INSTITUTE, *CLIMATE SCIENCE IN THE COURTS: A REVIEW OF U.S. AND JUDICIAL PRONOUNCEMENTS 2* (2020).

250. SAB, Draft Commentary on the Proposed Rule Defining the Scope of Waters Federally Regulated Under the Clean Water Act 3 (Jan. 20, 2020) (finding that the proposed deregulatory rule concerning the CWA to “not present a scientific basis”).

251. APA, 5 U.S.C. §706(2)(A). There is significant case law and scholarship discussing such requirements in detail. See, e.g., Zaring, *supra* note 246.

252. COOTER & ULEN, *supra* note 243, at 400-04 (specifically discussing legal uncertainty and how it increases litigation).

253. Sverker C. Jagers & Johannes Stripple, *Climate Governance Beyond the State*, 9 GLOBAL GOVERNANCE 385 (2003) (highlighting that climate governance is not only performed by states, but also by nongovernmental organizations and communities).

254. NAOMI ORESKES & ERIK M. CONWAY, *MERCHANTS OF DOUBT* (2010) (narrating how U.S. scientists have researched and gathered evidence on the dangers of DDT, tobacco smoke, acid rain, and climate change, while a small but industry-funded subset of such scientists advance claims denying these dangers). Another seminal work describing how U.S. corporations have been manufacturing uncertainty by discrediting the scientific consensus and ultimately bringing corrupt science to be the foundation of public policy is DAVID MICHAELS, *THE TRIUMPH OF DOUBT: DARK MONEY AND THE SCIENCE OF DECEPTION* (2020).

benefit,²⁵⁵ and this adds challenges to regulatory action on climate change domestically and internationally.

As cost-benefit analysis is informed by the best science available, it needs experts, scientists, and collaborations to achieve its ultimate goal of maximizing well-being through the best-informed and reasoned policymaking. Domestically, as shown in Parts I and II, this maximization is hardly occurring. Unfortunately, the international situation is even more dire, as the Trump Administration has decided to formalize its withdrawal from the Paris Agreement.²⁵⁶

As of today, the justifications provided by the Trump Administration for the withdrawal from the Paris Agreement do not pass a close scrutiny test, let alone a comprehensive cost-benefit analysis considering domestic and international factors.²⁵⁷ In the case of the Paris Agreement, President Obama clearly understood that regulation²⁵⁸ (which here means committing to voluntary standards aimed at curbing carbon emissions) has a net benefit.²⁵⁹ Under President Trump, by contrast, U.S. policy assumes that the country is free-riding, when novel research shows that the United States will be among those hit the hardest by climate change.²⁶⁰ Moreover, policies denying science and cost-benefit analysis will likely increase the costs of doing business in the country while removing the economic opportunities that would have been generated if the Administration were to consider climate change and its consequences.²⁶¹ Therefore, the United States' withdrawal from the Paris Agreement is detrimental not only domestically, but also from the standpoint of climate governance.

As the United States denies science and proper analysis of its regulatory policies on climate change, its policy choices have grown further apart from those pursued by other countries. For instance, due to pressure from European countries, specifically Germany, Russia ratified the Paris Agreement last year.²⁶² This shows the vacuum of U.S. leadership, which the overwhelming majority of experts contend is crucial to expanding climate action beyond the Paris Agreement.²⁶³

In striking contrast, U.S. leadership was paramount in the signing of the Paris Agreement. The United States, the largest emitter of carbon dioxide in history,²⁶⁴ was actively involved in the negotiation and approval of the Agreement.²⁶⁵ As science avoids bias, it advances a common denominator and momentum in negotiating international treaties. These international instruments aim at reconciling domestic necessities (bottom-up measures) while being attentive to a common goal (e.g., curbing GHG emissions, which is determined from the top down), as the Paris Agreement did.²⁶⁶ Those goals were informed by science and accurate cost-benefit analysis. By contrast, the continuing U.S. deregulatory measures on climate change pursued by the Trump Administration disregard science, incur negative impacts domestically, and jeopardize momentum on climate governance. They also evidenced the loss of precious time in a moment so critical from a climate action standpoint.

D. Closing Remarks on the Consequences for Climate Change and Its Governance

This part demonstrates that disregard of the social costs of carbon, which have not been validly calculated in the

255. The following 1998 quote from the American Petroleum Institute illustrates their efforts to discredit scientific knowledge: "Victory will be achieved when . . . average citizens 'understand' (recognize) uncertainties in climate science; recognition of uncertainties becomes part of the 'conventional wisdom' . . . Those promoting the Kyoto treaty on the basis of extant science appear to be out of touch with reality." See CENTER FOR INTERNATIONAL ENVIRONMENTAL LAW, *SMOKE AND FUMES: THE LEGAL AND EVIDENTIARY BASIS FOR HOLDING BIG OIL ACCOUNTABLE FOR THE CLIMATE CRISIS 3* (2017), <https://www.ciel.org/wp-content/uploads/2017/11/Smoke-Fumes-FINAL.pdf> (describing the recurring misleading actions of the oil industry across a variety of public and environmental issues).

256. The United States served notice of the withdrawal on the first date possible under the Paris Agreement. Lisa Friedman, *Trump Serves Notice to Quit Paris Climate Agreement*, N.Y. TIMES, Nov. 4, 2019, <https://www.nytimes.com/2019/11/04/climate/trump-paris-agreement-climate.html>.

257. For a detailed analysis, see Carolina Arlota, *Does the United States' Withdrawal From the Paris Agreement Pass the Cost-Benefit Analysis Test?*, 41 U. PA. J. INT'L L. 881 (2020).

258. President Obama embraced cost-benefit analysis and issued Executive Orders requesting regulatory impact analyses (RIAs), including the requirement that agencies must consider their previous estimations in RIAs and assess these in light of the actual consequences of a particular action. Exec. Order No. 13563, §6, 76 Fed. Reg. 3821 (Jan. 21, 2011).

259. Barack Obama, *The Irreversible Momentum of Clean Energy*, 355 SCIENCE 126-29 (2017) (arguing that the Paris Agreement is not a partisan issue, as it fosters the U.S. low-emissions economy and its renewable energy industry and employment therein, maintaining U.S. competitiveness while enhancing the country's climate security).

260. MATTHEW E. KAHN ET AL., *LONG-TERM MACROECONOMIC EFFECTS OF CLIMATE CHANGE: A CROSS-COUNTRY ANALYSIS 2-5, 5-32* (National Bureau of Economic Research, Working Paper No. 26167, 2019) (discussing the economic impact, specifically).

261. U.S. GLOBAL CHANGE RESEARCH PROGRAM, *supra* note 9, at 1311-34 (arguing that the use of scientific information enabling people to prepare for climate change in advance can provide economic opportunities while proactively managing the risks, diminishing the negative effects and costs of climate change over time).

262. Alec Luhn, *Russia Ratifies Paris Climate Accord—But Targets Are "Critically Insufficient"*, TELEGRAPH, Sept. 23, 2019, <https://www.telegraph.co.uk/news/2019/09/23/russia-ratifies-paris-climate-accord-targets-critically-insufficient/>. International organizations classified the Russian targets as "critically insufficient," as Russia committed to such weak targets (25% to 30% reduction in relation to 1990, when the country was dealing with a severe crisis) that reductions of current emissions are not required. See Climate Action Tracker, *Russian Federation*, <https://climateactiontracker.org/countries/russian-federation/> (last visited Oct. 12, 2020).

263. David G. Victor, *Order From Chaos: America Exits the Climate Stage*, BROOKINGS INST., June 1, 2017.

264. For historical data since 1850, see Justin Gillis & Nadja Popovich, *The U.S. Is the Biggest Carbon Polluter in History. It Just Walked Away From the Paris Climate Deal*, N.Y. TIMES, June 1, 2017, <https://www.nytimes.com/interactive/2017/06/01/climate/us-biggest-carbon-polluter-in-history-will-it-walk-away-from-the-paris-climate-deal.html>.

265. Press Release, The White House, U.S. Leadership and the Historic Paris Agreement to Combat Climate Change (Dec. 12, 2015), <https://obamawhitehouse.archives.gov/the-press-office/2015/12/12/us-leadership-and-historic-paris-agreement-combat-climate-change>. President Obama committed the United States to a 26% to 28% reduction below 2005 levels of GHG emissions by 2025. See Fact Sheet, The White House, U.S. Reports Its 2025 Emissions Target to the UNFCCC (Mar. 31, 2015).

266. The Paris Agreement reconciles top-down measures (i.e., those agreed upon by the international community for the treaty's Parties (Paris Agreement, *supra* note 7, arts. 3-4, 6)) with bottom-up features. These bottom-top measures require countries to establish NDCs with more demanding targets than those set in the past. Each country voluntarily determines its targets, considering their own national priorities, circumstances, and capabilities. For a detailed discussion, see JENNIFER MORGAN ET AL., *WORLD RESOURCES INSTITUTE, ELEMENTS AND IDEAS FOR THE 2015 PARIS AGREEMENT 12* (2015).

cost-benefit analysis discussed in Part II, has significant drawbacks for the United States. It also shows how unreasoned deregulatory policies on climate change, which are founded in unsound science and flawed cost-benefit analysis, adversely impact regulatory stability and increase the frequency and complexity of litigation.

With specific regard to climate governance, the situation is also concerning. The United States, so far, is the only signatory to withdraw from the Paris Agreement. This action is likely to reduce momentum for global efforts to combat climate change. After all, premature deaths related to air pollution are not confined to state borders²⁶⁷; neither are increasing temperatures. According to the National Aeronautics and Space Administration (NASA), 2019 was the second-warmest year on record²⁶⁸ and the warmest in the oceans.²⁶⁹ Hence, the potential impact is consequential and extends beyond the borders of the United States.

As President-elect Joseph R. Biden Jr. promised to reenter the Paris Agreement, it appears that the United States will engage in constructive climate governance.²⁷⁰ The country's international leadership, however, has diminished under the Trump Administration.²⁷¹ Accordingly, the Trump Administration has lost a unique window of opportunity to significantly reduce carbon emissions, because actions taken earlier tend to be more consequential for fulfilling the goals of the Paris Agreement.

Considering all of the above arguments, it is clear that the deregulatory measures pursued by the Trump Administration disregard the social costs of carbon and contribute to unnecessary litigation, as such measures are based on unreasoned policies. The Administration's decision to withdraw from the Paris Agreement will not only increase GHG emissions in the country, but also adversely impact momentum on curbing global carbon emissions. All of these policy choices ignore science and, as demonstrated, are detrimental domestically as well as from the standpoint of climate governance.

267. Irene C. Dedoussi et al., *Premature Mortality Related to United States Cross-State Air Pollution*, 578 NATURE 261 (2020) (finding that, on average, 41% to 53% of air quality-related premature mortality in a state result from emissions occurring outside of that state and that New York has been a significant importer of pollution from other states, as 60% of premature deaths in New York are related to pollution outside its boundaries).

268. NASA scientists and colleagues from renowned institutions have found that the increase in global temperatures primarily has been driven by increased atmospheric emissions of carbon dioxide and other GHGs produced by human activities. The agency estimates that the 2019 global mean change is accurate, with a 95% certainty level. *NASA, NOAA Analyses Reveal 2019 Second Warmest Year on Record*, NASA: GODDARD INST. FOR SPACE STUD., Jan. 15, 2020, <https://www.giss.nasa.gov/research/news/20200115/>. See also Figure 1 in the Appendix.

269. *NASA, NOAA Analyses Reveal 2019 Second Warmest Year on Record*, NASA: GODDARD INST. FOR SPACE STUD., Jan. 15, 2020, <https://www.giss.nasa.gov/research/news/20200115/>.

270. The President-elect tweeted that his administration will rejoin the Paris Agreement. *Joe Biden Vows to Rejoin the Paris Climate Deal on First Day of Office if Elected*, CARBONBRIEF, Nov. 4, 2020, <https://www.carbonbrief.org/daily-brief/joe-biden-vows-to-rejoin-the-paris-climate-deal-on-first-day-of-office-if-elected>.

271. Arlota, *supra* note 257, at 931-32 (contending how the Trump Administration's international policies, such as the withdrawal from the Paris Agreement combined with the denunciation of the "Iran Deal," the Trans-Pacific Partnership and Intermediate Range Nuclear Forces Treaty, have been detrimental to the leadership of the United States).

IV. Conclusion

This Article presented concrete examples of the Trump Administration's war on science that may adversely impact climate change policies, with consideration of specific literature on attacks on science. It found that the Trump Administration has engaged in attacks encompassing all four categories discussed in the literature, namely (1) creating a hostile environment for scientific staff; (2) appointing insufficiently qualified individuals to executive branch positions that manage, conduct, or disseminate science; (3) tampering with science or scientific reports; and, finally, (4) undermining of science-based regulations.²⁷²

In this context, the Trump Administration's war on science and scientists has significant costs domestically and internationally. It negatively interferes with the separation of powers, as the Trump Administration precluded scientist experts from attending congressional audiences; it also imperils congressional and public oversight of the executive, because the agencies are tampering with reports on climate change. The actions of the Trump Administration jeopardize the work of current scientists at national agencies and universities, as well as future collaborations abroad. This exposes the United States to the possibility of losing its edge on innovative, cutting-edge research and fosters a regulatory environment not based on sound science.

This Article then proceeded to introduce the legal justifications for cost-benefit analysis in the deregulatory context, studying specific instances in which the methodology of cost-benefit analysis has been tampered with, and how such actions have been disguised under a scientific façade. These include the (actual or proposed) rollbacks of the Clean Water Rule, pesticides ban, CAA, Clean Power Plan, and regulations promoting fuel efficiency, as well as the proposed modification of NEPA and the flexibilization of environmental enforcement during COVID-19. All of these cases are illustrative of at least one modality of the war on science.

None of these proposed deregulatory measures withstand an accurate cost-benefit analysis test, because they are unreasoned, informed by unsound science, and represent different modalities of attacks on science. In addition, a trademark of the deregulatory actions of the Trump Administration on matters relating to climate change is the disregard for environmental costs and the discredit of the benefits of regulation. These policies authorize actions that are significantly costly to the well-being of U.S. society and that are based on unsound science. These findings concur with previous claims asserting that the Trump Administration notoriously focuses on costs while neglecting benefits²⁷³; and that when the Administration actually engages in cost-benefit analysis, research finds it to be significantly flawed.

In the aggregate, the analysis of specific cases also demonstrates the negative effects of removing regulations and/or flexibilizing their standards for the separation of pow-

272. Berman & Carter, *supra* note 1, at 3.

273. SUNSTEIN, *supra* note 38, at 159.

ers. After all, the absence of definitive scientific evidence does not mean that regulation is inappropriate, as the congressional mandate to agencies asks them to regulate on the basis of potential risks to humans instead of waiting for definitive evidence of substantial harm.²⁷⁴ Those findings are also consistent with previous studies indicating that legal claims arguing the use of unsound science tend to be more successful when based on the agency's failure to provide reasoned decisionmaking.²⁷⁵ If unsound science is used (and the cost-benefit analysis is flawed), then the probability of deregulatory measures being invalidated in court is higher. As presented earlier, the Trump Administration's success rate in court cases related to its climate policies is the lowest of all administrations, which is indicative of a causal link between the absence of a scientific approach and the reiterative invalidation of the Administration's deregulatory agenda in courts.

Hence, unreasoned deregulatory measures are likely to increase litigation and remove significant environmental protections. This is particularly concerning, because in economics, improving environmental quality is often connected to increasing marginal costs; in practice, this means that the first steps are also the cheapest.²⁷⁶ The findings based on the analysis of specific deregulatory cases also show that President Trump's deregulatory policies often assume a zero-sum game, which does not advance sound policymaking (let alone the maximization of well-being).

As Parts I and II show, it is clear that the lack of a scientific approach to regulations by the Trump Administration and its related use of an inaccurate methodology for cost-benefit analysis are intimately connected. The war on science promotes decisions lacking reasoned justifications. These flawed (or absent) justifications are incorporated into the cost-benefit analysis, which will in turn inform

misguided policies in a vicious cycle. The war on science thus also undermines reasoned decisionmaking. By doing so, it fosters uncertainty and increases the transaction costs for negotiation. Hence, the Article analyzed specific consequences of the war on science (including disregarding the social costs of carbon and unnecessary litigation) and the promotion of unreasoned deregulatory policy choices on climate matters by the Trump Administration up to June 2020.

The Trump Administration's deregulatory measures disregard the social costs of carbon and (being based on unreasoned policies) contribute to unnecessary litigation; this in turn is a byproduct of the vicious cycle triggered by attacks on science and tainted cost-benefit analysis. As for climate governance, the Administration's decision to withdraw from the Paris Agreement not only increases GHG emissions in the country, but also adversely impacts momentum on curbing carbon emissions globally. All of these policy choices ignore science and, as demonstrated, are detrimental domestically as well as from the standpoint of climate governance. Moreover, these detrimental effects are likely to endure past this Administration.

In light of the above, it is clear that this situation must not continue, because "when government fails to use its best analytic tools, when bad decisions are made that could have been avoided, it is time to demand change."²⁷⁷ Regardless of who is president, the attacks on science, the absence of a scientific approach informing policymaking, and the related inadequate use of cost-benefit analysis must cease immediately. The well-being of the U.S. population (and beyond) is at risk. Change is urgently needed due to the significant impacts of climate change. There is no time for bigotry, as the costs continue mounting in the United States as well as globally.

(Appendix on next page)

274. See, e.g., Shapiro, *supra* note 219, at 37.

275. Meazell, *supra* note 220, at 748-49.

276. Livermore et al., *supra* note 43, at 5.

277. REVESZ & LIVERMORE, *supra* note 23, at 4.

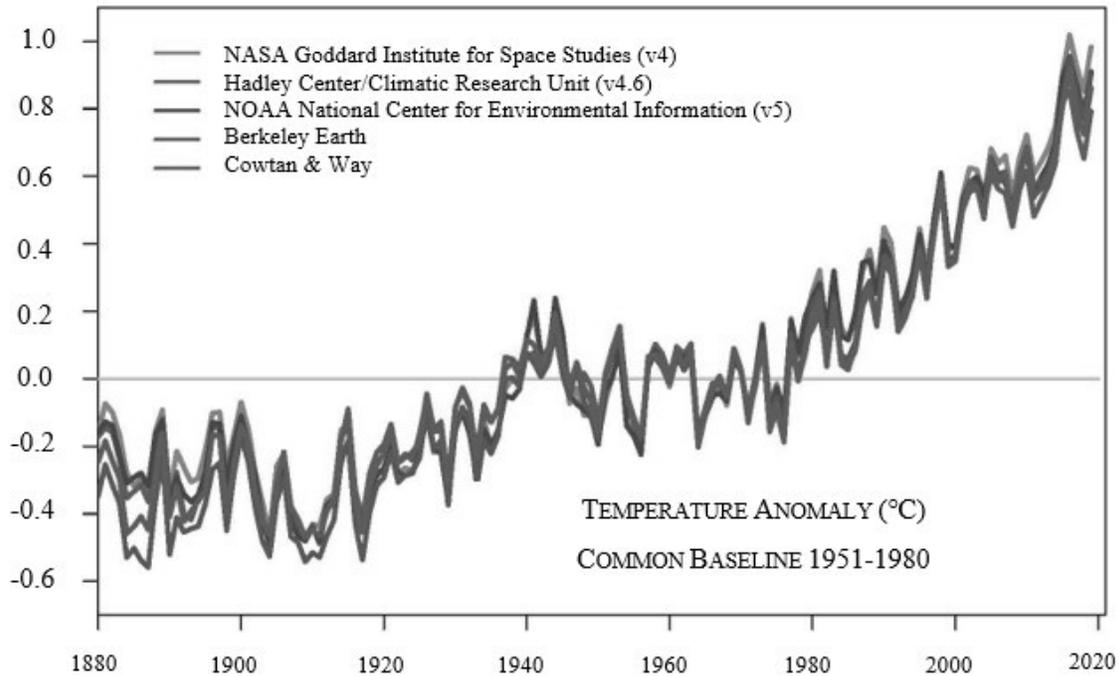
Appendix: Tables and Figures

Table 1. Carbon Dioxide Produced Per Type of Fuel

Fuel type	Pounds of carbon dioxide emitted
(per million British thermal units (BTU))	228.6
Coal (bituminous)	205.7
Coal (lignite)	215.4
Coal (subbituminous)	214.3
Diesel fuel and heating oil	161.3
Gasoline (without ethanol)	157.2
Propane	139.0
Natural gas	117.0

Source: Table 1 was built by the author according to information available at U.S. Energy Information Administration, *Frequently Asked Questions (FAQS): How Much Carbon Dioxide Is Produced When Different Fuels Are Burned?*, <https://www.eia.gov/tools/faqs/faq.php?id=73&t=11> (last reviewed June 17, 2020).

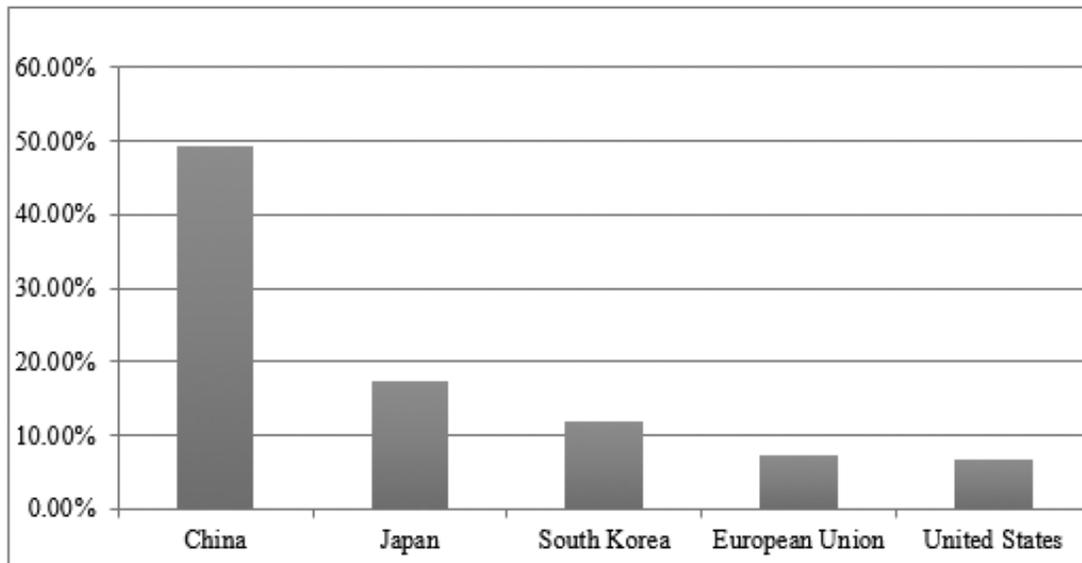
Figure 1. Temperature Anomaly



Source: NASA, NOAA Analyses Reveal 2019 Second Warmest Year on Record, NASA: GODDARD INST. FOR SPACE STUD., Jan. 15, 2020, <https://www.giss.nasa.gov/research/news/20200115/> (NASA Goddard Institute for Space Studies/Gavin Schmidt).

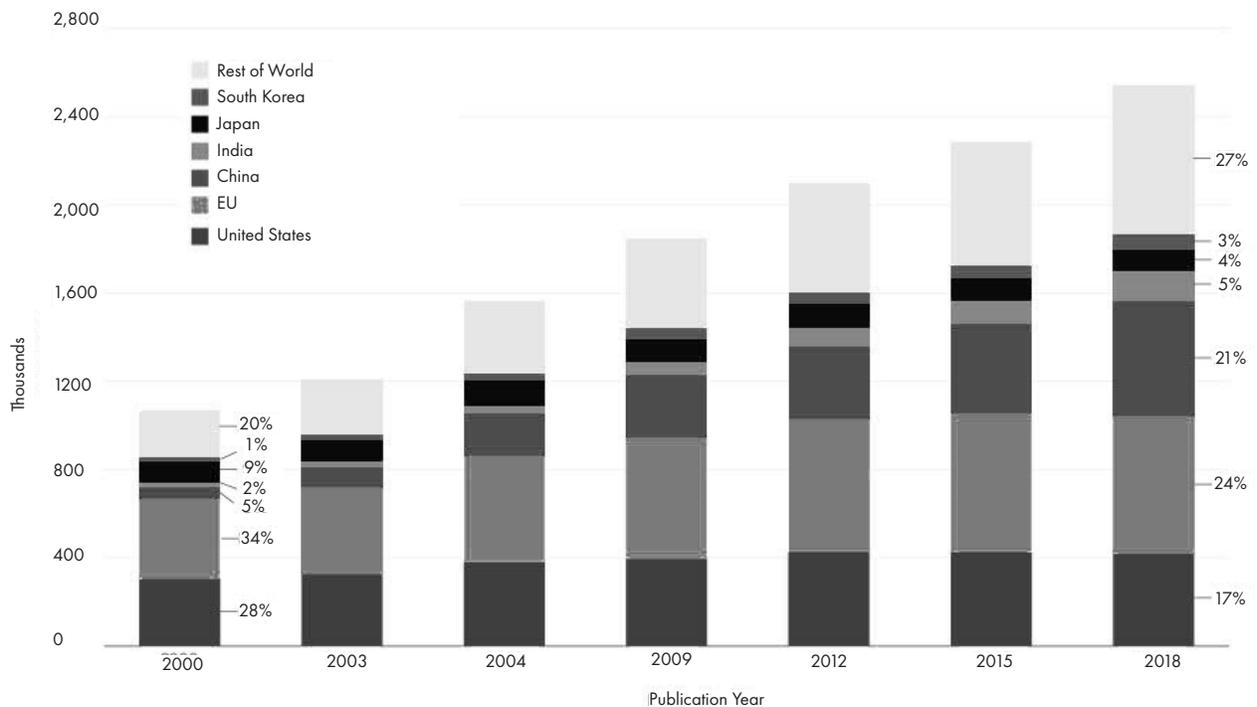
Note: The plot shows yearly temperature anomalies from 1880 to 2019, with respect to the 1951-1980 mean, as recorded by NASA, the National Oceanic and Atmospheric Administration, the Berkeley Earth research group, the Met Office Hadley Centre (United Kingdom), and the Cowtan and Way analysis. Though there are minor variations from year to year, all five temperature records show peaks and valleys in sync with each other. All show rapid warming in the past few decades, and all show the past decade has been the warmest.

Figure 2. Percentage of Worldwide Patents Granted to Inventors Per Country



Source: NATIONAL SCIENCE BOARD & NATIONAL SCIENCE FOUNDATION, SCIENCE AND ENGINEERING INDICATORS 2020: THE STATE OF U.S. SCIENCE AND ENGINEERING (2020), <https://ncses.nsf.gov/pubs/nsb20201/global-science-and-technology-capabilities>.

Figure 3. Science and Engineering Articles (From 2000 to 2018)



Source: NATIONAL SCIENCE BOARD & NATIONAL SCIENCE FOUNDATION, SCIENCE AND ENGINEERING INDICATORS 2020: THE STATE OF U.S. SCIENCE AND ENGINEERING (2020), <https://ncses.nsf.gov/pubs/nsb20201/global-science-and-technology-capabilities>.