

ENDNOTES

Introduction

1. Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, p. 10, https://www.whitehouse.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.
2. Environmental Protection Agency, “Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles,” Final Rule, *Federal Register*, Vol. 89 No. 76 (April 18, 2024) pp. 27842-28215, <https://www.federalregister.gov/documents/2024/04/18/2024-06214/multi-pollutant-emissions-standards-for-model-years-2027-and-later-light-duty-and-medium-duty> and Environmental Protection Agency, “New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule,” Final Rule, *Federal Register*, Vol. 89, No. 91 (May 9, 2024), pp. 39798-40064, <https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>.
3. President Barack Obama, Memorandum for the Heads of Executive Departments and Agencies, Scientific Integrity, March 9, 2009, <https://obamawhitehouse.archives.gov/the-press-office/memorandum-heads-executive-departments-and-agencies-3-9-09> (accessed January 2, 2025).
4. Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, pp. 8-9, https://www.whitehouse.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.
5. Alexander Hamilton, *The Federalist* No. 72, March 19, 1788, <https://founders.archives.gov/documents/Hamilton/01-04-02-0223>

6. See e.g. *The Republic of Plato*, Second Edition, Translated with notes and an interpretive essay by Alan Bloom (New York: Basic Books, 1991) and Plato, *Hippias Major*, 304(e): So I think, Hippias, that I have been benefited by conversation with both of you; for I think I know the meaning of the proverb “beautiful things are difficult.” In Greek: χαλεπὰ τὰ καλὰ.

Chapter 1

1. EPA, Peer Review Handbook, 4th Edition, 2015, https://www.epa.gov/sites/default/files/2020-08/documents/epa_peer_review_handbook_4th_edition.pdf.
2. EPA, EPA Science at 50: Progress for a Stronger Future, <https://www.epa.gov/sciencematters/epa-science-50-progress-stronger-future> (accessed June 25, 2024).
3. Congress transferred to the EPA numerous environmental responsibilities from the Departments of Interior, Agriculture, and Health, Education and Welfare, as well as the Atomic Energy Commission, Federal Radiation Council, and Council on Environmental Quality. See “EPA’s Origins: Duties Transferred to EPA from Other Federal Agencies,” <https://www.epa.gov/archive/epa/aboutepa/epas-origins-duties-transferred-epa-other-federal-agencies.html> (accessed June 27, 2024).
4. The 50th Anniversary page does not mention the EPA’s climate change risk assessments, such as the 2009 greenhouse gas (GHG) endangerment finding. The quality of the EPA’s climate science is discussed below.
5. Charles Andrew Miller. 2021. Fifty years of EPA science for air quality management and control. *Environmental Management*, 67:1017-1028, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8106583/pdf/267_2021_Article_1468.pdf.
6. EPA, Clean Water Technology Center, <https://www.epa.gov/sustainable-water-infrastructure/clean-water-technology-center#research> (accessed July 12, 2024); Drinking Water Technologies, <https://www.epa.gov/ground-water-and-drinking-water/drinking-water-technologies> (accessed July 12, 2024); Office of Land and Emergency Management, *Superfund Remedy Report*, 16th Edition, July 2020, <https://19january2021snapshot.epa.gov/sites/static/files/2020-07/documents/100002509.pdf>.
7. David Randall and Christopher Welser in *The Irreproducibility Crisis of Modern Science: Causes, Consequences and Road to Reform*, National Association of Scholars, April 2018, https://www.nas.org/storage/app/media/Reports/Irreproducibility%20Crisis%20Report/NAS_irreproducibilityReport.pdf.
8. For example, the EPA’s April 2024 motor vehicle rule is the most expensive regulation in the agency’s history, adding an estimated \$760 billion to auto industry compliance costs during 2027-2055 and \$2,000 to the average cost of a new car in 2032. The rule also restricts vehicle choice, effectively mandating that 70 percent of all new car sales in 2032 be electric vehicles—a policy with no clear congressional authorization. The EPA estimates that the rule’s costs will be outweighed by \$1.6 trillion in climate benefits and \$200 billion in air quality benefits. See EPA, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles; Final Rule, 89 FR 27842, 27856, 27860, April 18, 2024, <https://www.govinfo.gov/content/pkg/FR-2024-04-18/pdf/2024-06214.pdf>.
9. Here and elsewhere in the chapter, “weight of [scientific] evidence” (WOE) means an expert review of a scientific issue based on all relevant evidence, strong or weak,

- positive or negative, from all relevant research disciplines. In *An Examination of EPA Risk Assessment Principles and Practices*, March 2004, pp. 71-72, <https://semspub.epa.gov/work/10/500006305.pdf>, the agency notes that in WOE evaluations, “study findings are not scored by any mathematical algorithm; rather, they are based on professional scientific judgment.” Or, as one researcher put it, “Most applications of WOE in support of public policy that are cited in the literature seem to (by inference or lack of specification) use a process methodology that is low on transparency and high on subjectivity.” Sheldon Krinsky. 2005. *The Weight of Scientific Evidence in Policy and Law. American Journal of Public Health*, Volume 95, Issue 51, <https://ajph.aphapublications.org/doi/epub/10.2105/AJPH.2004.044727>.
10. Stuart Ritchie, *Science Fictions: How Fraud, Bias, Negligence, and Hype Undermine the Search for Truth*, p. 8 (cleaned), (New York: Metropolitan Books, 2020).
 11. Ritchie, *Science Fictions*, p. 7.
 12. *Economist*, “How science goes wrong: Scientific research has changed the world. Now it needs to change itself,” October 13, 2013, http://www.chem.ucla.edu/dept/Faculty/merchant/pdf/How_Science_Goes_Wrong.pdf.
 13. Patrick J. Michaels, “Peer Review and ‘Pal Review’ in Climate Science,” *Forbes*, June 16, 2011, <https://www.forbes.com/sites/patrickmichaels/2011/06/16/peer-review-and-pal-review-in-climate-science/>.
 14. John J. Cardarelli II. 2024. Overt Scientific Bias and Clandestine Acts by Trusted Scientists: The Flawed Application of the Linear No-threshold Model. *Health Phys.* 127(3):450–460, <https://pubmed.ncbi.nlm.nih.gov/39052875/>. From the abstract: “Shortly thereafter, many emails discovered via an independent Freedom of Information Act request revealed multiple layers of coordination between prominent people in the field of radiation protection to coopt the leadership within the HPS [Health Physics Society] and suppress information they perceived or assumed to be contrary to a pro-LNT [linear-no-threshold] message.”
 15. Sharon Begley, “The maddening saga of how an Alzheimer’s ‘cabal’ thwarted progress towards a cure for decades,” *Stat*, June 25, 2019, <https://www.statnews.com/2019/06/25/alzheimers-cabal-thwarted-progress-toward-cure/>; cited by Ritchie, *Science Fictions*, pp. 114-115. See also Marlo Lewis, “Climate study urges blacklisting of contrarians,” *Open Market*, August 16, 2019, <https://cei.org/blog/climate-study-urges-blacklisting-of-contrarians/>.
 16. Twenty papers by fraudster anesthesiologist Scott Reuben were retracted in 2009. Over the next five years, those papers were cited 247 times in other studies. Ritchie, *Science Fictions*, p. 75.
 17. Richard Feynman, “The Character of Physical Law,” Lecture, Cornell University, November 9, 1964, <https://jamesclear.com/great-speeches/seeking-new-laws-by-richard-feynman>.
 18. Feynman, “The Character of Physical Law.”
 19. D.B. McCullough and Ross McKittrick, *Check the Numbers: The Case for Due Diligence in Policy Formation*, Fraser Institute, February 2009, pp. 3-4, https://www.rossmckittrick.com/uploads/4/8/0/8/4808045/thecaseforduediligence_fiedition.pdf.
 20. Ritchie, *Science Fictions*, p. 5 (emphasis added).

21. Karl Popper, *The Logic of Scientific Discovery* (London & New York: Routledge Classics, 1959/2002), p. 23, cited by Ritchie, *Science Fictions*, p. 23.
22. McCullough and McKittrick, *Check the Numbers*, p. 6, quoting McCullough and H.D. Vinod (2003). Verifying the solution from a nonlinear solver: a case study. *American Economic Review* 93(3): 873-892, <https://www.jstor.org/stable/3592786>.
23. S. Stanley Young and Alan Karr. 2011. Deming, data and observational studies: A process out of control and needing fixing. *Significance* Volume 8, Issue 3, 116 -120, <https://rss.onlinelibrary.wiley.com/doi/full/10.1111/j.1740-9713.2011.00506.x>.
24. S. Stanley Young et al., *Shifting Sands Report #1: Keeping Count of Government Science: P-Value Plotting, P-Hacking, and PM2.5 Regulation*, National Association of Scholars, 2021, pp. 30, 29, <https://www.nas.org/reports/shifting-sands-report-i/full-report>.
25. Ritchie, *Science Fictions*, p. 34, citing Frank Mueller-Langer et al. 2019. Replication Studies in Economics—How many and Which Papers Are Chosen for Replication and Why? *Research Policy* 48, no. 1, <https://www.sciencedirect.com/science/article/pii/S0048733318301847>, and Matthew C. Makel et al. 2012. Replications in Psychology Research: How Often Do They Really Occur? *Perspectives on Psychological Science* 7, no. 6, <https://journals.sagepub.com/doi/full/10.1177/1745691612460688>.
26. Eduardo Hariton and Edward J. Locascio. 2018. Randomized controlled trials—the gold standard of effectiveness research. HHS Public Access, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6235704/>.
27. Ritchie, *Science Fictions*, p. 37, citing C.M. Begley and Lee M. Ellis. 2012. Raise standards for preclinical cancer research. *Nature* 483, 531-533, <https://www.nature.com/articles/483531a>.
28. Florian Prinz et al. 2011. Believe it or not: How much can we rely on published data on drug targets? *Nature Reviews Drug Discovery*, 10, 712, <https://www.nature.com/articles/nrd3439-c1>, cited by Ritchie, *Science Fictions*, p. 37.
29. Ritchie, *Science Fictions*, p. 38, citing Shareen A. Iqbal et al. 2016. Reproducible Research Practices and Transparency across the Biomedical Literature. *PLOS Biology* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4699702/>.
30. Ritchie, *Science Fictions*, p. 38, citing Nicole A. Vasilevsky et al. 2013. On the reproducibility of science: unique identification of research resources in the biomedical literature. *Peer J*, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771067/>.
31. McCullough and McKittrick, *Check the Numbers*, p. 9.
32. Andrew C. Chaing and Phillip Li, Is Economics Research Replicable? Sixty Published Papers from Thirteen Journals Say “Usually Not,” September 4, 2015, Finance and Economics Discussion Series 2015-083, Board of Governors of the Federal Reserve System, <http://dx.doi.org/10.17016/FEDS.2015.083>, cited by Ritchie, *Science Fictions*, p. 35.
33. Young and Karr (2011), *Deming, data, and observational studies*, p. 116.
34. Volunteers may inhale concentrations up to 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Animal studies may use concentrations up to 1,000 $\mu\text{g}/\text{m}^3$. EPA, Review of the National Ambient Air Quality Standards for Particulate Matter; Final Rule, 85 FR 82684, 82703-82704, December 18, 2020, <https://www.federalregister.gov/documents/2020/12/18/2020-27125/review-of-the-national-ambient-air-qualitystandards-for-particulate-matter>. For comparison, the annual average $\text{PM}_{2.5}$ level in Washington,

D.C. during 2020-2022 was 8.6 $\mu\text{g}/\text{m}^3$ Metropolitan Washington Council of Governments, Air Quality Dashboard, <https://www.mwcog.org/environment/data-and-tools/air-quality-progress-dashboard/> (accessed July 26, 2024).

35. The BMJ, *Epidemiology for the Uninitiated*, Chapter 7. Longitudinal Studies, <https://www.bmj.com/about-bmj/resources-readers/publications/epidemiology-uninitiated/7-longitudinal-studies#chapters> (accessed October 9, 2024).

36. Google Scholar, (accessed October 9, 2024).

37. Monya Baker. 2016. 1500 scientists lift the lid on reproducibility. *Nature* 533, 452-454, <https://www.nature.com/articles/533452a>.

38. EPA, Scientific Integrity Policy for Objective and Transparent Science, 2012, https://www.epa.gov/system/files/documents/2023-12/scientific_integrity_policy_2012_accessible.pdf

39. EPA, Proposed Scientific Integrity Policy, January 24, 2024, https://peer.org/wp-content/uploads/2024/01/2_1_24_EPA_draft_policy.pdf.

40. EPA Scientific Integrity Policy, January 2025, <https://www.epa.gov/system/files/documents/2025-01/us-epa-scientific-integrity-policy.pdf>.

41. EPA, Proposed Scientific Integrity Policy, p. 16.

42. EPA, Strengthening Transparency in the Pivotal Science Underlying Significant Regulatory Actions and Influential Scientific Information, Final Rule. 86 FR 469. January 6, 2021, <https://www.govinfo.gov/content/pkg/FR-2021-01-06/pdf/2020-29179.pdf>.

43. Marlo Lewis, Comments on the EPA's Transparency Rule, May 18, 2020, <https://cei.org/sites/default/files/MarloLewisCompetitiveEnterpriseInstituteSupplementalnotice.pdf>.

44. Comments of the Environmental Protection Network on EPA's Proposal entitled "Strengthening Transparency in Regulatory Science," April 30, 2018, pp. 15-18, <https://www.environmentalprotectionnetwork.org/wpcontent/uploads/2018/08/EPN-Comments-on-Censored-Science.pdf>.

45. EPA, *Science Policy Council Handbook: Risk Characterization*, December 2000, pp. 8, 15-16, https://www.epa.gov/sites/default/files/2015-10/documents/osp_risk_characterization_handbook_2000.pdf; *Framework for Cumulative Risk Assessment*, May 2003, p. 59, https://www.epa.gov/sites/default/files/2014-11/documents/frmwrk_cum_risk_assmnt.pdf.

46. EPA, Strengthening Transparency in Pivotal Science, 86 FR 469, 471.

47. *Env't Def. Fund v. U.S. Env't Prot. Agency*, No. 4:21-CV-00003-BMM, 2021 WL 402824 (D. Mont. Feb. 1, 2021).

48. EPA (2000), Risk Characterization Handbook, p. 8.

49. "It is usually necessary to provide a sensitivity analysis to reveal whether, and to what extent, the results of the analysis are sensitive to plausible changes in the main assumptions and numeric inputs," OMB Circular A-4, 2003, https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/; "Use a numerical sensitivity analysis to examine how the results of your analysis vary with plausible changes in assumptions, choices of input data, valuation metrics, and alternative analytical approaches," OMB Circular A-4, https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/.

50. Jason Scott Johnson, Introduction, pp. 2-3, in J.S. Johnston, ed., *Institutions and Incentives in Regulatory Science* (Lanham, Maryland: Lexington Books, 2012). See also Patrick J. Michaels and Terence Kealey, eds., *Scientocracy: The Tangled Web of Public Science and Public Policy* (Washington, D.C.: Cato Institute, 2019).
51. United States Department of Justice, *Overview of the Privacy Act of 1974*, 2020 Edition, https://www.justice.gov/Overview_2020/dl?inline.
52. Milloy, *Scare Pollution*, pp. 15-24; McCullough and McKittrick (2009), *Check the Numbers*, pp. 11-12.
53. Joel S. Cecil and Eugene Griffith, “The Role of Legal Policies in Data Sharing,” p. 180, Stephen E. Fienberg, Margaret E. Martin, and Miron L. Straf, Eds., *Sharing Research Data* (Washington, D.C.: National Academies Press, 1985), <https://nap.nationalacademies.org/catalog/2033/sharing-research-data>.
54. Krewski, D. et al. *Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality*. Health Effects Institute, July 2000, <https://www.healtheffects.org/system/files/HEI-Reanalysis-2000.pdf>.
55. Joel M. Schwartz and Stephen F. Hayward, *Air Quality in America: A Dose of Reality on Air Pollution Levels, Trends, and Health Risks* (Washington, D.C. The AEI Press, 2007), p. 128.
56. The EPA provides half of HEI’s funds. The other half comes from corporate and non-profit donors, of which two dozen are automobile companies. Health Effects Institute, Sponsors, <https://www.healtheffects.org/about/sponsors> (accessed July 24, 2024).
57. EPA, National Ambient Air Quality Standards for Particulate Matter; Final Rule. 62 FR 38652, July 18, 1997, <https://archive.epa.gov/ttn/pm/web/pdf/pmnaaqs.pdf>.
58. The 1997 PM rule cites the Dockery study 60 times and the Pope study 45 times.
59. Andrew Wheeler, “Why We’re Ending the EPA’s Reliance on Secret Science,” *The Wall Street Journal*, January 4, 2021, <https://www.wsj.com/articles/why-were-ending-the-epas-reliance-on-secret-science-11609802643>.
60. EPA, Strengthening Transparency in Pivotal Science, 86 FR 469, 489.
61. Krewski et al. (2000), *Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study*, p. 4.
62. The following pivotal PM_{2.5} studies are based on data shielded from independent scrutiny:
- ▶ Dockery, D. W., Pope III, C.A., et al. 1993. An association between air pollution and mortality in six U.S. cities. *New England Journal of Medicine* 329:1753–59, <https://doi.org/10.1056/nejm199312093292401>.
 - ▶ Pope III, C. A., Dockery, D.W., et al. 1995. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. *American Journal of Respiratory and Critical Care Medicine* 151, 3, Pt. 1: 669–74, <https://pubmed.ncbi.nlm.nih.gov/7881654/>.
 - ▶ Pope, C.A., III, Krewski, D., et al. 2004. Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. *Circulation* 109(1):71–77, <https://pubmed.ncbi.nlm.nih.gov/14676145/>.
 - ▶ Laden, F., Dockery, D.W., et al. 2006. Reduction in fine particulate air pollution and

mortality: extended follow-up of the Harvard Six Cities study. *American Journal of Respiratory and Critical Care Medicine* 173(6): 667–672, <https://www.atsjournals.org/doi/10.1164/rccm.200503-4430C>.

- ▶ Miller, K.A., et al. 2007. Long-term exposure to air pollution and incidence of cardiovascular events in women. *New England Journal of Medicine* 356(5): 447–458, <https://www.nejm.org/doi/full/10.1056/nejmoa054409>.
- ▶ Krewski, D., Pope, C.A. III, et al. 2009. Extended follow-up and spatial analysis of the American Cancer Society study linking particulate air pollution and mortality. ISSN 1041–5505, HEI Research Report 140, <https://www.healtheffects.org/system/files/Krewski140Statement.pdf>.
- ▶ Lepeule, J., Laden, F., Dockery, D., et al. 2012. Chronic exposure to fine particles and mortality: an extended follow-up of the Harvard Six Cities study from 1974 to 2009. *Environmental Health Perspectives* 120(7): 965–970, <https://ehp.niehs.nih.gov/doi/10.1289/ehp.1104660>.

63. The null hypothesis is the default assumption that, contrary to the researcher's hypothesis, no significant relationship exists between variable X and variable Y.

64. Young et al. (2021), *Shifting Sands Report #1*, p. 31.

65. Annie Franco et al. 2014. Publication Bias in the Social Sciences: Unlocking the File Drawer. *Science* 345, no. 6203: 1502-5, <https://www.science.org/doi/10.1126/science.1255484>, cited by Ritchie, *Science Fictions*, p. 96.

66. D. Dockery et al. 1993. An association between air pollution and mortality in six U.S. cities. *New England Journal of Medicine* 329: 1753–59, <https://www.nejm.org/doi/pdf/10.1056/NEJM199312093292401>.

67. Styer et al. 1995. Effect of Outdoor Airborne Particulate Matter on Daily Death Counts. *Environmental Health Perspectives* 103, 5: 490–97. <https://doi.org/10.1289/ehp.95103490>.

68. Young et al. (2021), *Shifting Sands Report #1*, p. 69.

69. Jason S. Johnston, “The EPA’s conflicted ‘science’ on fine particulate matter mortality,” Chapter 11 of Patrick J. Michaels and Terence Kealey, eds., *Scientocracy: The Tangled Web of Public Science and Public Policy* (Washington, D.C.: Cato Institute, 2019), pp. 282–283.

70. Johnston, “The EPA’s conflicted ‘science,’” p. 285.

71. From the Mission Statement of the Southern California Particle Center and Supersite, quoted by Johnston, “The EPA’s conflicted ‘science,’” p. 336.

72. Daren Bakst and Marlo Lewis, Comments on the EPA’s Proposed Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, March 28, 2023, <https://cei.org/wp-content/uploads/2023/03/CEI-Comments-Marlo-PM2.5-Reconsideration-March-23-draft.pdf>.

73. EPA, Reconsideration of National Ambient Air Quality Standards for Particulate Matter; Final Rule, 89 FR 16202, 16375–16380, March 6, 2024, <https://www.govinfo.gov/content/pkg/FR-2024-03-06/pdf/2024-02637.pdf>.

74. Enstrom, J.E. 2017. Fine Particulate Matter and Total Mortality in Cancer Prevention Study Cohort Reanalysis, *Dose-Response: An International Journal*, January–March, 1–12,

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5407529/pdf/10.1177_1559325817693345.pdf.

75. Young, S.S. et al. 2017. Air quality and acute deaths in California, 2000-2012. *Regulatory Toxicology and Pharmacology* 88:173-184, <https://pubmed.ncbi.nlm.nih.gov/28619682/>.

76. Briefly, Pope (1995) and Krewski (2000) found positive associations between PM_{2.5} and total mortality in 50 counties within a population cohort called Cancer Prevention Study (CPS II). They relied on PM_{2.5} data of dubious quality from the Brookhaven National Laboratory (BNL). They did so even though high quality PM_{2.5} data were available from the EPA's Inhalable Particle Network (IPN). Moreover, the IPN data were available for 85 counties in the CPS II cohort, not just the subset of 50 examined by Pope and Krewski. Using the IPN data, Enstrom (2017) found no association between PM_{2.5} and total mortality in either the original 50 counties or 85 counties with IPN data in the CPS II cohort.

77. Young et al. (2017), Air quality and acute deaths in California.

78. EPA, Integrated Science Assessment for Particulate Matter, December 2019, <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534>.

79. For example, the EPA's March 2024 Reconsideration of NAAQS for Particulate Matter cites Pope et al. (2004). See 89 FR 16202, 16378.

80. EPA, Reconsideration of National Ambient Air Quality Standards for Particulate Matter; Proposed Rule, 88 FR 5558, 5582, January 27, 2023, <https://www.govinfo.gov/content/pkg/FR-2023-01-27/pdf/2023-00269.pdf>.

81. Greven, S. et al. 2011. An approach to the estimation of chronic air pollution effects using spatiotemporal information. *Journal of the American Statistical Association* 106:396–406, <https://pubmed.ncbi.nlm.nih.gov/28751799/>. The authors do report that PM_{2.5} reductions at the national level are correlated with increased life expectancy. That finding is perplexing. All air pollution exposures are local. At local scales, the authors do not find any change in life expectancy from PM_{2.5} reductions.

82. Marlo Lewis and Daren Bakst, Comments on Reconsideration of National Ambient Air Quality Standards for Particulate Matter, Docket ID No. EPA-HQ-OAR-2015-0072, March 28, 2023, <https://cei.gov/wp-content/uploads/2023/03/CEI-Comments-Marlo-PM2.5-Reconsideration-March-23-draft.pdf>.

83. Dan Taylor, "D.C.: Here's How Long Your Life Expectancy Is," *Patch*, October 1, 2019, <https://patch.com/district-columbia/washingtondc/dc-heres-how-long-your-life-expectancy> (accessed July 26, 2024).

84. Xinhuanet, "Beijing life expectancy hits 82.2 years," February 21, 2019, http://www.xinhuanet.com/english/2019-02/21/c_137840135.htm#:~:text=BEIJING%2C%20Feb.,municipal%20health%20commission%20on%20Thursday (accessed July 26, 2024).

85. Metropolitan Washington Council of Governments, Air Quality Dashboard, <https://www.mwcog.org/environment/data-and-tools/air-quality-progress-dashboard/> (accessed July 26, 2024); Statista, Average annual PM2.5 air pollution levels in Beijing, China between 2013 and 2023, <https://www.statista.com/statistics/690823/china-annual-pm25-particle-levels-beijing/> (accessed July 26, 2024).

86. IQAir, Beijing Air Quality Report, September 12, 2019, file:///C:/Users/marlo.lewis/Documents/Air%20Issues/PM2.5/2019-beijing-air-quality-report.pdf.

87. Lv, B. et al. 2016. A systematic analysis of PM2.5 in Beijing and its sources from 2000 to 2012. *Atmospheric Science* 124: 98-108, <https://www.sciencedirect.com/science/article/abs/pii/S1352231015303733>.
88. C. Arden Pope, et al. 2009. Cardiovascular Mortality and Exposure to Airborne Fine Particulate Matter and Cigarette Smoke: Shape of the Exposure-Response Relationship. *Circulation*, Volume 120, Issue 11, 941-948, <https://www.ahajournals.org/doi/epub/10.1161/CIRCULATIONAHA.109.857888>.
89. Prabhat, J. et al 2013. 21st-Century Hazards of Smoking and Benefits of Cessation in the United States. *New England Journal of Medicine*, Vol. 368, No. 4: 341-350, <https://www.nejm.org/doi/full/10.1056/NEJMsa1211128>.
90. Steve Milloy, "How does this photo debunk EPA's most important 'scientific' claim?" <https://www.stevemilloy.com/?p=89746>.
91. 42 U.S.C. §7409(d).
92. Johnston, "The EPA's Conflicted 'Science,'" p. 285.
93. 2021 CASAC Lead Review Panel, https://casac.epa.gov/ords/sab/r/sab_apex/casac/mems?p14_committeeon=2021%20CASAC%20Lead%20Review%20Panel&clear=14&session=8005319811026.
94. EPA, Grantee Research Projects Results University of Washington, https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/recipient.display/location_id/2576.
95. James Madison, *Federalist* No. 10, <https://founders.archives.gov/documents/Madison/01-10-02-0178>.
96. Legal Buddies, *Nemo Judex In Causa Sua: Legal Concept Explained*, December 28, 2023, <https://getlegalbuddies.com/blog/nemo-judex-in-causa-sua-legal-concept-explained/> (accessed August 24, 2024).
97. Johnston, "The EPA's Conflicted 'Science,'" p. 283.
98. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule, 74 FR 66496, 66510, December 15, 2007, https://www.epa.gov/sites/default/files/2021-05/documents/federal_register-epa-hq-oar-2009-0171-dec.15-09.pdf.
99. Devin Watkins and Sam Kazman, Attorneys, Competitive Enterprise Institute, Information Quality Act Correction Request Regarding EPA's 2009 GHG Endangerment Finding, May 13, 2019, Attachment A: Relationship of Peer Reviewers to References Upon Which EPA Relied Most Heavily for its 2009 Endangerment Finding, https://www.epa.gov/sites/default/files/2019-07/documents/rfc_19002_-_endangerment_cei.pdf.
100. Ross McKittrick, "Adversarial versus Consensus Processes for Assessing Scientific Evidence," Chapter 3, p. 57, *Institutions and Incentives in Regulatory Science*, J.S. Johnston, ed. (Maryland: Lexington Books, 2012).
101. Asked if he was "getting anywhere" with his research, Richard Feynman recalled his reply when someone asked the same question about his attempts to open a safe: "You can't tell until you open it. But you have tried a lot of numbers that you know don't work." Michelle Feynman, ed., *The Portable Feynman* (Princeton and Oxford: Princeton University Press, 2015), p. 123.

102. Chittaranjan Andrade. 2021. HARKing, Cherry-Picking, P-Hacking, Fishing Expeditions, Data Dredging and Mining as Questionable Research Practices. *J Clin Psychiatry* 18:1, <https://pubmed.ncbi.nlm.nih.gov/33999541/>.
103. Andrade (2021), Questionable Research Practices.
104. Xiao Wu, Rachel C. Nethery, M. Benjamin Sabath, Danielle Braun, and Francesca Dominici, Exposure to air pollution and COVID-19 mortality in the United States, April 5, 2020, <https://pubmed.ncbi.nlm.nih.gov/32511651/> (accessed March 28, 2023).
105. Dino Grandoni, “A Harvard study tying coronavirus death rates to pollution is causing an uproar in Washington,” *Washington Post*, May 7, 2020, <https://www.washingtonpost.com/news/powerpost/paloma/the-energy202/2020/05/07/the-energy-202-a-harvard-study-tying-coronavirus-dea>.
106. EPA, Review of the National Ambient Air Quality Standards for Particulate Matter, 85 FR 24094-24144, April 30, 2020, <https://www.regulations.gov/document?D=EPA-HQ-OAR-2015-0072-0069>.
107. Kelsey Brugger, “Critics: ‘Secret science rule will spur ‘public health crisis,’” *Greenwire*, April 15, 2020, <https://subscriber.politicopro.com/article/eenews/1062882421>.
108. Christopher R. Knittel and Bora Ozaltun, “What Does and Does Not Correlate with COVID-19 Death Rates,” Working Paper 27391, National Bureau of Economic Research, June 2020, <http://www.nber.org/papers/w27391> (accessed March 28, 2023).
109. John McLaren, “Racial Disparity in COVID-19 Deaths: Seeking Economic Roots in Census Data,” Working Paper 27407, National Bureau of Economic Research, June 2020, <http://www.nber.org/papers/w27407> (accessed March 28, 2023).
110. Andrade (2021), Questionable Research Practices.
111. Ritchie, *Science Fictions*, p. 111. To avoid possible misunderstanding, there is nothing wrong with using algorithms to find unsuspected correlations among stressors, covariables, and health outcomes. What is illegitimate is presenting such correlations as confirming a hypothesis the investigator did not have prior to dredging the data. Moreover, a hypothesis generated by exploratory research is not confirmed until it tests positive in an independent dataset.
112. 42 CFR Part 11—Clinical Trials Registration and Results Information, <https://www.ecfr.gov/current/title-42/chapter-I/subchapter-A/part-11>.
113. Compare, Tracking Switched Outcomes in Clinical Trials, <https://www.compare-trials.org/>, cited by Ritchie, *Science Fictions*, p.111.
114. Data cleaning or cleansing “involves spotting and resolving potential data inconsistencies or errors to improve your data quality.” For example, duplicate entries can skew results, hence should be removed prior to analyzing the data. However, “Improperly cleansed or calibrated data can lead to several types of research bias, particularly information bias and omitted variable bias.” Reproducibility testing thus requires independent access to both the raw and cleaned data. Excerpts are from Pritha Bhandari, “What Is Data Cleansing?” Scribbr, November 23, 2021, <https://www.scribbr.com/methodology/data-cleansing/>.
115. S. Stanley Young. 2017. Air Quality Environmental Epidemiology Studies Are Unreliable. *Regulatory Toxicology and Pharmacology* 86: 178, <https://www.sciencedirect.com/science/article/abs/pii/S0273230017300673>.

116. Ritchie, *Science Fictions*, p. 100.
117. Young et al. (2021), *Shifting Sands: Report #1*, p. 122.
118. Young et al. (2021), *Shifting Sands: Report #1*, p. 46.
119. Young et al. (2021), *Shifting Sands: Report #1*, p. 51. $13,000/0.05 = 650$.
120. Jim Frost, "What is the Bonferroni Correction and How to Use It," Statistics by Jim, <https://statisticsbyjim.com/hypothesis-testing/bonferroni-correction/> (accessed August 3, 2024).
121. $0.05/13,000 = 0.00000385 = 0.000385\%$.
122. Merriam-Webster defines meta-analysis as "a quantitative statistical analysis of several separate but similar experiments or studies in order to test the pooled data for statistical significance."
123. Young, S.S. et al. 2008. Cereal-induced gender selection? Most likely a multiple testing false positive. *Proc. Biol. Sci.* 276: 1211-1212, <https://pubmed.ncbi.nlm.nih.gov/19141426/>.
124. Lee, P.N., et al. 2012. Systematic review with meta-analysis of the epidemiological evidence in the 1900s relating smoking to lung cancer. *BMC Cancer* 12: 385, <https://bmccancer.biomedcentral.com/articles/10.1186/1471-2407-12-385>.
125. Young et al. (2021), *Shifting Sands Report #1*, p. 56.
126. Mustafic, H. et al. 2012. Main air pollutants and myocardial infarction: A systematic review and meta-analysis. *Journal of the American Medical Association* 307, 7: 713-21, <https://doi.org/10.1001/jama.2012.126>.
127. Due to "publication bias, selective outcome, and analysis reporting bias," the ratio of false positive to false negative findings in epidemiological literature is likely greater than 20:1. Ioannidis, J.P.A. et al. 2011. The False-Positive to False-Negative Ratio in Epidemiological Studies. *Epidemiology* Volume 22, Number 4, <https://pubmed.ncbi.nlm.nih.gov/21490505/>.
128. McCullough and McKittrick (2012), *Check the Numbers*, p. 28.
129. McCullough and McKittrick (2012), *Check the Numbers*, p. 29.
130. McCullough and McKittrick (2012), *Check the Numbers*, p. 29.
131. The EPA reviews National Ambient Air Quality Standards every five years, Hazardous Air Pollutant Standards every eight years, and Safe Drinking Water Standards every six years.
132. Young et al. (2021), *Shifting Sands Report #1*, p. 93.
133. EPA, Strengthening Transparency in Regulatory Science; Proposed Rule, 83 FR 18768, 18769, April 30, 2018, <https://www.govinfo.gov/content/pkg/FR-2018-04-30/pdf/2018-09078.pdf>.
134. EPA, "Strengthening Transparency in Regulatory Science," 83 FR 18768, 18770.
135. Panel on Data Access for Research Purposes, *Expanding Access to Research Data: Reconciling Risks and Opportunities*, National Academy of Sciences, 2005, pp. 34-35, <https://nap.nationalacademies.org/download/11434>; cited by EPA, "Strengthening Transparency in Regulatory Science," 83 FR 18768, 18771.
136. EPA, "Strengthening Transparency in Regulatory Science," 83 FR 18768, 18771.

137. Cecil and Griffin (1985), “The Role of Legal Policies in Data Sharing,” p. 180.
138. Steve Milloy, *Scare Pollution: Why and How to Fix the EPA* (Bench Press: 2016), p. 226.
139. EPA, Strengthening Transparency in Pivotal Science, 86 FR 469, 492, § 30.5(c).
140. EPA, Strengthening Transparency in Regulatory Science, 83 FR 18768, 18770. Two terms in the quotation may be unfamiliar. Crudely speaking, in toxicology, the “point of departure” is the lowest observed level of adverse effects while the “reference level” is the lifetime safe exposure level. See Chem Safety Pro, “What Is Point of Departure (POD) and How to Use It to Calculate Toxicological Reference Dose (RfD), April 6, 2017, [https://www.chemsafetypro.com/Topics/CRA/What_is_Point_of_Departure_\(POD\)_in_Toxicology_and_How_to_Use_It_to_Calculate_Reference_Dose_RfD.html](https://www.chemsafetypro.com/Topics/CRA/What_is_Point_of_Departure_(POD)_in_Toxicology_and_How_to_Use_It_to_Calculate_Reference_Dose_RfD.html).
141. EPA, Strengthening Transparency in Pivotal Science, 86 FR 469, 492.
142. President Dwight David Eisenhower, Farewell Address, January 17, 1961, <https://www.archives.gov/milestone-documents/president-dwight-d-eisenhowers-farewell-address>.
143. Terrence Kealey and Patrick J. Michaels, “Science and Liberty: A Complicated Relationship,” Chapter 1 of Kealey and Michaels, eds. (2019), *Scientocracy*, pp. 30-31.
144. U.S. Global Change Research Program, Budget, <https://www.globalchange.gov/budget> (accessed August 9, 2024).
145. Stone Washington and Ryan Young, *Conflict of Justice: Making the case for administrative law court reform*, Competitive Enterprise Institute, December 14, 2023, https://cei.org/wp-content/uploads/2023/12/Are_Administrative_Courts_Unlawful_final.pdf.
146. James Madison, *The Federalist* No. 10, <https://founders.archives.gov/documents/Madison/01-10-02-0178>.
147. EPA, EPA Budget in Brief, FY 2024, p. 87.
148. Robert Bryce, “Environmentalism in America Is Dead,” Substack, May 24, 2024, <https://robertbryce.substack.com/p/environmentalism-in-america-is-dead>.
149. New York State, Division of the Budget, Department of Environmental Conservation, <https://www.budget.ny.gov/pubs/archive/fy21/exec/agencies/appropdata/EnvironmentalConservationDepartmentof.html> (accessed August 15, 2024).
150. U.S. Department of Energy, Office of Renewable Energy and Energy Efficiency, *Land-Based Wind Power Report*, 2023 Edition, <https://www.energy.gov/sites/default/files/2023-08/land-based-wind-market-report-2023-edition.pdf>.
151. Sarah Wood, “15 National Universities with the Biggest Endowments,” *U.S. News & World Report*, October 2, 2023, <https://www.usnews.com/education/best-colleges/the-short-list-college/articles/10-universities-with-the-biggest-endowments>.
152. *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins.* (State Farm), 463 U.S. 29, 43 (1983).
153. This form of cherry-picking appears to be methodologically driven. Hormesis conflicts with the EPA’s linear-no-threshold (LNT) dose-response model, which assumes there is no threshold below which exposures cease to be harmful. See Edward J. Calabrese and Evgenios Agathokleous. 2021. Hormesis: Transforming disciplines that rely on the dose response. *IUBMB Life*, Special Issue, 1-16, <https://iubmb.onlinelibrary.wiley.com/doi/10.1002/iub.2529>. For further discussion of LNT, see Chapter 4.

154. Public Law 106-554, <https://www.congress.gov/106/plaws/publ554/PLAW-106publ554.pdf>.
155. OMB, Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication, 67 FR 8452, February 22, 2002, <https://www.govinfo.gov/content/pkg/FR-2002-02-22/pdf/R2-59.pdf>.
156. *Salt Institute v. Thompson*, 345 F. Supp. 2d 589 (E.D. Va. 2004).
157. CRS, *Brief Overview of Rulemaking and Judicial Review*, March 27, 2017, p. 3, citing 5 U.S.C. § 556(c)-(d), https://www.everycrsreport.com/files/20170327_R41546_111f287760c1f66c18b71ae31c2850c37138de54.pdf.
158. JUSTIA, “Formal Agency Rulemaking Under the Law,” <https://www.justia.com/administrative-law/rulemaking-writing-agency-regulations/formal-rulemaking/> (accessed August 19, 2024).
159. JUSTIA, “Formal Agency Rulemaking Under the Law.”
160. Kent H. Barnett, “How the Supreme Court Derailed Formal Rulemaking,” University of Georgia Law School, *George Washington Law Review Arguendo*, Vol. 85, No. 1, 2017, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2911218. Barnett argues that the Peanut Butter rule’s protracted negotiations were due to FDA’s “failure to prioritize what it viewed as an insignificant matter;” not to any inherent defect of formal rulemaking. Regardless, what we advocate here is not a procedure to negotiate regulatory standards but a procedure to referee disputations about the scientific basis of rulemakings.
161. U.S. Environmental Protection Agency, *Peer Review Handbook*, 4th Edition, 2015, pp. 42-43, https://www.epa.gov/sites/default/files/2020-08/documents/epa_peer_review_handbook_4th_edition.pdf; Office of Personnel Management, *Information Quality Guidelines*, 2004, <https://www.opm.gov/information-management/information-quality-guidelines/information-quality-guidelines.pdf>.
162. James Enstrom. 2005. Fine particulate air pollution and total mortality among elderly Californians, 1973-2002. *Inhalation Toxicology*, 17(14):803-816, <http://scientificintegrityinstitute.org/IT121505.pdf>; Fred W. Lipfert and S. Stanley Young. 2012. A Closer Look at Air Pollution-Mortality Relationships for California Members of the American Cancer Society Cohort. American Statistical Association, <http://www.statlit.org/pdf/2012-Lipfert-Young-ASA.pdf>; S. Stanley Young et al. 2017. Air quality and acute deaths in California, 2000-2012. *Regulatory Toxicology and Pharmacology* 18: 173-184, <https://pubmed.ncbi.nlm.nih.gov/28619682/>.
163. CDC. 2023. Asthma Surveillance in the United States 2001-2021, Power Point, p. 8, <https://www.cdc.gov/asthma/Asthma-Prevalence-US-2023-508.pdf> (accessed August 17, 2024).
164. CDC, Asthma Data Visualizations, <https://www.cdc.gov/asthma/data-visualizations/default.htm> (accessed August 17, 2024).
165. Julia A. Wisnieski, M.D., et al. 2016. A comparison of seasonal trends in asthma exacerbations among children from geographic regions with different climates. *Allergy Asthma Proc.* 37: 475-481 (emphasis added), <https://www.ncbi.nlm.nih.gov/pubmed/27931303>; Stephen J. Teach, M.D., et al. 2015. Seasonal Risk Factors for Asthma Exacerbations among Inner City Children, *J Allergy Clin Immunol.* 135(6): 1465-1473.e5. (emphasis added), <https://www.ncbi.nlm.nih.gov/pubmed/25794658>.

166. Federal Advisory Committee Act, 5 U.S.C. § 5(b)(2)(3), <https://www.law.cornell.edu/uscode/text/5a/compiledact-92-463/section-5>.
167. EPA, Membership and Nomination Process, https://casac.epa.gov/ords/sab/r/sab_apex/casac/mnp (accessed August 18, 2024).
168. Watkins and Kazman, Information Quality Act Correction Request Regarding EPA's 2009 GHG Endangerment Finding, p. 2. citing EPA Inspector General, *Procedural Review of EPA's Greenhouse Gases Endangerment Finding Data Quality Processes*, September 26, 2011, p. 83, <https://www.epa.gov/sites/default/files/2015-10/documents/20110926-11-p-0702.pdf>.
169. OMB, Final Information Quality Bulletin for Peer Review, 70 FR 2664, 2669, January 14, 2005, <https://www.govinfo.gov/content/pkg/FR-2005-01-14/pdf/05-769.pdf>.
170. OMB (2005), Final Information Quality Bulletin for Peer Review, 70 FR 2664, 2669.
171. Quoting OMB (2005), Final Information Quality Bulletin for Peer Review, 70 FR 2664, 2669.
172. *Jacobellis v. Ohio*, 378 U.S. 184, 197 (1964) (Stewart, J., concurring).
173. Environmental Protection Network, *Resetting the Course of EPA: Restoring Science as the Backbone of EPA Decision-making*, <https://www.environmentalprotectionnetwork.org/wp-content/uploads/2020/08/Restoring-Science-as-Backbone-of-EPA-Decision-making.pdf> (accessed October 15, 2024). Sean Reilly, "EPA science advisers could face ouster under 'reset,'" *Greenwire*, March 26, 2021, <https://subscriber.politicopro.com/article/eenews/1063728617> (accessed March 28, 2023).
174. Lisa Friedman, "The E.P.A. administration purges its scientific advisory boards, which included many Trump appointees." *The New York Times*, <https://www.nytimes.com/2021/03/31/us/epa-advisory-boards-trump.html> (accessed October 15, 2024).
175. EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment, <https://www.epa.gov/cira/multi-model-framework-quantitative-sectoral-impacts-analysis>.
176. EPA, *Climate Change in the United States: Benefits of Global Action*, June 2015, <https://www.epa.gov/cira/climate-change-united-states-benefits-global-action-2015>.
177. EPA, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, November 2023, https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf.
178. *Chem. Mfrs. Ass'n v. EPA* 28 F.3d 1259, 1264 (D.C. Cir. 1994); *Am. Iron & Steel Inst. v. EPA*, 115 F.3d 979, 1004 (D.C. Cir. 1997); *Columbia Falls Aluminum Co. v. EPA*, 139 F.3d 914, 923 (D.C. Cir. 1998); *Sierra Club v. EPA*, 356 F.3d 296, 307 (D.C. Cir. 2004).
179. The technical distinction between these two types of global climate models is not material to the argument of this chapter, but it may be of interest to readers. One source explains the difference as follows. A GCM "represents physical processes occurring in the atmosphere, ocean, cryosphere, and interactions between these domains." ESMs do so as well, but also consider the climate feedback effects from changes in terrestrial and marine ecosystems. "Therefore, all ESMs are GCMs, but not all GCMs are ESMs." Rebecca G. Asch et al., *Demystifying Models: Answer to Ten Common Questions that Ecologists Have about Earth System Models*. *ASLO*, August 2016, <https://aslopubs.onlinelibrary.wiley.com/doi/pdf/10.1002/lob.10113>.

180. CMIP The Coupled Model Intercomparison Project, <https://wcrp-cmip.org/> (accessed August 20, 2024).
181. IPCC, 2013: *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Stocker, T.F. et al. eds., Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, <https://www.ipcc.ch/report/ar5/wg1/>.
182. IPCC, 2021: *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Masson-Delmotte, V. et al., eds. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, <https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/>.
183. A reanalysis uses a combination of interpolation models and data to fill in gaps in empirical records. See European Centre for Medium-Range Weather Forecasts, Climate Reanalysis, <https://www.ecmwf.int/en/research/climate-reanalysis> (accessed August 21, 2024).
184. John R. Christy. 2017. State of the Climate in 2016. *Bull. Amer. Meteor. Soc.* 98, (8), S16-S17, <https://journals.ametsoc.org/view/journals/bams/98/8/2017bamsstateoftheclimate.1.xml>. John R. Christy and Richard T. McNider. 2017. Satellite Bulk Tropospheric Temperatures as a Metric for Climate Sensitivity. *Asia-Pac. J. Atmos. Sci.*, 53(4), 511-518, <https://link.springer.com/article/10.1007/s13143-017-0070-z>.
185. INM-CM4 projections form the dotted orange line intersecting the circles and squares.
186. E. Volodin. 2021. The Mechanisms of Cloudiness Evolution Responsible for Equilibrium Climate Sensitivity in Climate Model INM-CM4-8. *Geophysical Research Letters* Volume 48, Issue 24, <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GL096204>.
187. D. Painter et al. 2018. Equilibrium Climate Sensitivity Obtained from Multimillennial Runs of Two GFDL Climate Models. *Journal of Geophysical Research: Atmospheres*, 123, 1921–1941, <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2017JD027885>.
188. The GFDL-CM3 projection is the solid orange line that runs off the margins in second chart.
189. R. McKittrick and J. Christy. 2020. Pervasive Warming Bias in CMIP6 Tropospheric Layers. *Earth and Space Science* Volume 7, Issue 9, <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020EA001281>.
190. R. McKittrick and J. Christy. 2018. A Test of the Tropical 200- to 300-hPa Warming Rate in Climate Models, *Earth Space and Science*, 5, 529–536, <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2018EA000401>.
191. Frédéric Hourdin et al. 2017. The Art and Science of Climate Model Tuning. *Bulletin of the American Meteorological Society* Vol. 98: Issue 3, <https://journals.ametsoc.org/view/journals/bams/98/3/bams-d-15-00135.1.xml>. For further discussion, see Patrick J. Michaels, “Endangered Science and the EPA’s Finding of Endangerment from Carbon Dioxide,” in Michaels and Keeley, eds., *Scientocracy*, pp. 247-249.

192. Big Data e-learning, “In-Sample vs Out-Of-Sample: The Secret to Building Models that Can Predict the Future,” <https://www.bigdatalearning.com/blog/in-sample-out-sample> (accessed October 10, 2024).
193. Zeke Hausfather, “Cold Water on Hot Models,” The Breakthrough Institute, February 11, 2020, <https://thebreakthrough.org/issues/energy/cold-water-hot-models>; *Explainer: How scientists estimate climate sensitivity*, Carbon Brief, June 19, 2018, <https://www.carbonbrief.org/explainer-how-scientists-estimate-climate-sensitivity/>.
194. Jiang Zhu et al. 2020. High climate sensitivity in CMIP6 model not supported by paleoclimate. *Nature Climate Change* Vol. 10, 378–379, <https://www.nature.com/articles/s41558-020-0764-6>.
195. NOAA National Centers for Environmental Information, Climate Change in the Context of Paleoclimate, <https://www.ncei.noaa.gov/news/climate-change-context-paleoclimate> (accessed August 21, 2024).
196. Zhu et al. (2020). High climate sensitivity in CMIP6 model not supported by paleoclimate.
197. Zeke Hausfather et al. 2022. Climate simulations: recognize the ‘hot model’ problem. *Nature* Vol. 605, 26-29, <https://media.nature.com/original/magazine-assets/d41586-022-01192-2/d41586-022-01192-2.pdf>.
198. U.S. Energy Information Administration, Natural Gas, U.S Shale Production, 2007-2021, December 30, 2022, https://www.eia.gov/dnav/ng/hist/res_epg0_r5302_nus_bcfa.htm.
199. Justin Ritchie and Hadi Dowlatabadi, *The 1,000 GtC Coal Question: Are Cases of High Future Coal Combustion Plausible?* Resources for the Future, RFF DP 16-45, November 2016, <https://media.rff.org/documents/RFF-DP-16-45.pdf>; Justin Ritchie and Hadi Dowlatabadi. 2017. Why Do Climate Change Scenarios Return to Coal? *Energy* 140: 1276-1291, <https://www.sciencedirect.com/science/article/abs/pii/S0360544217314597>.
200. RCP stands for Representative Concentration Pathway. An RCP is an estimate of the future GHG emissions and atmospheric concentrations required to achieve a specific “radiative forcing” by 2100. SSP stands for Shared Socioeconomic Pathway. An SSP is a baseline socioeconomic development scenario that achieves a specific forcing by 2100. Radiative forcing is the imbalance, measured in watts per square meter (W/m²), between incoming short-wave solar radiation and outgoing longwave infrared radiation. Thus, in both RCP8.5 and SSP5-8.5, the rise in greenhouse gas concentration by 2100 adds 8.5W/m² of warming pressure compared to the pre-industrial climate.
201. Zeke Hausfather and Glenn P. Peters, “Emissions – the ‘business as usual’ story is misleading,” *Nature*, January 29, 2020, <https://www.nature.com/articles/d41586-020-00177-3>; Roger Pielke, Jr. and Justin Ritchie, “How Climate Scenarios Lost Touch with Reality,” *Issues in Science & Technology*, Vol. XXXVII, No. 4, Summary 2021, <https://issues.org/climate-change-scenarios-lost-touch-realitypielke-ritchie/>.
202. EIA, International Energy Outlook 2023, <https://www.eia.gov/outlooks/ieo/narrative/index.php> (accessed August 21, 2024).
203. Kewan Riahi et al. 2011. RCP8.5—A Scenario of Comparatively High Greenhouse Gas Emissions. *Climate Change* 109: 33-57, <https://link.springer.com/article/10.1007/s10584-011-0149-y>.

204. St. Louis Federal Reserve Bank, Producer Price Index by Industry—Coal Mining, Dec. 1985-June 2024, <https://fred.stlouisfed.org/series/PCU21212121#> (accessed August 21, 2024).
205. Hausfather and Peters (2020), “Emissions – the ‘business as usual’ story is misleading.”
206. Kevin Rennert et al. 2022. *The Social Cost of Carbon: Advances in Long-Term Probabilistic Projections of Population, GDP, Emissions, and Discount Rates, Resources for the Future*, <https://www.rff.org/publications/working-papers/the-social-cost-of-carbon-advances-in-long-term-probabilistic-projections-of-population-gdp-emissions-and-discount-rates/>.
207. USGCRP, NCA4, Chapter 29, Reducing Risks Through Emissions Mitigation, p. 1359.
208. Roger Pielke, Jr. et al. 2022. Plausible 2005-2050 emissions scenarios project between 2°C and 3°C of warming by 2100. *Environ. Res. Lett.* 17: 02407, <https://iopscience.iop.org/article/10.1088/1748-9326/ac4ebf/pdf>.
209. Google Scholar, <https://scholar.google.com/> (accessed August 21, 2024).
210. IPCC, Sixth Assessment Report, *Climate Change 2021: The Physical Science Basis*, Chapter 1, pp. 238-239, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter01.pdf.
211. Roger Pielke, Jr., “How to Understand the New IPCC Report: Part 1, Scenarios,” The Honest Broker, Substack, August 10, 2021, <https://rogerpielkejr.substack.com/p/how-to-understand-the-new-ipcc-report?s=r>.
212. Global life expectancy increased 46.5 years in 1960 to 71 years in 2021—a 31 percent improvement. Our World in Data, Life Expectancy, <https://ourworldindata.org/life-expectancy> (accessed October 10, 2024).
213. In current U.S. dollars, global per capita income increased from \$450 in 1960 to \$13,138.3 in 2023—a 2,820 percent improvement. World Bank, GDP per capita (current US\$), 1960-2023, <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD> (accessed October 10, 2024).
214. Global per capita kilocalorie supply from all foods per increased from 2,282.25 kcal in 1961 to 2,959.11 kcal in 2021—a 30 percent improvement. Our World in Data, Per capita kilocalorie supply from all foods per day, 1961-2021, <https://ourworldindata.org/food-supply> (accessed August 30, 2024).
215. Globally, from 1961 to 2022, corn yields increased from 1.94 t to 5.72 t per hectare (194 percent); wheat yields increased from 1.09 t to 3.69 t per hectare (238 percent); and rice yields increased from 1.87 t to 4.70 t (151 percent). Our World in Data, Crop Yields, <https://ourworldindata.org/crop-yields> (accessed October 10, 2024).
216. Kevin Dayaratna et al. 2020. Climate sensitivity, agricultural productivity and the social cost of carbon in FUND. *Environmental Economics and Policy Studies* 22: 433–448, <https://link.springer.com/article/10.1007/s10018-020-00263-w>.
217. Bjorn Lomborg, “We’re Safer from Climate Disasters than Ever Before,” *Wall Street Journal*, November 3, 2021, <https://lomborg.com/news/were-safer-climate-disasters-ever>.
218. Bjorn Lomborg, “The risk of dying from climate-related disasters has declined precipitously,” X, January 1, 2023, <https://twitter.com/BjornLomborg/status/1612790152539131904>.

219. Our World in Data, Incidence of malaria, <https://ourworldindata.org/malaria> (accessed August 30, 2024).
220. Our World in Data, Malaria deaths by world region, <https://ourworldindata.org/malaria> (accessed August 30, 2024).
221. Scott C. Sheridan et al. 2021. Recent Trends in Heat-Related Mortality in the United States: An Update through 2018. *Weather, Climate, and Society* Volume 13, p. 98, <https://journals.ametsoc.org/view/journals/wcas/13/1/wcas-d-20-0083.1.xml>.
222. Giuseppe Formetta and Luc Feyen. 2019. Empirical Evidence of Declining Global Vulnerability to Climate-Related Hazards, *Global Environmental Change*, 57: 1-9, https://www.researchgate.net/publication/333507964_Empirical_evidence_of_declining_global_vulnerability_to_climate-related_hazards.
223. Roger Pielke, Jr. 2024. Scientific Integrity and U.S. “Billion Dollar Disasters.” *NJP Natural Hazards* 1:12, <https://www.nature.com/articles/s44304-024-00011-0>.
224. EPA, *Climate Change in the United States: Benefits of Global Action*, June 2015, <https://www.epa.gov/cira/climate-change-united-states-benefits-global-action-2015>.
225. Paris Agreement, Article 2(1)(a), https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf.
226. EPA, *Benefits of Global Action*, pp. 10-11.
227. EPA, *Benefits of Global Action*, p. 16.
228. Empirically constrained studies use “long and detailed observational data sets” (such as ocean heat uptake values) to estimate climate sensitivity with energy balance models. See Kevin Dayaratna et al. 2017. Empirically-Constrained Climate Sensitivity and the Social Cost of Carbon, *Climate Change Economics* Vol. 8, No. 2, <https://www.worldscientific.com/doi/abs/10.1142/S2010007817500063>.
229. Patrick J. Michaels and Paul C. (“Chip”) Knappenberger, “The Collection of Evidence for a Low Climate Sensitivity Continues to Grow,” *Cato at Liberty*, September 25, 2014, <https://www.cato.org/blog/collection-evidence-low-climate-sensitivity-continues-grow>.
230. EPA, *Benefits of Global Action*, pp. 26-27.
231. EPA, *Benefits of Global Action*, p. 27. In a technical appendix, the EPA acknowledges there is “less certainty” about the effects of warmer weather on PM_{2.5} formation than on ozone formation. EPA, *Technical Appendix for Report: Climate Change in the United States: Benefits of Global Action*, p. 34, <https://www.epa.gov/sites/default/files/2021-03/documents/technicalappendixfinal.pdf>.
232. EPA, Air Quality Trends Show Clean Air Progress, <https://gispub.epa.gov/air/trendsreport/2024/#introduction> (accessed August 26, 2024).
233. EPA, *Benefits of Global Action*, p. 25.
234. EPA, *Benefits of Global Action*, p. 25.
235. Fernando Garcia-Menendez et al. 2015. U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation. *Environmental Science & Technology* 49, 7580–7588, https://globalchange.mit.edu/sites/default/files/MITJPSPGC_Reprint_15-13.pdf.
236. Statista, Annual pollutant emissions in the United States from 1970 to 2023, by pollutant, <https://www.statista.com/statistics/1139418/air-pollutant-emissions-by-type-us/>.

237. Garcia-Menendez (2015), Table 2, p. 7584.
238. Oren Cass, *Overheated: How Flawed Analyses Overestimate the Costs of Climate Change*, Manhattan Institute, March 2018, p. 13, <https://media4.manhattan-institute.org/sites/default/files/R-OC-0318.pdf>.
239. USGCRP, *Fourth National Climate Assessment*, Volume 2: Impacts, Risks, and Adaptation in the United States; Chapter 29. Reducing Risks Through Emissions Mitigation, p. 1360, https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf.
240. Coral Davenport and Kendra Pierre-Louis, “U.S. Climate Report Warns of Damaged Environment and Shrinking Economy,” *The New York Times*, November 23, 2018, <https://www.nytimes.com/2018/11/23/climate/us-climate-report.html>.
241. Hsiang et al. 2017. Estimating Economic Damage from Climate Change in the United States. *Science* Vol. 356, No. 6345, <https://www.science.org/doi/10.1126/science.aal4369>.
242. A Krause et al. 2022. Confidence levels and likelihood terms in IPCC reports: a survey of experts from different scientific disciplines. *Climate Change* Volume 173, Number 2, <https://link.springer.com/article/10.1007/s10584-022-03382-3>.
243. EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis, p. 79.
244. USGCRP, NCA4, Chapter 8, Coastal Effects, p. 327.
245. Bjorn Lomborg, “Climate Change Calls for Adaptation, Not Panic,” *Wall Street Journal*, October 21, 2021, <https://www.wsj.com/articles/climate-change-adaptation-panic-exaggerating-disaster-11634760376>.
246. OMB (2005), Final Information Quality Bulletin for Peer Review, 70 FR 2664, 2669.
247. *Chem. Mfrs. Ass’n v. EPA* 28 F.3d 1259, 1264 (D.C. Cir. 1994); *Am. Iron & Steel Inst. v. EPA*, 115 F.3d 979, 1004 (D.C. Cir. 1997); *Columbia Falls Aluminum Co. v. EPA*, 139 F.3d 914, 923 (D.C. Cir. 1998); *Sierra Club v. EPA*, 356 F.3d 296, 307 (D.C. Cir. 2004).
248. Michaels, “Endangered Science,” p. 43.
249. The title alludes to Bob Dylan’s lyric, “You don’t need a weatherman to know which way the wind blows.” A weatherman’s common-sense methodology is much needed in EPA, USGCRP, and IPCC climate impact assessments.
250. Interagency Working Group on the Social Cost of Carbon (IWG), *Technical Support Document: - Social Cost of Carbon Regulatory Impact Analysis under Executive Order 12886*, February 2010, pp. 2, 28, https://www.epa.gov/sites/default/files/2016-12/documents/scc_tsd_2010.pdf; EPA Fact Sheet: Social Cost of Carbon, p. 1, December 2016, <https://www.epa.gov/sites/default/files/2016-07/documents/social-cost-carbon.pdf>.
251. Marshall Burke and Lawrence Goulder, Stanford Explainer: Social Cost of Carbon, June 7, 2021, <https://news.stanford.edu/2021/06/07/professors-explain-social-cost-carbon/>.
252. EPA (2024) Multi-Pollutant Emissions Standards for Model Years 2027 and Later, 89 FR 27842, 27856, 27860.
253. MAGICC stands for Model for the Assessment of Greenhouse Gas Induced Climate Change. See <https://magicc.org/> (accessed September 2, 2024).

254. Benjamin Zycher, “Biden’s EPA can justify his new EV rules only by cooking the books,” *The Hill*, April 2, 2024, <https://thehill.com/opinion/energy-environment/4564253-bidens-epa-can-justify-his-new-ev-rules-only-by-cheating/>.
255. Global temperature changes are typically calculated as monthly, seasonal, or annual departures (“anomalies”) from a 30-year or longer average. Due to inherent uncertainties in measurement and evaluation, scientists who estimate anomalies also estimate an uncertainty range or margin of error, expressed in plus/minus values. Berkeley Earth calculates an uncertainty range of $\pm 0.04^{\circ}\text{C}$ for its estimate of the 2023 global temperature anomaly. (Robert Rohde, Global Temperature Report for 2023, Berkeley Earth, January 12, 2024, <https://berkeleyearth.org/global-temperature-report-for-2023/>). Thus, the EPA auto rule’s potential 0.0068°C global warming reduction is about 12 times smaller than Berkeley Earth’s 0.08°C margin of error.
256. Robert S. Pindyck, *Climate Change Policy: What Do the Models Tell Us?* NBER Working Paper No. 19244 July 2013, https://www.nber.org/system/files/working_papers/w19244/w19244.pdf.
257. IWG, *Technical Support Document: - Technical Update on the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*, May 2013, https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf.
258. IWG, *Technical Support Document:- Technical Update of the Social Cost of Carbon for Regulatory Analysis under Executive Order 12866*, August 2016, https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.
259. IWG, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, Interim Estimates under Executive Order 13990*, February 2021, https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.
260. The original OMB Circular A-4 recommended discount rates of 3 percent and 7 percent in regulatory benefit-cost analysis. See OMB, Circular A-4, September 17, 2003, p. 33, https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf. The IWG used discount rates ranging from 2.5 percent to 5 percent. OMB’s updated Circular A-4 in 2023 recommends discount rates of 2 percent or lower. See OMB, Circular No. A-4, November 9, 2023, p. 76, <https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf>. President Trump’s January 20, 2025 Executive Order, “Unleashing American Energy,” requires agencies to use discount rates “consistent with the guidance contained in OMB Circular A-4 of September 17, 2003,” <https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/>.
261. Craig Idso, *The Positive Externalities of Carbon Dioxide: Estimating the Monetary Benefits of Rising Atmospheric CO₂ Concentrations on Global Food Production*, October 21, 2013, <https://co2science.org/education/reports/co2benefits/co2benefits.php>.
262. Marlo Lewis, “Yet Another Study Confirms Ecological Benefits of Carbon Dioxide,” Open Market, April 10, 2017, <https://cei.org/blog/yet-another-study-confirms-ecological-benefits-of-carbon-dioxide/>.
263. EPA, Science Inventory: Dynamic Integrated Climate Economy (DICE), https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=OAP&dirEntryId=240426 (accessed September 3, 2024).

264. EPA, Science Inventory: Policy Analysis of Greenhouse Effect (PAGE), https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=OAP&dirEntryId=240711 (accessed September 3, 2024).
265. The PAGE model's adaptation assumptions are discussed on pp. 14-15 of the IWG's 2016 TSD, https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.
266. Roger Pielke, Jr., "The Biden Administration Just Failed Its First Scientific Integrity Test," *The Honest Broker*, February 28, 2021, <https://rogerpielkejr.substack.com/p/the-biden-administration-just-failed>.
267. Kevin D. Dayaratna and David Kreutzer. 2014. "Environment: Social Cost of Carbon Statistical Modeling Is Smoke and Mirrors," *Natural Gas & Electricity*, Vol. 30, No. 12, pp. 7-11, <https://onlinelibrary.wiley.com/doi/abs/10.1002/gas.21771>; Dayaratna et al. 2017. "Empirically Constrained Climate Sensitivity and the Social Cost of Carbon," *Climate Change Economics*, Vol. 8, No. 2 pp. 1-12, <https://www.jstor.org/stable/90009410>; Dayaratna et al. 2020. Climate sensitivity, agricultural productivity, and the social cost of carbon in FUND. *Environmental Economics and Policy Studies* Volume 22, pages 433-448, <https://link.springer.com/article/10.1007/s10018-020-00263-w>.
268. EPA, *Report on the Social Cost of Greenhouse Gases*, pp. 107-140.
269. The Climate Framework for Uncertainty, Negotiation, and Distribution (FUND) model, <https://www.fund-model.org/> (accessed September 3, 2024).
270. Leon Clarke et al. 2009. International climate policy architectures: Overview of the EMF 22 International Scenarios. *Energy Economics* Volume 31, Supplement 2, S64-S81, <https://www.sciencedirect.com/science/article/pii/S0140988309001960?via%3Dihub>.
271. IWG, 2010 TSD, pp. 15-16.
272. Carbon intensity defined as the amount of CO₂ emitted per unit of GDP.
273. IWG, 2010 TSD, p. 43.
274. EPRI, *Understanding the Social Cost of Carbon: A Technical Assessment*, Section 4, pp.14-15, October 2014, <https://www.epri.com/research/products/3002004657> (hereafter EPRI 2014).
275. Kevin Rennert et al. 2022. *The Social Cost of Carbon: Advances in Long-Term Probabilistic Projections of Population, GDP, Emissions, and Discount Rates*.
276. EPA, *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*, pp. 23-26.
277. My calculation based on the chart below, sent to me by Dr. Rennert on 12/2/2022.
278. OMB, Circular No. A-4, November 9, 2023, p. 76, <https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf>.
279. Roger Pielke, Jr., "Secret Sauce: You'll Never Guess What Drives the Biden Administration's Social Cost of Carbon," December 4, 2023, <https://rogerpielkejr.substack.com/p/secret-sauce>.
280. EPA. 2023. *Report on the Social Cost of Greenhouse Gases*, p. 45.
281. Climate Impact Lab, Data-driven Spatial Climate Impact Model (DSCIM), <https://impactlab.org/research/data-driven-spatial-climate-impact-model-user-manual-version-092023-epa/> (accessed September 3, 2024).

282. Carlton et al. 2022. Labor Disutility in a Warmer World: The Impact of Climate Change on the Global Workforce, SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4221478.
283. Roger Pielke, Jr., “Public Health and Climate Change: How to be an informed consumer in public discussions of climate change,” Substack, April 24, 2023, <https://rogerpielkejr.substack.com/p/public-health-and-climate-change>.
284. Keywan Riahi et al. The Shared Socio-Economic Pathways and their energy, land use, and greenhouse gas emissions implications: An Overview, *Global Environmental Change*, 42, 153-168, <https://www.sciencedirect.com/science/article/pii/S0959378016300681>.
285. Zeke Hausfather, *Explainer: How ‘Shared Socioeconomic Pathways’ explore future climate change*, Carbon Brief, April 19, 2018, <https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change/>.
286. EPRI (2014), *Understanding the Social Cost of Carbon*, p. 4-14.
287. Pindyck (2013), *Climate Change Policy: What Do the Models Tell Us?* p. 3.

Chapter 2

1. See e.g. “Air Quality,” Environmental Performance Index (Yale University), accessed October 24, 2024, <https://epi.yale.edu/epi-results/2022/component/air> and “Ambient air pollution data,” World Health Organization, accessed October 24, 2024, <https://www.who.int/data/gho/data/themes/air-pollution/ambient-air-pollution>.
 2. Clean Air Amendments of 1970, Public Law No. 91-604, December 31, 1970. <https://www.congress.gov/bill/91st-congress/house-bill/17255/text>.
 3. Clean Air Act Amendments of 1977, Public Law No. 95-95, August 7, 1977. <https://www.congress.gov/bill/95th-congress/house-bill/6161/text>.
- Clean Air Act Amendments of 1990, Public Law No. 101-549, November 15, 1990. <https://www.congress.gov/bill/101st-congress/senate-bill/1630/text>.
- “Evolution of the clean air act,” Environmental Protection Agency, accessed October 24, 2024, [https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial\)%20sources%20and%20mobile%20sources.](https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial)%20sources%20and%20mobile%20sources.)
4. Technically the 1970 bill was also an “amendment”; the origin of what we call the “Clean Air Act” was a 1955 bill called the Air Pollution Control Act. “Evolution of the clean air act,” Environmental Protection Agency, accessed October 24, 2024, [https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial\)%20sources%20and%20mobile%20sources.](https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial)%20sources%20and%20mobile%20sources.) For the history of the CAA, Congressional Research Service, *Clean Air Act: A Summary of the Act and Its Major Requirements*, September 13, 2022, <https://crsreports.congress.gov/product/pdf/RL/RL30853>.
 5. See e.g. Indur M. Goklany, *Clearing the Air: The Real Story of the War on Air Pollution* (Washington, D.C.: Cato Institute, 1999) <https://www.cato.org/books/clearing-air>. In addition, a Brookings Institution study analyzed air pollutant data and concluded “these data suggest that pollution reduction was more effective in the 1960s, before there was a serious federal policy dealing with stationary sources, than since the 1970 Clean Air

Act amendments.” Robert W. Crandall, *Controlling Industrial Pollution: The Economics and Politics of Clean Air*, (Washington, DC: Brookings Institution, January 1983) p. 19, <https://archive.org/details/controllingindus00cran/page/18/mode/2up>.

6. Susan E. Dudley, “The Diminishing Returns of Tighter Fine Particle Standards,” *Forbes*, March 27, 2023, <https://www.forbes.com/sites/susandudley/2023/03/27/the-diminishing-returns-of-tighter-fine-particle-standards/>.

7. Environmental Protection Agency, “Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles,” Final Rule, *Federal Register*, Vol. 89 No. 76 (April 18, 2024) pp. 27842-28215, <https://www.federalregister.gov/documents/2024/04/18/2024-06214/multi-pollutant-emissions-standards-for-model-years-2027-and-later-light-duty-and-medium-duty>.

8. Environmental Protection Agency, “New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule,” Final Rule, *Federal Register*, Vol. 89, No. 91 (May 9, 2024), pp. 39798-40064, <https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>.

9. Environmental Protection Agency, “Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units,” Final Rule, *Federal Register*, Vol. 80 No. 205 (October 23, 2015), pp. 64662-64964, <https://www.federalregister.gov/documents/2015/10/23/2015-22842/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>.

10. *West Virginia v. Environmental Protection Agency*, 597 U.S. 697(2022) <https://supreme.justia.com/cases/federal/us/597/20-1530/>.

11. “Criteria Air Pollutants,” Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/criteria-air-pollutants>. The following are the chemical formulas for the pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ground-level ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂).

12. NAAQS Table, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. EPA promulgated NAAQS for SO₂, PM, Ozone, Nitrogen Dioxide, and Carbon Monoxide on April 30, 1971, it promulgated NAAQS for lead on October 5, 1978.

13. Air Quality-National Summary, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/air-trends/air-quality-national-summary>.

14. Air Quality-National Summary, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/air-trends/air-quality-national-summary>. See info under emissions chart.

15. This is based on the annual standard, but the 24-hour standard has a similar decline (36 percent).

16. The PM_{2.5} (24-hour) standard did increase by 1 percent from 2010-2023, but the PM_{2.5} (annual) standard declined by 15 percent, and direct PM_{2.5} emissions declined by 11 percent in that same time period.

17. What is Ozone, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/ozone-pollution-and-your-patients-health/what-ozone>.
18. Air Quality-National Summary, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/air-trends/air-quality-national-summary>. During this time, there was also an increase in gross domestic product (GDP) of 321 percent. The relationship between GDP and emissions is a standard measure that EPA uses. This GDP number is being referenced to show that economic growth has not led to environmental harm. It is in no way intended to demonstrate that environmental regulation has helped with economic growth or that environmental regulation did not hinder economic growth. Some may point to declining emissions and rising GDP as evidence that CAA regulations do not hinder economic growth or even contribute to it. However, the same trends may be evidence of something quite different: A resourceful people can prosper even when regulations are wasteful or excessive.
19. “EPA Finalizes NAAQS for Particulate Matter,” Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/newsreleases/epa-finalizes-naaqs-particulate-matter>.
20. “SDG Indicator 11.6.2 Concentrations of fine particulate matter (PM2.5),” World Health Organization, accessed October 24, 2024, [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/concentrations-of-fine-particulate-matter-\(pm2-5\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/concentrations-of-fine-particulate-matter-(pm2-5)).
21. “Country Composition of WEO Groups,” International Monetary Fund, accessed October 24, 2024, <https://www.imf.org/en/Publications/WEO/weo-database/2023/April/groups-and-aggregates>.
22. “Easy to read-The European Union,” The European Union, accessed October 24, 2024, https://european-union.europa.eu/easy-read_en.
23. Looking at air quality generally, the United States was ranked 16 out of 180 countries for air quality in the Yale Environmental Performance Index.
“Air Quality,” Environmental Performance Index (Yale University), accessed October 24, 2024, <https://epi.yale.edu/epi-results/2022/component/air>.
24. As this label suggests, “air toxics” are pollutants of heightened concern that are regulated under separate CAA authority, distinct from the NAAQS program. See *generally* CAA § 112, 42 U.S.C. § 7412, accessed October 24, 2024, <https://www.law.cornell.edu/uscode/text/42/7412>.
25. “What are Hazardous Air Pollutants,” Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/haps/what-are-hazardous-air-pollutants>.
26. “Initial List of Hazardous Air Pollutants with Modifications,” Environmental Protection Agency, accessed January 1, 2025, <https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications>.
27. “What are Hazardous Air Pollutants,” Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/haps/what-are-hazardous-air-pollutants>.
28. Air Quality-National Summary, Environmental Protection Agency, accessed October 24, 2024, <https://www.epa.gov/air-trends/air-quality-national-summary>.
29. See e.g. Dr. Kim Knowlton, “Climate Change and Health: Air Quality,” National Resources Defense Council, accessed October 24, 2024, <https://www.nrdc.org/resources/climate-change-and-health-air-quality#/map>.

and Justine McDaniel, “Nearly 2 in 5 Americans Breathe Unhealthy Air. Why it’s getting worse.” The Washington Post, April 24, 2024, <https://www.washingtonpost.com/climate-environment/2024/04/24/worsening-air-pollution-climate-change/>.

30. Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.

31. Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, p. 10, https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.

32. The 92 percent was calculated using the cost data for the EPA in Table 1-1 and using the cost of the 26 Office of Air and Radiation rules in Table 1-2 from the 2017 OMB report. The results were 92 percent regardless of whether taking lower bound or upper bound numbers. https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.

33. 2017 report, see Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf. The high costs are also discussed in the 2015 report that analyzed rules from 2004-2014 and found that EPA rules accounted for 44 to 55 percent of the monetized costs across the federal government.

Office of Management and Budget, *2015 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2015, *ReviewerDoc-1-2016-OIRA-253-PADs---Policy-Officials-Review-FYI-Email-18.docx*. There was no final 2016 report and more recent reports do not appear to have the same 10-year analysis.

34. Office of Management and Budget, *2017 Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, p. 10, https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf. These are “rules that have a significant aim to improve air quality” as OMB explains. OMB did not do a cost calculation to figure out what percent of the costs of EPA rules are air rules. However, data was available to calculate this percentage as explained in an earlier footnote. The cost calculation uses the same 26 rules that OMB appears to be referring to as “rules that have a significant aim to improve air quality.” Further, a review of the 26 rules appears to be fairly classified in this manner.

35. The methodology used for the Regulation Rodeo site can be found at “Regulation Rodeo,” American Action Forum, accessed January 22, 2025, <https://regrodeo.com/>. According to the site, “RegRodeo only tracks rules that have quantified estimates of either net costs or savings or paperwork burden changes in either the Federal Register notice for the rule, or the regulatory impact analysis typically found in the docket for the rule.”

36. “Regulation Rodeo,” American Action Forum, accessed October 24, 2024, <https://regrodeo.com/>.
37. Environmental Protection Agency, “Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles,” Final Rule, *Federal Register*, Vol. 89 No. 76 (April 18, 2024) pp. 27842-28215, <https://www.federalregister.gov/documents/2024/04/18/2024-06214/multi-pollutant-emissions-standards-for-model-years-2027-and-later-light-duty-and-medium-duty>. and Marlo Lewis Jr., “Questions about EPA’s electric vehicle rule—some answered, some not,” Competitive Enterprise Institute, March 28, 2024, <https://cei.org/blog/questions-about-epas-electric-vehicle-rule-some-answered-some-not/>.
38. See e.g. Patricia Patnode, “House expected to consider legislation to block EPA’s ‘EV mandate,’” Competitive Enterprise Institute, September 19, 2024, <https://cei.org/blog/house-expected-to-consider-legislation-to-block-epas-ev-mandate/>. and David Gluckman, “Gas vs. Electric Cars: Pros and Cons of Each,” Car and Driver, March 30, 2024, <https://www.caranddriver.com/features/a60300078/gas-vs-electric-cars-pros-and-cons/>.
39. David Rogers, Senate passes \$787 billion stimulus bill, POLITICO, February 2, 2009, <https://www.politico.com/story/2009/02/senate-passes-787-billion-stimulus-bill-018837>.
40. There are many reasons why the legislative process ensures greater buy-in. See e.g. Daren Bakst, *Congress, Not Agencies, Should Answer Major Policy Questions: A legislative blueprint for restoring representative government* (Washington DC: Competitive Enterprise Institute, July 2024) https://cei.org/wp-content/uploads/2024/07/Congress_Not_Agencies_Should_Answer_Major_Policy_Questions.pdf.
41. Christine Perkins, “Joseph Goffman joins Environmental Law Program as new executive director,” Harvard Law Today, October 02, 2017, <https://hls.harvard.edu/today/joseph-goffman-joins-environmental-law-program-new-executive-director/>.
42. Environmental Protection Agency, “Strengthening Transparency in Pivotal Science Underlying Significant Regulatory Actions and Influential Scientific Information,” Final Rule, *Federal Register*, Vol. 86 No. 3 (January 6, 2021) pp. 469-493, <https://www.federalregister.gov/documents/2021/01/06/2020-29179/strengthening-transparency-in-pivotal-science-underlying-significant-regulatory-actions-and>.
43. Environmental Defense Fund et al v. U.S. Environmental Protection Agency et al, No. 4:2021cv00003 - Document 36 (D. Mont. 2021), <https://law.justia.com/cases/federal/district-courts/montana/mtdce/4:2021cv00003/65797/36>.
44. Lisa Friedman, “The E.P.A. administration purges its scientific advisory boards, which included many Trump appointees.” The New York Times, March 31, 2021, <https://www.nytimes.com/2021/03/31/us/epa-advisory-boards-trump.html>.
45. “Resetting the Course of EPA: Restoring Science as the Backbone of EPA Decision-making,” Environmental Protection Network, August, 2020, <https://www.environmentalprotectionnetwork.org/wp-content/uploads/2020/08/Restoring-Science-as-Backbone-of-EPA-Decision-making.pdf>. Sean Reilly, “EPA science advisers could face ouster under ‘reset,’” Greenwire, March 26, 2021, <https://subscriber.politicopro.com/article/eenews/1063728617>.
46. Lisa Friedman, “The E.P.A. administration purges its scientific advisory boards, which included many Trump appointees.” The New York Times, March 31, 2021, <https://www.nytimes.com/2021/03/31/us/epa-advisory-boards-trump.html>.

47. 42 U.S. Code § 7604, accessed October 24, 2024, <https://www.law.cornell.edu/uscode/text/42/7604>.

48. Environmental Protection Agency, “National Emission Standards for Hazardous Air Pollutants From Coal- and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units,” Final Rule, Federal Register, Vol. 77, No. 32 (February 16, 2012), pp. 9304-9513, <https://www.federalregister.gov/documents/2012/02/16/2012-806/national-emission-standards-for-hazardous-air-pollutants-from-coal-and-oil-fired-electric-utility>.

49. *Michigan v. Environmental Protection Agency*, 576 U.S. 743 (2015), <https://supreme.justia.com/cases/federal/us/576/743/>.

50. *Michigan v. Environmental Protection Agency*, 576 U.S. 743 (2015), <https://supreme.justia.com/cases/federal/us/576/743/>.

51. *Whitman v. American Trucking Assn's, Inc.*, 531 U.S. 457 (2001), <https://supreme.justia.com/cases/federal/us/531/457/>.

52. Gregory Conko, *Throwing Precaution to the Wind: The Perils of the Precautionary Principle* (Washington, DC: Competitive Enterprise Institute, October 25, 2024), <https://cei.org/publication/throwing-precaution-to-the-wind-the-perils-of-the-precautionary-principle/>.

Jonathan H. Adler, “The Problems with Precaution: A Principle Without Principle,” American Enterprise Institute, May 25, 2024, <https://www.aei.org/articles/the-problems-with-precaution-a-principle-without-principle/>.

Bernard D. Goldstein and Russel S. Carruth, *Implications of the Precautionary Principle for Environmental Regulation in the United States: Examples from the Control of Hazardous Air Pollutants in the 1990 Clean Air Act Amendments* (Durham, NC: Duke University, 2003), <https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1300&context=lcp>.

53. Even when Congress requires the EPA to promulgate a rule when it reaches a scientific conclusion, the question of whether the rule is warranted is still not being based solely on science. Congress has made the policy choice that regardless of other factors, a scientific conclusion should trigger a rule.

54. President Barack Obama, Memorandum for the Heads of Executive Departments and Agencies, Scientific Integrity, March 9, 2009, <https://obamawhitehouse.archives.gov/the-press-office/memorandum-heads-executive-departments-and-agencies-3-9-09> (accessed March 28, 2023).

55. See e.g. Mary Graham, *Environmental Protection & the States: “Race to the Bottom” or “Race to the Bottom Line”?* (Washington, DC, Brookings Institution, December 1, 1998) <https://www.brookings.edu/articles/environmental-protection-the-states-race-to-the-bottom-or-race-to-the-bottom-line/>.

56. The CAA did not address the issue of global climate change until the 1990 amendments in which it did not authorize regulation. Congress.gov. “Text - S.1630 - 101st Congress (1989-1990): Clean Air Act Amendments of 1990.” November 15, 1990. <https://www.congress.gov/bill/101st-congress/senate-bill/1630/text>. The following is included in the text below, but it is worth adding here: The “Inflation Reduction Act” of 2022 (IRA) did insert *references* to greenhouse gases at various places in the CAA, and did create new CAA § 136 that authorizes EPA to charge a *fee* for “waste” methane emissions from

the petrochemical sector above certain thresholds and subject to certain exemptions, but the IRA provided EPA with no new authority to *restrict* greenhouse gas emissions through binding, compulsory regulation.

57. See e.g. Justice Antonin Scalia’s dissent Scalia, J., dissenting *Massachusetts V. EPA* 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>.

58. *Massachusetts v. EPA*, 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>.

59. As stated in an earlier footnote, the CAA did not address the issue of global climate change until the 1990 amendments, and then only obliquely. As amended, the CAA mentions “carbon dioxide” once, in §103 (g), a provision authorizing EPA to develop “nonregulatory strategies and technologies” for reducing “multiple air pollutants” from power plants. The word “nonregulatory” occurs six times. Moreover, no regulatory consequence may lawfully be inferred from the provision’s inclusion of CO₂ within a list of “air pollutants.” The provision concludes: “Nothing in this subsection shall be construed to authorize the imposition on any person of air pollution control requirements.” Similarly, the 1990 CAA mentions “global warming” only once, in another nonregulatory provision, §602(e), which requires EPA to “publish” (i.e. study) the “global warming potential” of ozone-depleting substances. A similar admonition immediately follows: “The preceding sentence shall not be construed to be the basis of any additional regulation under” the CAA.

60. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.

61. In *Massachusetts v. EPA*, Justice Antonin Scalia in his dissent made an excellent point as to whether the Administrator is required to make a judgment in the first place under 202(a)(1). “The question thus arises: Does anything *require* the Administrator to make a ‘judgment’ whenever a petition for rulemaking is filed? Without citation of the statute or any other authority, the Court says yes. Why is that so? When Congress wishes to make private action force an agency’s hand, it knows how to do so... Where does the CAA say that the EPA Administrator is required to come to a decision on this question whenever a rulemaking petition is filed? The Court points to no such provision because none exists.” Justice Scalia did not argue that the Administrator could always defer judgement. “I am willing to assume, for the sake of argument, that the Administrator’s discretion in this regard is not entirely unbounded—that if he has no reasonable basis for deferring judgment he must grasp the nettle at once.” In other words, the decision whether the Administrator has to make a judgment should be treated as a distinct question and this question is one that the agency should have significant, but not unbounded discretion when answering it.

62. There is other endangerment language throughout the statute that is the same or very similar to that in Section 202(a)(1). There is also language that may not use “endanger” but is still similar. See e.g. 42 U.S.C. § 7571(a)(2)(A), accessed December 30, 2024, <https://www.law.cornell.edu/uscode/text/42/7571>, 42 U.S. Code § 7411(b)(1)(A), accessed December 30, 2024, <https://www.law.cornell.edu/uscode/text/42/7411>, and 42 U.S.C. § 7412(b)(3)(B), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7412>.

63. “Fossil fuels account for the largest share of U.S. energy production and consumption,” Energy Information Administration, accessed October 25, 2024, <https://>

www.eia.gov/todayinenergy/detail.php?id=45096#:~:text=The%20share%20of%20U.S.%20total%20energy%20consumption%20that%20originated%20from,has%20decreased%20by%2011%20quads.

64. Environmental Protection Agency, “New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule,” Final Rule, *Federal Register*, Vol. 89, No. 91 (May 9, 2024), pp. 39798-40064, <https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>.

65. Environmental Protection Agency, “Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles,” Final Rule, *Federal Register*, Vol. 89 No. 76 (April 18, 2024) pp. 27842-28215, <https://www.federalregister.gov/documents/2024/04/18/2024-06214/multi-pollutant-emissions-standards-for-model-years-2027-and-later-light-duty-and-medium-duty>.

66. “Greenhouse Gas Reduction Fund,” Environmental Protection Agency, accessed October 25, 2025, <https://www.epa.gov/greenhouse-gas-reduction-fund>.

67. Congress.gov. “Text - H.R.5376 - 117th Congress (2021-2022): Inflation Reduction Act of 2022.” August 16, 2022. <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.

68. *Massachusetts v. EPA*, 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>.

69. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.

70. Inflation Reduction Act of 2022, Public Law No. 117-169, August 16, 2022, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.

71. Inflation Reduction Act of 2022, Public Law No. 117-169, August 16, 2022, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>. 42 U.S. Code § 7436, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7436>.

72. Interagency Working Group on the Social Cost of Carbon (IWG), Technical Support Document: - Social Cost of Carbon Regulatory Impact Analysis under Executive Order 12886, February 2010, pp. 2, 28, https://www.epa.gov/sites/default/files/2016-12/documents/scc_tsd_2010.pdf. See also Environmental Protection Agency, Fact Sheet Social Cost of Carbon, 2016, https://www.epa.gov/sites/default/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf.

73. Interagency Working Group on the Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990, February 2021, <https://www.regulations.gov/document/EPA-HQ-OPPT-2021-0057-0097>.

74. See § 6(a) of the Clean Air Amendments of 1970, 84 Stat. 1690. <https://www.govinfo.gov/content/pkg/STATUTE-84/pdf/STATUTE-84-Pg1676.pdf> and <https://www.govinfo.gov/content/pkg/STATUTE-91/pdf/STATUTE-91-Pg685.pdf> See also FN 7 of *Massachusetts v. EPA* 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>.

75. “The meaning of ‘endanger’ is not disputed. Case law and dictionary definition agree that endanger means something less than actual harm. When one is endangered, harm is *threatened*; no actual injury need ever occur.” *Ethyl Corp. v. Environmental Protection Agency* 541 F.2d 1 (D.C. Cir. 1976), <https://casetext.com/case/ethyl-corp-v-epa>.
76. The Supreme Court in *Massachusetts v. EPA*, FN 7 explained how the “which may reasonably be anticipated language” is more risk averse, or as the majority stated, “more-protective” than the original language: “The 1970 version of §202(a)(1) used the phrase ‘which endangers the public health or welfare’ rather than the more-protective ‘which may reasonably be anticipated to endanger public health or welfare.’” *Massachusetts v. EPA*, 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>. See also §6(a) of the Clean Air Amendments of 1970, 84 Stat. 1690, accessed October 25, 2024, <https://www.govinfo.gov/content/pkg/USCODE-2010-title42/html/USCODE-2010-title42-chap85-subchapII-partA-sec7521.htm>.
77. Susan E. Dudley, “The Diminishing Returns of Tighter Fine Particle Standards,” *Forbes*, March 27, 2023, <https://www.forbes.com/sites/susandudley/2023/03/27/the-diminishing-returns-of-tighter-fine-particle-standards/>.
78. 42 U.S. Code § 7416, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7416>.
79. For example, under CAA 110(a), an upwind State may not “contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to” primary or secondary NAAQS. That should continue and is not affected on what is being proposed. However, an upwind state would not be obligated to reduce its own emissions below the NAAQS to help downwind neighbors go below the NAAQS. 42 U.S. Code § 7410, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7410>.
80. “NAAQS Table,” Environmental Protection Agency, accessed October 25, 2024, <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.
81. 42 U.S. Code § 7409, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7409>.
82. 42 U.S. Code § 7409, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7409>.
83. Environmental Protection Agency, “Review of the Ozone National Ambient Air Quality Standards,” Final Rule, *Federal Register*, Vol. 85, No. 158 (August 14, 2020), pp. 49830-49917, <https://www.federalregister.gov/documents/2020/08/14/2020-15453/review-of-the-ozone-national-ambient-air-quality-standards>.
84. *Mississippi v. EPA*, 744 F.3d 1334 (D.C. Cir. 2013), <https://caselaw.findlaw.com/court/us-dc-circuit/1652053.html>.
85. *Whitman v. American Trucking Assn’s, Inc.*, 531 U.S. 457 (2001), <https://supreme.justia.com/cases/federal/us/531/457/>.
86. The White House, “Statement by the President on the Ozone National Ambient Air Quality Standards,” press release, September 02, 2011, <https://obamawhitehouse.archives.gov/the-press-office/2011/09/02/statement-president-ozone-national-ambient-air-quality-standards>. Something similar happened during the Biden administration. See Daren Bakst, “EPA won’t rush ozone decision. Good. Now do the same for particulate matter,” Competitive Enterprise Institute, August 8, 2023, <https://cei.org/blog/epa-wont-rush-ozone-decision-good-now-do-the-same-for-particulate-matter-daren-bakst/>.

87. Susan E. Dudley and Marcus Peacock, *Improving Regulatory Science: A Case Study of the National Ambient Air Quality Standards* (Washington, DC: George Washington University, August 3, 2018) <https://regulatorystudies.columbian.gwu.edu/improving-regulatory-science-case-study-national-ambient-air-quality-standards>.
88. Congressional Research Service, *Background Ozone: Challenges in Science and Policy*, January 31, 2019, <https://crsreports.congress.gov/product/pdf/R/R45482/1>.
89. U.S. Chamber of Commerce, *Here's Why the EPA's Proposed Air Quality Standards Will Cause Permitting Gridlock Across our Economy*, 2011, https://www.globaleenergyinstitute.org/sites/default/files/2023-11/Air-Quality-Fact-Sheet_%20US%20Chamber%20GEI%20Final%2011.3.23.pdf.
90. "Basic Information about Air Quality SIPs", Environmental Protection Agency, accessed October 25, 2024, [https://www.epa.gov/air-quality-implementation-plans/basic-information-about-air-quality-sips#:~:text=A%20State%20Implementation%20Plan%20\(SIP,of%20the%20Clean%20Air%20Act](https://www.epa.gov/air-quality-implementation-plans/basic-information-about-air-quality-sips#:~:text=A%20State%20Implementation%20Plan%20(SIP,of%20the%20Clean%20Air%20Act).
91. Congressional Research Service, *Clean Air Act: A Summary of the Act and Its Major Requirements*, September 13, 2022, <https://crsreports.congress.gov/product/pdf/RL/RL30853>.
92. Congressional Research Service, *Clean Air Act: A Summary of the Act and Its Major Requirements*, September 13, 2022, <https://crsreports.congress.gov/product/pdf/RL/RL30853>.
93. "Air Quality Implementation Plans," Environmental Protection Agency, accessed October 25, 2024, <https://www.epa.gov/air-quality-implementation-plans/about-air-quality-implementation-plans#:~:text=EPA%20is%20required%20to%20develop,own%20implementation%20plan%2C%20as%20appropriate>. Congressional Research Service, *Clean Air Act: A Summary of the Act and Its Major Requirements*, September 13, 2022, <https://crsreports.congress.gov/product/pdf/RL/RL30853>.
94. 42 U.S. Code § 7619, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7619>. Congressional Research Service, *Clean Air Act Issues in the 117th Congress*, November 23, 2021, p. 10, <https://crsreports.congress.gov/product/pdf/R/R46684>. "Exceptional Events Core Concepts," AirKnowledge.gov, accessed October 25, 2024, https://airknowledge.gov/Mod/Exceptional_Events_Core_Concepts/Web/index.html#/.
95. Environmental Protection Agency, *Wildland Fire, Air Quality, and Public Health Considerations Fact Sheet*, accessed October 25, 2024, <https://www.epa.gov/system/files/documents/2024-02/pm-naaqs-wildland-fire-air-quality-fact-sheet-final.pdf>.
96. 42 U.S. Code § 7619, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7619>. Congressional Research Service, *Clean Air Act Issues in the 117th Congress*, November 23, 2021, <https://crsreports.congress.gov/product/pdf/R/R46684>.
97. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.
98. There is an exception to this "fixed floor" and no backsliding recommendation: If there is no scientific basis demonstrating that there are sufficient health benefits of maintaining a standard.
99. "Petitions for Rulemaking," Environmental Protection Agency, accessed October 25, 2024, https://19january2017snapshot.epa.gov/aboutepa/petitions-rulemaking_.html.

100. U.S. Senate Committee on Environment & Public Works, “Capito Introduces Legislation to Reform EPA’s Air Quality Standards Process,” June 23, 2023, <https://www.epw.senate.gov/public/index.cfm/2023/6/capito-introduces-legislation-to-reform-epa-s-air-quality-standards-process>.
101. U.S. Senate Committee on Environment & Public Works, “Capito Introduces Legislation to Reform EPA’s Air Quality Standards Process,” June 23, 2023, <https://www.epw.senate.gov/public/index.cfm/2023/6/capito-introduces-legislation-to-reform-epa-s-air-quality-standards-process>.
102. If there were a 10-year schedule to review whether to revise the standards, this does not mean that the science itself could only be reviewed on this schedule.
103. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.
104. *Massachusetts v. EPA*, 549 U.S. 497 (2007), <https://supreme.justia.com/cases/federal/us/549/497/#top>.
105. There may be risk considerations as well, such as with NAAQS, which inform whether to regulate.
106. This is in no way suggesting greenhouse gases are a pollutant.
107. 42 U.S.C. § 7412(b)(3), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7412>.
108. 42 U.S.C. § 7412(b)(3), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7412>.
109. 42 U.S.C. § 7412(b)(3), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7412>. Congressional Research Service, *Clean Air Act: A Summary of the Act and Its Major Requirements*, September 13, 2022, p. 11, <https://crsreports.congress.gov/product/pdf/RL/RL30853>.
110. It is worth repeating this important point listed in an earlier footnote: Even when Congress requires the EPA to promulgate a rule when it reaches a scientific conclusion, the question of whether the rule is warranted is still not being based solely on science. Congress has made the policy choice that regardless of other factors, a scientific conclusion should trigger a rule.
111. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.
112. See e.g. William Yeatman, *The EPA’s Dereliction of Duty: How the Agency’s Failure to Meet Its Clean Air Act Deadlines Undermines Congressional Intent* (Washington, DC: Competitive Enterprise Institute, August 2016) <https://cei.org/sites/default/files/William%20Yeatman%20-%20EPA%27s%20Dereliction%20of%20Duty%20-%20200803.pdf>.
113. 42 U.S. Code § 7604, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7604>.
114. U.S. Chamber of Commerce, *Sue and Settle Updated: Damage Done 2013-2016*, May 2017, https://www.uschamber.com/assets/archived/images/u.s._chamber_sue_and_settle_2017_updated_report.pdf.
115. There are ways to address abuses across the government. See e.g. Daren Bakst, *Congress, Not Agencies, Should Answer Major Policy Questions: A legislative blueprint for restoring representative government* (Washington DC: Competitive Enterprise Institute,

July 2024) https://cei.org/wp-content/uploads/2024/07/Congress_Not_Agencies_Should_Answer_Major_Policy_Questions.pdf).

116. This includes the EPA asserting power that common sense tells us Congress never would have authorized absent clear statutory authority. See *West Virginia v. Environmental Protection Agency*, 597 U.S. 697(2022) <https://supreme.justia.com/cases/federal/us/597/20-1530/>. Daren Bakst, *Congress, Not Agencies, Should Answer Major Policy Questions: A legislative blueprint for restoring representative government* (Washington DC: Competitive Enterprise Institute, July 2024) https://cei.org/wp-content/uploads/2024/07/Congress_Not_Agencies_Should_Answer_Major_Policy_Questions.pdf.

117. 42 U.S.C. § 7543(a), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.

118. 42 U.S.C. § 7543(b), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.

119. 42 U.S.C. § 7543(b), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.

120. 42 U.S. Code § 7507, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7507>.

121. “Vehicle Emissions California Waivers and Authorizations,” Environmental Protection Agency, accessed October 25, 2024, <https://www.epa.gov/state-and-local-transportation/vehicle-emissions-california-waivers-and-authorizations#state>.

122. Environmental Protection Agency, “The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program,” *Federal Register* Vol. 84, No. 188, (September 27, 2019), p. 51339, <https://www.govinfo.gov/content/pkg/FR-2019-09-27/pdf/2019-20672.pdf>.

123. “Air Quality-Cities and Counties,” Environmental Protection Agency, accessed October 25, 2024, <https://www.epa.gov/air-trends/air-quality-cities-and-counties>.

“Historical Ozone Air Quality Trends,” South Coast AQMD, accessed October 25, 2025, <https://www.aqmd.gov/home/air-quality/historical-air-quality-data/historic-ozone-air-quality-trends>.

124. “About South Coast AQMD,” South Coast Air Quality Management District, <https://www.aqmd.gov/nav/about>, accessed October 28, 2024.

125. “Historical Ozone Air Quality Trends,” South Coast Air Quality Management District, <https://www.aqmd.gov/home/air-quality/historical-air-quality-data/historic-ozone-air-quality-trends>, accessed October 28, 2024. The trends for the number of “exceedances” went way down regardless of what standard is examined.

126. Marlo Lewis, Jr., Comment on, “The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program,” Competitive Enterprise Institute, July 6, 2021, <https://cei.org/wp-content/uploads/2021/07/EPA-HQ-OAR-2021-0257.pdf>.

127. “Letter from Stephen Johnson to Governor Schwarzenegger denying California’s request for a waiver of Federal preemption for motor vehicle greenhouse gas emission standards,” Environmental Protection Agency, December 19, 2007, accessed October 25, 2024, <https://www.epa.gov/sites/default/files/2016-10/documents/20071219-slj.pdf>.

128. 42 U.S.C. § 7543(e), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.

129. 42 U.S.C. § 7543(e)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.
130. 42 U.S.C. § 7543(e)(2), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7543>.
131. In general, states should be able to exceed federal standards. However, in this instance where some states would be imposing standards that directly regulate interstate commerce and affect the nature of goods crossing state lines across the country, this can pose significant problems including higher costs for consumers.
132. Nonroad engines or vehicles subject to the current authorization process should instead be preempted under 209(e)(1).
133. “Stop CARB Act of 2024,” S.5038, 118th Congress, <https://www.congress.gov/bill/118th-congress/senate-bill/5038>. Office of Senator Mike Lee, “Lee Bill Defends National Regulatory Standards from California’s Overreach,” September 12, 2024, <https://www.lee.senate.gov/2024/9/lee-bill-defends-national-standards-from-california-s-overreach>.
134. “Stop CARB Act of 2024,” H.R. 9574, 118th Congress, <https://www.congress.gov/bill/118th-congress/house-bill/9574>. Office of Congressman Troy E. Nehls, “Rep. Troy E. Nehls Introduces the Stop CARB Act,” September 12, 2024, <https://nehls.house.gov/media/press-releases/rep-troy-e-nehls-introduces-stop-carb-act>.
135. “Advanced Clean Cars II,” California Air Resources Board, accessed October 25, 2024, <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii>.
136. Environmental Protection Agency, “California State Motor Vehicle Pollution Control Standards; Advanced Clean Cars II Regulations; Request for Waiver of Preemption; Opportunity for Public Hearing and Public Comment,” Notice of opportunity for public hearing and comment, *Federal Register*, Vol. 88 No. 246 (December 26, 2024), pp. 88908-88910, <https://www.federalregister.gov/documents/2023/12/26/2023-28301/california-state-motor-vehicle-pollution-control-standards-advanced-clean-cars-ii-regulations>.
137. Environmental Protection Agency, “California State Motor Vehicle and Engine Pollution Control Standards; Advanced Clean Cars II; Waiver of Preemption; Notice of Decision,” *Federal Register* Vol. 90, No. 3, (January 6, 2025), pp. 642-643, <https://www.govinfo.gov/content/pkg/FR-2025-01-06/pdf/2024-31128.pdf>.
138. 42 U.S. Code § 7521, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7521>.
139. The authorization language in 209(e)(2)(iii) dealing with nonroad engines or vehicles states that the California standards and enforcement procedures must be consistent with this “section.” This is different than the language in Section 209(b)(1)(C) that expressly references Section 202(a). It is important that the statute references back to 202(a) as that is where the standards requirements are listed. The EPA has properly read “section” to include looking at Section 202(a). See: Environmental Protection Agency, “California State Nonroad Engine Pollution Control Standards; In-Use Locomotive Regulation; Requests for Authorization; Opportunity for Public Hearing and Comment,” Notice of opportunity for public hearing and comment, *Federal Register*, Vol. 89 No. 39 (February 27, 2024) pp. 14484-14486, <https://www.federalregister.gov/documents/2024/02/27/2024-03955/california-state-nonroad-engine-pollution-control>.

standards-in-use-locomotive-regulation-requests. However, Congress should make this requirement to look at 202(a) clearer so there is no question that the authorization process requires consistency with Section 202(a).

140. See e.g. Marlo Lewis Jr., “Questions about EPA’s electric vehicle rule—some answered, some not,” Competitive Enterprise Institute, March 28, 2024, <https://cei.org/blog/questions-about-epas-electric-vehicle-rule-some-answered-some-not/>.

141. 42 U.S. Code § 7411, accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7411>.

142. 42 U.S.C. § 7411(a)(1), accessed October 25, 2024, <https://www.law.cornell.edu/uscode/text/42/7411>.

143. Environmental Protection Agency, “New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule,” Final Rule, *Federal Register*, Vol. 89, No. 91 (May 9, 2024), pp. 39798-40064, <https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>.

144. See e.g. Gibson Dunn, *The Inflation Reduction Act Includes Significant Benefits for the Carbon Capture Industry*, August 16, 2022, <https://www.gibsondunn.com/the-inflation-reduction-act-includes-significant-benefits-for-the-carbon-capture-industry/>.

145. Daren Bakst and Paige Lambermont, “Congress should prohibit the EPA’s use of IRA subsidies to justify its regulations,” Competitive Enterprise Institute, October 11, 2023, <https://cei.org/blog/congress-should-prohibit-the-epas-use-of-ira-subsidies-to-justify-its-regulations/>.

146. Environmental Protection Agency, “New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule,” Final Rule, *Federal Register*, Vol. 89, No. 91 (May 9, 2024), pp. 39798-40064, <https://www.federalregister.gov/documents/2024/05/09/2024-09233/new-source-performance-standards-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>.

147. Power Magazine, *Commercially Available CO2 Capture Technology*, Aug 1, 2009, <https://www.powermag.com/commercially-available-co2-capture-technology/>.

148. Competitive Enterprise Institute, “CEI Leads Coalition Letter Supporting CRA Resolution of Disapproval on EPA Power Plant Rule,” May 30, 2024, https://cei.org/coalition_letters/cei-leads-coalition-letter-supporting-cra-resolution-of-disapproval-on-epa-power-plant-rule/.

149. Environmental Protection Agency, “Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units,” Final Rule, *Federal Register*, Vol. 80 No. 205 (October 23, 2015), pp. 64510- 64660, <https://www.govinfo.gov/content/pkg/FR-2015-10-23/pdf/2015-22837.pdf>.

150. Environmental Protection Agency, “Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating

Units; Revisions to Emission Guidelines Implementing Regulations,” Final Rule. *Federal Register*, (July 8, 2019), pp. 32520-32549, <https://www.govinfo.gov/content/pkg/FR-2019-07-08/pdf/2019-13507.pdf>.

151. “Energy Policy Act of 2005,” H.R. 6, 109th Congress, <https://www.govinfo.gov/content/pkg/PLAW-109publ58/pdf/PLAW-109publ58.pdf>.

152. This was weak language. “Solely by reason of” suggests if any other reason is identified, no matter how weak, it would mean the “solely by reason of” threshold has not been met.

153. This section frequently describes “direct benefits” or “ancillary benefits” as “quantified” or “monetized.” For readability purposes and concerns over unnecessary repetition, “quantified” or “monetized” (which are used as synonyms) are not always used to describe “direct benefits” or “ancillary benefits.” However, in these situations, both types of benefits are still considered “quantified” or “monetized.”

154. C. Boyden Gray, “EPA’s Use of Co-Benefits,” The Federalist Society, September 24, 2015, <https://fedsoc.org/fedsoc-review/epa-s-use-of-co-benefits>.

155. Anne E. Smith, *An Evaluation of the PM 2.5 Health Benefits Estimates in Regulatory Impact Analyses for Recent Air Regulations*, (Washington, DC: NERA Economic Consulting, December 2011) p. 15, https://www.nera.com/content/dam/nera/publications/archive2/PUB_RIA_Critique_Final_Report_1211.pdf.

156. Anne E. Smith, *An Evaluation of the PM 2.5 Health Benefits Estimates in Regulatory Impact Analyses for Recent Air Regulations*, (Washington, DC: NERA Economic Consulting, December 2011) p. 15, https://www.nera.com/content/dam/nera/publications/archive2/PUB_RIA_Critique_Final_Report_1211.pdf. See Daren Bakst, Comment on “Rescinding the Rule on Increasing Consistency and Transparency in Considering Benefits and Costs in the Clean Air Act Rulemaking Process,” The Heritage Foundation, June 10, 2021, https://static.heritage.org/2022/Regulatory_Comments/BakstCommentsBCARescissionFinal.pdf.

157. *Michigan v. Environmental Protection Agency*, 576 U.S. 743 (2015), <https://supreme.justia.com/cases/federal/us/576/743/>.

158. Environmental Protection Agency, “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,” Final Rule, *Federal Register*, Vol. 85, No. 100 (May 22, 2020) pp. 31286-31320, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>.

159. See ES-1 footnote d: Environmental Protection Agency, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards*, December 2011, https://www3.epa.gov/ttn/ecas/docs/ria/utilities_ria_final-mats_2011-12.pdf. See Environmental Protection Agency, “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,” Final Rule, *Federal Register*, Vol. 85, No. 100 (May 22, 2020) pp. 31286-31320, part B, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>.

160. Environmental Protection Agency, “National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review,” Final Rule, *Federal Register*,

Vol. 89 No. 89 (May 7, 2024) pp. 38508-38593, <https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal-and-oil-fired-electric-utility-steam>.

161. Molly Christian, “NRECA Pursues Supreme Court Stay of EPA Mercury and Air Rule,” NRECA, August 27, 2024, <https://www.electric.coop/nreca-pursues-supreme-court-stay-of-epa-mercury-and-air-rule>. See also: *Talen Montana, LLC and NorthWestern Corporation V. U.S. Environmental Protection Agency and Michael S. Regan, Administrator, U.S. Environmental Protection Agency*, Motion for Stay, <https://www.4cleanair.org/wp-content/uploads/North-Dakota-v.-EPA-States-Stay-Motion-6-10-24.pdf>. *State of North Dakota, State of West Virginia, et al., v. Environmental Protection Agency*, Case No. 24-1119, Motion for Stay (May 7, 2024), <https://www.4cleanair.org/wp-content/uploads/North-Dakota-v.-EPA-States-Stay-Motion-6-10-24.pdf>. See also: Amy Howe, “Supreme Court declines to block EPA methane, mercury rules,” *Scotus Blog*, October 4, 2024, <https://www.scotusblog.com/2024/10/supreme-court-declines-to-block-epa-methane-mercury-rules/>.

162. Environmental Protection Agency, “National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review,” Final Rule, Federal Register, Vol. 89 No. 89 (May 7, 2024) p. 38512, <https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal-and-oil-fired-electric-utility-steam>. See *State of North Dakota, State of West Virginia, et al., v. Environmental Protection Agency*, Case No. 24-1119, Motion for Stay (May 7, 2024), p. 9, <https://www.4cleanair.org/wp-content/uploads/North-Dakota-v.-EPA-States-Stay-Motion-6-10-24.pdf>.

163. Environmental Protection Agency, “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,” Final Rule, Federal Register, Vol. 85, No. 100 (May 22, 2020) pp. 31286-31320, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>. Environmental Protection Agency, “Final Revised Supplemental Finding and Results of the Residual Risk and Technology Review,” accessed October 28, 2024, https://19january2021snapshot.epa.gov/mats/final-revised-supplemental-finding-and-results-residual-risk-and-technology-review_.html.

164. Environmental Protection Agency, “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,” Final Rule, Federal Register, Vol. 85, No. 100 (May 22, 2020) pp. 31286-31320, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>. Environmental Protection Agency, “Final Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding,” accessed October 28, 2024, <https://www.epa.gov/stationary-sources-air-pollution/final-revocation-2020-reconsideration-and-affirmation-appropriate>.

165. From the rule: “Under the interpretation of CAA section 112(n)(1)(A) that the EPA adopts in this action, HAP benefits, as compared to costs, must be the primary question in making the ‘appropriate and necessary’ determination. While the Administrator could consider air quality benefits other than HAP-specific benefits in the CAA section 112(n)(1)(A) context, consideration of these co-benefits could permissibly play only, at most, a marginal role in that determination, given that the CAA has assigned regulation

of criteria pollutants to other provisions in title I of the CAA, specifically the NAAQS regime pursuant to CAA sections 107–110, Environmental Protection Agency, “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,” Final Rule, Federal Register, Vol. 85, No. 100 (May 22, 2020) p. 31303, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>.

166. Environmental Protection Agency, “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,” Final Rule, Federal Register, Vol. 85, No. 100 (May 22, 2020) p. 31301, <https://www.govinfo.gov/content/pkg/FR-2020-05-22/pdf/2020-08607.pdf>.

167. C. Boyden Gray, “EPA’s Use of Co-Benefits,” The Federalist Society, September 24, 2015, <https://fedsoc.org/fedsoc-review/epa-s-use-of-co-benefits>.

168. *Murray Energy Corporation, et al., v. United States Environmental Protection Agency, et al.*, No. 16-1127 (April 25, 2016), https://www.edf.org/sites/default/files/content/murray_energy_v_epa_-_cato_amicus.pdf. Statement of Adam R.F. Gustafson, “Undermining Mercury Protections: EPA Endangers Human Health and the Environment,” Hearing Before the U.S. House of Representatives Committee On Energy & Commerce Subcommittee On Oversight and Investigations, May 21, 2019, HHRG-116-IF02-Wstate-GustafsonA-20190521.pdf. There are other situations in the CAA where there are arguably prohibitions, such as in Section 111(d), 42 U.S.C. § 7411(d), 42 U.S. Code § 7411, accessed October 28, 2024, <https://www.law.cornell.edu/uscode/text/42/7411>. See also: C. Boyden Gray, “Environmental Law and Property Rights,” The Federalist Society, July 2015, <https://fedsoc-cms-public.s3.amazonaws.com/update/pdf/9JP5LCu5cyJfBZG6qz0BvUfwJu7lLZO3bbePOiNh.pdf>.

169. *Michigan v. Environmental Protection Agency*, 576 U.S. 743 (2015), <https://supreme.justia.com/cases/federal/us/576/743/>.

170. See, e.g., Exec. Order No. 12,866 “Regulatory Planning and Review,” Executive Order, Federal Register, Vol. 58, No. 190 (Oct. 4, 1993), <https://www.archives.gov/files/federal-register/executive-orders/pdf/12866.pdf>.

171. There are other regulatory analysis concerns as well. See e.g. Anne E. Smith, *An Evaluation of the PM 2.5 Health Benefits Estimates in Regulatory Impact Analyses for Recent Air Regulations*, (Washington, DC: NERA Economic Consulting, December 2011), https://www.nera.com/content/dam/nera/publications/archive2/PUB_RIA_Critique_Final_Report_1211.pdf. C. Boyden Gray, “EPA’s Use of Co-Benefits,” The Federalist Society, September 24, 2015, <https://fedsoc.org/fedsoc-review/epa-s-use-of-co-benefits>. In addition, the use of ancillary benefits can be misleading because documents like fact sheets and press announcements may proclaim the benefits of a rule without clearly stating that many of the benefits have nothing to do with reducing emissions of the targeted pollutant. For example, these documents can give the impression that a rule, such as one regulating mercury, leads to benefits that have nothing to do with reductions in mercury.

172. Congressional Research Service, “Visibility, Regional Haze, and the Clean Air Act: Status of Implementation,” October 23, 2006, https://www.everycrsreport.com/files/20061023_RL32483_0f0c2857acd5021367379018d141ee01007fbc10.pdf For the specific statutory language, see 42 U.S.C. § 7491, accessed October 28, 2024, <https://>

www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapl-partC-subpartii-sec7491.htm.

173. William Yeatman, “EPA’s New Regulatory Front: Regional Haze and the Takeover of State Programs,” U.S. Chamber of Commerce, https://www.uschamber.com/assets/archived/images/legacy/reports/1207_ETRA_HazeReport_lr.pdf.

174. *Id.*

175. U.S. Environmental Protection Agency, “Proposed Consent Decree, Clean Air Act Citizen Suit”, Notice of proposed consent decree; request for public comment, Vol. 89 No. 62 (March 29, 2024), pp. 22141-22143, <https://www.federalregister.gov/documents/2024/03/29/2024-06722/proposed-consent-decree-clean-air-act-citizen-suit>.

176. Testimony of William Yeatman Senior Fellow, Competitive Enterprise Institute on “EPA’s Regional Haze Program” before the Subcommittee on Environment Committee on Science, Space, & Technology March 23, 2016, <https://cei.org/sites/default/files/William%20Yeatman%20-%20Testimony%20-%203232016.pdf>.

177. U.S. Environmental Protection Agency, “Ozone Protection Under Title VI of the Clean Air Act,” accessed October 28, 2024, <https://www.epa.gov/ozone-layer-protection/ozone-protection-under-title-vi-clean-air-act>.

178. American Innovation and Manufacturing Act of 2020 passed as part of the Consolidated Appropriations Act, 2021, Public Law No. 116-260, <https://www.congress.gov/bill/116th-congress/house-bill/133/text>. Codified at 42 U.S.C. §7675, accessed October 28, 2024, [https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section-7675\(a\)&num=0&edition=prelim](https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section-7675(a)&num=0&edition=prelim).

179. *Id.*, §7675(e).

180. United Nations, Kigali Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer (Kigali Amendment), October 10-15, 2016, <https://ozone.unep.org/treaties/montreal-protocol/amendments/kigali-amendment-2016-amendment-montreal-protocol-agreed>.

181. United States Senate, Roll Call Vote on the Kigali Amendment, September 21, 2022, https://www.senate.gov/legislative/LIS/roll_call_votes/vote1172/vote_117_2_00343.htm.

182. Competitive Enterprise Institute, Regulatory Comments to the Environmental Protection Agency, Docket No. EPA-HQ-OAR-2021-0044; Phasedown of Hydrofluorocarbons: Establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing Act; Proposed Rule, 86 FR 27,150, July 6, 2021, <https://cei.org/wp-content/uploads/2021/07/AIMAct-NOPR-Comments-6-2021.pdf>.

183. U.S. Environmental Protection Agency, “AIM Act Notices and Rulemakings,” accessed October 28, 2024, <https://www.epa.gov/climate-hfcs-reduction/notices-and-rulemakings>.

184. U.S. Environmental Protection Agency, “AIM Act Technology Transitions Program,” accessed October 28, 2024, <https://www.epa.gov/climate-hfcs-reduction/technology-transitions-program#:~:text=EPA's%20Technology%20Transitions%20Program%2C%20under,enacted%20through%20a%20rulemaking%20process>.

185. American Society of Heating, Refrigeration, and Air Conditioning Engineers, “Designation and Safety Classification of Refrigerants,” 2019, <https://www.ashrae.org/>

file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/34_2019_f_20191213.pdf.

186. Ben Lieberman, “Biden Is Coming for Your Air Conditioner,” *Wall Street Journal*, May 7, 2024, https://cei.org/opeds_articles/biden-is-coming-for-your-air-conditioner/.

187. U.S. Environmental Protection Agency, “U.S. Inventory of Greenhouse Gas Emissions and Sinks, 1990-2022,” 2024, https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf.

Chapter 3

1. “Federal Water Pollution Control Act (Clean Water Act).” *Public Law 92-500*, October 18, 1972. 33 U.S.C. §§ 1251-1387, [STATUTE-86-Pg816.pdf](https://www.govinfo.gov/STATUTE-86-Pg816.pdf) (govinfo.gov) and

“Safe Drinking Water Act.” *Public Law 93-523*, December 16, 1974. 42 U.S.C. §§ 300f-300j-27, S.433 - 93rd Congress (1973-1974): Safe Drinking Water Act | [Congress.gov](https://www.congress.gov/library/congress) | Library of Congress.

2. Claudia Copeland, “Safe Drinking Water Act: A Summary of the Act and Its Major Requirements,” Congressional Research Service, October 18, 2016. <https://sgp.fas.org/crs/misc/RL30030.pdf>.

3. Kara Manke, “Clean Water Act Dramatically Cut Pollution in U.S. Waterways.” *Berkeley News*, October 8, 2018. accessed October 17, 2024. <https://news.berkeley.edu/2018/10/08/clean-water-act-dramatically-cut-pollution-in-u-s-waterways/>.

4.33 U.S.C. § 1362, accessed October 17, 2024. <https://www.law.cornell.edu/uscode/text/33/1362>.

5. While certain statutes like the Wilderness Act put the environment clearly and decisively before the economy, the Clean Water Act is a balance of the two, and that balance is struck through Congressional decisions on what to include and exclude.

6. Jonathan Wood, “EPA and Enviro decide to Sue Poultry Farmer over His Birds.” *Pacific Legal Foundation*, October 14, 2014, accessed October 17, 2024, <https://pacificlegal.org/epa-enviro-decide-suit-poultry-farmer-birds/>.

7. Bobby Magill, “Biden Administration Walking Thin Line in Alaska Waters Claim.” *Bloomberg Law*, September 16, 2024, accessed October 17, 2024, <https://news.bloomberglaw.com/environment-and-energy/biden-administration-walking-thin-line-in-alaska-waters-claim>.

8. Federal Water Pollution Control Act (Clean Water Act) Section 404(f)(1)(A). 33 U.S.C. § 1344(f)(1)(A), <https://www.epa.gov/cwa-404/overview-clean-water-act-section-404>.

9. Ellen Steen, *Regarding: The Definition of “Waters of the United States” Proposed Rule and its Impact on Rural Americans* (Statement of the American Farm Bureau Federation before the House Agriculture Committee’s Subcommittee on Conservation, Energy, and Forestry, Washington DC, March 03, 2015), https://agriculture.house.gov/uploadedfiles/steen_testimony.pdf.

10. 33 U.S.C. § 1251(b), accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1251> and see *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159, 174 (2001).

11. U.S. Constitution, amend. XIV, <https://constitutioncenter.org/the-constitution/amendments>. U.S. Constitution, amend X, <https://constitutioncenter.org/the-constitution/amendments>.
12. 33 CFR § 326.6(a)(1) and Table 1, accessed October 17, 2024. <https://www.law.cornell.edu/cfr/text/33/326.6>.
13. Sunding & Zilberman, *The Economics of Environmental Regulation by Licensing: An Assessment of Recent Changes to the Wetland Permitting Process*, 42 *Natural Resources J.* 59, 74–76 (2002), accessed October 17, 2024 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=338562.
14. United States Environmental Protection Agency, “Overview of CWA Section 401 Certification.” *U.S. EPA*. accessed October 17, 2024. <https://www.epa.gov/cwa-401/overview-cwa-section-401-certification>.
15. The Supreme Court has several times rejected EPA and the Army Corps’ broad reading of “navigable waters” in the CWA. Several Justices of the Supreme Court have observed, in this line of decisions, that the CWA lacks clarity on this term, and that congressional attention may be warranted. See, e.g., *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001); *Rapanos v. United States*, 547 U.S. 715 (2006); *Sackett v. EPA*, 566 U.S. 120, 132 (2012) (*Sackett I*) (Alito, J., concurring); *U.S. Army Corps of Engineers v. Hawkes Co., Inc.*, 578 U.S. 590, 602 (2016) (Kennedy, J., concurring); *Sackett v. EPA*, 598 U.S. 651 (2023) (*Sackett II*).
16. In 1870, the Supreme Court interpreted the phrase “navigable waters of the United States” as follows: “Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used or are susceptible of being used in their ordinary condition as highways for commerce over which trade and travel are or may be conducted in the customary modes of trade and travel on water. And they constitute navigable waters of the United States within the meaning of the acts of Congress, in contradistinction from the navigable waters of the states, when they form in their ordinary condition by themselves, or by uniting with other waters, a continued highway over which commerce is or may be carried on with other states or foreign countries in the customary modes in which such commerce is conducted by water.” *The Daniel Ball*, 77 U.S. 557, 563 (1870), <https://supreme.justia.com/cases/federal/us/77/557/>.
17. The Clean Water Act, as it is known today, refers to the 1972 amendments to the Federal Water Pollution Control Act of 1948. “History of the Clean Water Act,” *U.S. EPA*. accessed October 17, 2024. <https://www.epa.gov/laws-regulations/history-clean-water-act>.
18. Isaiah McKinney, Note, “*Navigable Waters*” Does Not Include Mud Puddles: The Clean Water Act’s Legislative History Supports a Narrow, Commercial-Focused Interpretation, 12 *Wake Forest J.L. & Pol’y* (2022). See also *Sackett v. EPA*, 598 U.S. 651, 684–710 (2023) (*Sackett II*) (Thomas, J., concurring), <https://www.vernalpools.me/wp-content/uploads/2022/10/Mckinney-2022-Navigable-Waters-does-not-include-mud-puddles.pdf>. See also *Sackett v. EPA*, 598 U.S. 651, 684–710 (2023) (Thomas, J., concurring), <https://www.scotusblog.com/case-files/cases/sackett-v-environmental-protection-agency/>.
19. See example definitions at Army Corps of Engineers and Environmental Protection Agency, “The Navigable Waters Protection Rule: Definition of ‘Waters of the United States,’” Final Rule, *Federal Register*, Vol. 85 No. 77 (April 21, 2020), pp. 22250-22342 at

22338-22339, <https://www.federalregister.gov/documents/2020/04/21/2020-02500/the-navigable-waters-protection-rule-definition-of-waters-of-the-united-states>.

20. 33 C.F.R. § 328.3(c) (2019).

21. See Army Corps of Engineers and Environmental Protection Agency, “Clean Water Rule: Definition of ‘Waters of the United States,’” Final Rule, *Federal Register*, Vol. 80 No. 124 (June 29, 2015), pp. 37054-37127, <https://www.federalregister.gov/documents/2015/06/29/2015-13435/clean-water-rule-definition-of-waters-of-the-united-states>.

22. *Rapanos v. United States*, 547 U.S. 715 (2006) (plurality opinion); <https://supreme.justia.com/cases/federal/us/547/715/>. *Sackett v. EPA*, 598 U.S. 651 (2023), <https://www.scotusblog.com/case-files/cases/sackett-v-environmental-protection-agency/>.

23. Federal Water Pollution Control Act (Clean Water Act) Section 404(g)(1), 33 U.S.C. § 1344(g)(1), <https://www.epa.gov/cwa-404/overview-clean-water-act-section-404>.

24. *Sackett v. EPA*, 598 U.S. 651 (2023), <https://www.scotusblog.com/case-files/cases/sackett-v-environmental-protection-agency/>.

25. Briscoe, Ivester, and Bazel LLP, New (And Improved) Test for Clean Water Act authority over wetlands under *Sackett v. EPA*, April 1, 2024, accessed October 17, 2024, <https://briscoelaw.net/the-epa-strikes-back/>.

26. *Lewis v. United States*, 88 F.4th 1073 (5th Cir. 2023), <https://law.justia.com/cases/federal/appellate-courts/ca5/21-30163/21-30163-2023-12-18.html>.

27. See *Sackett II*, 598 U.S. at 666 (“Days after our decision, the agencies issued guidance that sought to minimize SWANCC’s impact.”); *id.* at 667 (“In the decade following *Rapanos*, the EPA and the Corps issued guidance documents that ‘recognized larger grey areas and called for more fact-intensive individualized determinations in those grey areas.’” (citation omitted); *Rapanos*, 547 U.S. 715, 758 (Roberts, C.J., concurring) (“Rather than refining its view of its authority in light of our decision in *SWANCC*, and providing guidance meriting deference under our generous standards, the Corps chose to adhere to its essentially boundless view of the scope of its power.”); *Lewis v. United States*, 88 F.4th 1073, 1079 n.4 (5th Cir. 2023) (“Indeed, USACE intransigently adopts the same arguments that the Supreme Court squarely rejected in *Hawkes*” (citing *U.S. Army Corps of Eng’rs v. Hawkes Co., Inc.*, 578 U.S. 590, 601–02 (2016)); *id.* at 1080 n.7 (observing the Army’s “utter unwillingness to concede its lack of regulatory jurisdiction in this case following *Sackett*”).

28. This provision would codify an “ordinary presence of water” requirement in Justice Antonin Scalia’s plurality opinion in *Rapanos* as well as the *Sackett II* opinion that embraces the *Rapanos* plurality opinion. *Rapanos v. United States*, 547 U.S. 715 (2006) (plurality opinion); <https://supreme.justia.com/cases/federal/us/547/715/>. *Sackett v. EPA*, 598 U.S. 651 (2023), <https://www.scotusblog.com/case-files/cases/sackett-v-environmental-protection-agency/>.

29. Army Corps of Engineers and Environmental Protection Agency, “Revised Definition of ‘Waters of the United States,’” Final Rule, *Federal Register*, Vol. 88 No. 11 (January 18, 2023), pp. 3004-3144, <https://www.federalregister.gov/documents/2023/01/18/2022-28595/revised-definition-of-waters-of-the-united-states>.

30. Army Corps of Engineers and Environmental Protection Agency, “Revised Definition of ‘Waters of the United States’; Conforming,” Final Rule, *Federal Register*,

Vol. 88 No. 173 (September 8, 2023), pp. 61964-61969, <https://www.federalregister.gov/documents/2023/09/08/2023-18929/revised-definition-of-waters-of-the-united-states-conforming>.

31. The degree to which the EPA and Army Corps have pushed back on *Sackett II* in their effort to preserve the full scope of their own power suggests the importance of amending the CWA as recommended above. If the agencies were more compliant with the statute and the Supreme Court's interpretations of it, such an amendment may not be as necessary.

32. Federal Water Pollution Control Act (Clean Water Act) Section 404(f), 33 U.S.C. § 1344(f) <https://www.epa.gov/cwa-404/overview-clean-water-act-section-404>.

33. 33 C.F.R. § 323.4(a)(1)(ii), (iii)(D), accessed October 17, 2024. <https://www.ecfr.gov/current/title-33/chapter-II/part-323/section-323.4>.

34. Federal Water Pollution Control Act (Clean Water Act) Section 404(f)(2), 33 U.S.C. § 1344(f)(2), <https://www.epa.gov/cwa-404/overview-clean-water-act-section-404>.

35. Ellen Steen, *Regarding: The Definition of "Waters of the United States" Proposed Rule and its Impact on Rural Americans* (Statement of the American Farm Bureau Federation before the House Agriculture Committee's Subcommittee on Conservation, Energy, and Forestry, Washington DC, March 03, 2015), https://agriculture.house.gov/uploadedfiles/steen_testimony.pdf.

36. 33 U.S.C. § 1319(g)(1), accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1319> and 33 U.S.C. § 1344(s)(1), accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1344>.

37. See 5 U.S.C. § 554, accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/5/554>.

38. 33 CFR § 326.6(a)(1) and Table 1, accessed October 17, 2024. <https://www.law.cornell.edu/cfr/text/33/326.6>.

39. 33 U.S.C. § 1319(d), accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1319>.

40. Daren Bakst and Tony Francois, "Congress Must Protect Innocent Property Owners from Section 404 Civil and Criminal Penalties," Heritage Foundation Issue Brief No. 5275, June 22, 2022, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4144931.

41. 33 U.S.C. § 1365, accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1365>.

42. *Inland Empire Waterkeeper v. Corona Clay Co.*, 17 F.4th 825 (9th Cir. 2021), <https://casetext.com/case/inland-empire-waterkeeper-v-corona-clay-co-1>.

43. Sunding & Zilberman, *The Economics of Environmental Regulation by Licensing: An Assessment of Recent Changes to the Wetland Permitting Process*, 42 *Natural Resources J.* 59, 74–76 (2002) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=338562.

44. 33 U.S.C. § 1344(e)(1), accessed October 17, 2024. <https://www.law.cornell.edu/uscode/text/33/1344>.

45. 33 U.S.C. § 1341, accessed October 17, 2024, <https://www.law.cornell.edu/uscode/text/33/1341>.

46. U.S. Senate Committee on Environment and Public Works, "Senate Republicans Respond to Biden Administration's Unprecedented Water Regulation." *Press Release*, July

26, 2023, accessed October 17, 2024 <https://www.epw.senate.gov/public/index.cfm/press-releases-republican?ID=C879237F-48BD-4173-8440-73DE2B363C80>.

47. Daren Bakst and Rachel Wilfong, “Reinstated Trump Water Rule Could Help Economy Grow.” *The Heritage Foundation*, April 21, 2022. <https://www.heritage.org/government-regulation/commentary/reinstated-trump-water-rule-could-help-economy-grow>.

48. See, e.g., *California State Water Resources Control Board v. Federal Energy Regulatory Commission*, 43 F.4th 920 (9th Cir. 2022), <https://casetext.com/case/cal-state-water-res-control-bd-v-fed-energy-regulatory-commn>.

49. Army Corps of Engineers and Environmental Protection Agency, “Clean Water Act Section 401 Water Quality Certification Improvement Rule,” Final Rule, Federal Register, Vol. 88, No. 186 (September 27, 2023), pp. 66558-66666, <https://www.federalregister.gov/documents/2023/09/27/2023-20219/clean-water-act-section-401-water-quality-certification-improvement-rule>.

50. Daren Bakst, “Three Important Policy Reforms in H.R. 1.” *Competitive Enterprise Institute*, March 29, 2023, accessed October 17, 2024, <https://cei.org/blog/three-important-policy-reforms-in-h-r-1/>.

51. For a more detailed discussion of efforts to inappropriately expand the Section 401 certification process, see Daren Bakst, Comment in response to “Clean Water Act Section 401 Water Quality Certification Improvement Rule,” Environmental Protection Agency, (August 8, 2022), https://static.heritage.org/2022/Regulatory_Comments/Bakst401Comments8822V2.pdf.

52. “Lower Energy Costs Act,” H.R.1, 118th Congress, <https://www.congress.gov/bill/118th-congress/house-bill/1>.

53. See Section 30002 of H.R.1 “Lower Energy Costs Act,” Engrossed in House, 118th Congress, <https://www.congress.gov/bill/118th-congress/house-bill/1>.

54. 33 U.S.C. § 1344(b), accessed October 17, 2024. <https://www.law.cornell.edu/uscode/text/33/1344>.

55. 33 U.S.C. § 1344(c), accessed October 17, 2024. <https://www.law.cornell.edu/uscode/text/33/1344>.

Chapter 4

1. Several individuals contributed to this chapter, including CEI Senior Fellow James Broughel who worked on the precautionary principle, linear-no-threshold model, and IRIS sections, and CEI Research Fellow Paige Lambermont who worked on the CERCLA and RCRA sections.

2. Indur M. Goklany, *The precautionary principle: a critical appraisal of environmental risk assessment*, Washington, DC: Cato Institute, 2001.

3. Environmental Protection Agency, “Guidelines for Human Exposure Assessment,” October 2019, p. 63, https://www.epa.gov/sites/default/files/2020-01/documents/guidelines_for_human_exposure_assessment_final2019.pdf.

4. “Exposure estimates that include unextracted residues should always be well characterized, explaining that the unextracted residues are conservatively included due to uncertainty to create an upper bound on potential exposure. This upper bound

is conservatively used to estimate risk in the absence of better certainty regarding the extractability of the unextracted residues, unless there is a compelling reason to discuss the upper bound only as characterization.” See Environmental Protection Agency, Office of Pesticide Programs, “Guidance for Addressing Unextracted Residues in Laboratory Studies,” September 12, 2014, <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-addressing-unextracted-pesticide-residues#memo>.

5. Richard Belzer, “Risk Assessment, Safety Assessment, and the Estimation of Regulatory Benefits,” Mercatus Center at George Mason University, 2012, <https://www.mercatus.org/research/research-papers/risk-assessment-safety-assessment-and-estimation-regulatory-benefits>.

6. See, for example, Environmental Protection Agency, “Determination of the Appropriate FQPA Safety Factor(s) in Tolerance Assessment,” February 28, 2002, <https://www.epa.gov/sites/default/files/2015-07/documents/determ.pdf>.

7. Richard Belzer, “Risk Assessment, Safety Assessment, and the Estimation of Regulatory Benefits.”

8. Letter from Paul S. Rohwer to Honorable Ken Calvert, November 16, 2000, https://cdn-links.lww.com/permalink/hp/a/hp_2024_06_13_cardarelli_hpj-d-24-00012_sdc32.pdf.

9. Environmental Protection Agency, “EPA Requires Toxics Release Inventory Reporting on DINP,” July 13, 2023, <https://www.epa.gov/chemicals-under-tsca/epa-requires-toxics-release-inventory-reporting-dinp>.

10. “Biomonitoring – Phthalates,” Environmental Protection Agency, accessed September 27, 2024, <https://www.epa.gov/americaschildrenenvironment/biomonitoring-phthalates#:~:text=Given%20the%20importance%20of%20hormones,and%20changes%20to%20reproductive%20organs>.

11. See, for example, “Phthalates in Cosmetics,” U.S. Food and Drug Administration, accessed September 27, 2024 (content current as of 05/19/2022), <https://www.fda.gov/cosmetics/cosmetic-ingredients/phthalates-cosmetics#:~:text=While%20the%20CDC%20report%20noted,in%20Regulating%20Phthalates%20in%20Cosmetics;andAngelaLogomasini,“CPSC’sScientificShenanigansonPhthalates,”CompetitiveEnterpriseInstituteOpenMarketBlog,Mar18,2015,https://cei.org/blog/cpsc-scientific-shenanigans-on-phthalates/>.

12. See, for example, Warren Cornwall, “In BPA safety war, a battle over evidence,” *Science*, February 9, 2017, <https://www.science.org/content/article/bpa-safety-war-battle-over-evidence#:~:text=By%20now%20tests%20have%20found,safe%20dose%20of%20BPA:%20four;LauraN.Vandenberg,MaricelV.Maffini,CarlosSonnenschein,BeverlyS.Rubin,AnaM.Soto,“Bisphenol-AandtheGreatDivide:AReviewofControversiesintheFieldofEndocrineDisruption,”EndocrineReviews,Vol.30,No.1,2009,pp.75–95,https://doi.org/10.1210/er.2008-0021>.

13. Juliane Winkler, et al., “Bisphenol A replacement chemicals, BPF and BPS, induce protumorigenic changes in human mammary gland organoid morphology and proteome,” *Cell Biology*, Vol. 119, No. 11, 2022, p. e2115308119, <https://doi.org/10.1073/pnas.2115308119>.

14. Jerry Ellig and James Broughel, “FDA Regulations Should Be Safe and Effective,” Arlington, VA: Mercatus Center Data Visualization, March 12, 2014, <https://www.mercatus.org/research/data-visualizations/fda-regulations-should-be-safe-and-effective>.

15. James Broughel and W. Kip Viscusi, "The Mortality Cost of Expenditures," *Contemporary Economic Policy*, Vol. 39, No. 1, 2021, pp. 156-167, <https://doi.org/10.1111/coep.12483>.
16. David Zilberman, Andrew Schmitz, Gary Casterline, Erik Lichtenberg, and Jerome B. Siebert, "The Economics of Pesticide Use and Regulation," *Science*, Vol. 253, No. 5019, August 2, 1991 pp. 518-522, <https://doi.org/10.1126/science.253.5019.518>.
17. Richard Williams, "Economic benefit-cost implications of the LNT model," *Chemico-Biological Interactions*, Vol. 301, 2019, pp. 141-145, <https://doi.org/10.1016/j.cbi.2019.01.028>.
18. Reference value means "An estimate of an exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime." EPA, Integrated Risk Information System (IRIS) Glossary, <https://www.epa.gov/iris/iris-glossary> (accessed January 13, 2025).
19. Safety assessments identify what is considered a safe exposure level. They do not quantify the health benefits associated with a reduction in exposure, enabling a comparison of tradeoffs.
20. Office of Management and Budget, "Updated Principles for Risk Analysis," September 19, 2007, https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2007/m07-24.pdf.
21. James Broughel, "Myths and Facts in Radiation Risks: A simple solution to remove obstacles to nuclear power," (Washington DC: Competitive Enterprise Institute, April 4, 2024), <https://cei.org/studies/myths-and-facts-in-radiation-risks/>.
22. Albert L. Nichols, Richard J. Zeckhauser, "The Perils of Prudence: How Conservative Risk Assessments Distort Regulation," *Regulatory Toxicology and Pharmacology*, Vol. 8, No. 1, 1988, pp. 61-75, [https://doi.org/10.1016/0273-2300\(88\)90007-4](https://doi.org/10.1016/0273-2300(88)90007-4).
23. Jeffrey A. Siegel, Charles W. Pennington and Bill Sacks, "Subjecting Radiologic Imaging to the Linear No-Threshold Hypothesis: A Non Sequitur of Non- Trivial Proportion," *Journal of Nuclear Medicine*, Vol. 58, No. 1 (2017), pp. 1-6, <https://doi.org/10.2967/jnumed.116.180182>.
24. Jack Devanney, *Why Nuclear Power Has Been a Flop* (Tavernier, Florida: CTX Press, 2020).
25. Environmental Protection Agency, "Agency Information Collection Activities; Proposed Renewal of an Existing ICR Collection and Request for Comment; Formaldehyde Standards for Composite Wood Products Act," Federal Register, Vol. 89, No. 11, January 17, 2024, <https://www.federalregister.gov/documents/2024/01/17/2024-00740/agency-information-collection-activities-proposed-renewal-of-an-existing-icr-collection-and-request>.
26. Richard Williams, "Economic benefit-cost implications of the LNT model," *Chemico-Biological Interactions*, Vol. 301, 2019, pp. 141-145, <https://doi.org/10.1016/j.cbi.2019.01.028>.
27. National Academies of Sciences, Engineering, and Medicine, "Review of EPA's 2022 Draft Formaldehyde Assessment," Washington, DC: The National Academies Press, 2023, <https://doi.org/10.17226/27153>.

28. “Assessing and Managing Chemicals under TSCA: Risk Evaluation for Formaldehyde,” Environmental Protection Agency, accessed September 26, 2024, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-evaluation-formaldehyde>; Environmental Protection Agency, “Draft Human Health Risk Assessment for Formaldehyde,” March 2024, <https://www.epa.gov/system/files/documents/2024-03/formaldehyde-draft-re-human-health-risk-assessment-public-release-hero-march-2024.pdf>.
29. “What is EPA’s Action Level for Radon and What Does it Mean?” Environmental Protection Agency, accessed October 2, 2024, <https://www.epa.gov/radon/what-epas-action-level-radon-and-what-does-it-mean#:~:text=The%20EPA%20recommends%20homes%20be,L%20and%204%20pCi%20pL>.
30. Environmental Protection Agency, “A Citizen’s Guide to Radon: The Guide to Protecting Yourself and Your Family from Radon,” May 2012, https://www.epa.gov/sites/default/files/2016-02/documents/2012_a_citizens_guide_to_radon.pdf.
31. Richard Williams, “Economic benefit-cost implications of the LNT model.”
32. Robert Obenchain, S. Stanley Young and Goran Krstic, “Low-level radon exposure and lung cancer mortality,” *Regulatory Toxicology and Pharmacology*, Vol. 107, 2019, p. 104418, <https://doi.org/10.1016/j.yrtph.2019.104418>.
33. “Superfund: National Priorities List (NPL),” Environmental Protection Agency, accessed September 26, 2024, <https://www.epa.gov/superfund/superfund-national-priorities-list-npl>.
34. “PRG Home,” Environmental Protection Agency, accessed September 26, 2024, <https://epa-prgs.ornl.gov/radionuclides/>.
35. “Superfund Enforcement FY 2023 Annual Results,” Environmental Protection Agency, accessed September 26, 2024, <https://www.epa.gov/enforcement/superfund-enforcement-fy-2023-annual-results>.
36. “Hudson River Cleanup,” Environmental Protection Agency, accessed September 26, 2024, <https://www.epa.gov/hudsonriverpcbs/hudson-river-cleanup>; Jesse McKinley, “G.E. Spent Years Cleaning Up the Hudson. Was It Enough?” *The New York Times*, September 8, 2016, <https://www.nytimes.com/2016/09/09/nyregion/general-electric-pcbs-hudson-river.html>.
37. Stephen Breyer, *Breaking the Vicious Circle: Toward Effective Risk Regulation*, Boston: Harvard University Press, 1993.
38. Susan E. Dudley, “Perpetuating Puffery: An Analysis of the Composition of OMB’s Reported Benefits of Regulation,” *Business Economics*, Vol. 47, No. 3, 2012, pp. 165-176, <https://doi.org/10.1057/be.2012.14>.
39. Letter from EPA Assistant Administrator Gina McCarthy to Representative Fred Upton, House Energy and Commerce Committee, February 3, 2012, <https://www.nrdc.org/sites/default/files/epa-letter-upton-pm-benefits-20120203.pdf>.
40. Letter from Clean Air Science Advisory Committee to Administrator Stephen L. Johnson, US Environmental Protection Agency, June 6, 2005, p. 6, https://downloads.regulations.gov/EPA-HQ-ORD-2007-0517-0083/attachment_3.pdf.
41. Environmental Protection Agency, “Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical

Information,” OAQPS Staff Paper, December 2005, pp. 3-55 to 3-57, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009MZM.PDF?Dockey=P1009MZM.PDF>.

42. Environmental Protection Agency, “Integrated Science Assessment for Particulate Matter,” December 2009, p. 2-25, <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=216546>.

43. Environmental Protection Agency, “Integrated Science Assessment for Particulate Matter,” October 2018, pp. 11-81 to 11-84, <https://assessments.epa.gov/risk/document/&deid%3D341593#downloads>.

44. Environmental Protection Agency, “Integrated Science Assessment for Particulate Matter,” p. 11-81.

45. “Air Quality - National Summary,” Environmental Protection Agency, accessed September 26, 2024, <https://www.epa.gov/air-trends/air-quality-national-summary>.

46. One EPA employee described the LNT assumption as “set in stone policy”, suggesting the agency would “never subscribe to” “opening it up for policy review.” See, John J. Cardarelli II, “Overt Scientific Bias and Clandestine Acts by Trusted Scientists: The Flawed Application of the Linear No-threshold Model,” *Health Physics*, Vol. 1, No. 3, 2024, p. 457, <https://doi.org/10.1097/HP.0000000000001844>; see also, Junkscience.com, “Emails Reveal: Bureaucrats censor radiation risk science fraud by cancelling whistleblowers; Huge implications for nuclear power and more,” June 2, 2023, <https://junkscience.com/2023/06/emails-reveal-radiation-safety-establishment-tries-to-censor-blockbuster-debunking-of-the-lnt-and-cleanse-the-health-physics-society-of-lnt-critics/>.

47. Edward J. Calabrese, Dima Yazji Shamoun, Jaap C. Hanekamp, “Cancer risk assessment: Optimizing human health through linear dose-response models,” *Food and Chemical Toxicology* Vol. 81, 2015, pp. 137-140, <https://doi.org/10.1016/j.fct.2015.04.023>.

48. For example, Kerala, India and Denver, Colorado have high, naturally-occurring levels of background radiation, but don’t have the cancer incidence rates predicted by LNT. See James Broughel, “Myths and Facts in Radiation Risks A simple solution to remove obstacles to nuclear power,” Competitive Enterprise Institute, April 2024, p. 4, <https://cei.org/studies/myths-and-facts-in-radiation-risks/>.

49. EPA uses a “biological plausibility” standard in some cases when considering which defaults to use in its cancer risk assessments. See Environmental Protection Agency, “Guidelines for Carcinogen Risk Assessment,” Washington DC, March 2005, <https://www.epa.gov/risk/guidelines-carcinogen-risk-assessment>.

50. For example, perhaps a statistical correlation exists between a positive health outcome and exposure levels, yet the mode of action remains uncertain. In such cases, a hormesis model might be a reasonable alternative as part of a sensitivity or uncertainty analysis, even if the LNT model remains the default.

51. For information about IRIS, see “Basic Information about the Integrated Risk Information System,” Environmental Protection Agency, accessed November 4, 2024, <https://www.epa.gov/iris/basic-information-about-integrated-risk-information-system#basicinfo>.

52. National Research Council, “Review of EPA’s Integrated Risk Information System (IRIS) Process,” Washington DC: National Academies Press, 2014, <https://www.ncbi.nlm.nih.gov/books/NBK230074/>.

53. Risk assessment is typically divided into four steps: Hazard identification determines if an agent can cause harm; dose-response assessment quantifies the relationship between exposure and health effects; exposure assessment measures contact with the hazard; and risk characterization synthesizes these findings to estimate overall public health risk.

54. Angela Logomasini, “EPA’s Flawed IRIS Program Is Far from Gold Standard,” Competitive Enterprise Institute, 2019, https://cei.org/sites/default/files/IRIS_Paper_pdf.pdf.

55. Environmental Protection Agency, “ORD Staff Handbook for Developing IRIS Assessments,” December 2022, https://cfpub.epa.gov/ncea/iris_drafts/recordisplay.cfm?deid=356370

56. Angela Logomasini, “EPA IRIS Program Is Hardly The ‘Gold Standard,’” Competitive Enterprise Institute Science 2.0, May 24, 2018, https://cei.org/opeds_articles/epa-iris-program-is-hardly-the-gold-standard/.

57. Angela Logomasini, “EPA IRIS Program Is Hardly The ‘Gold Standard.’”

58. National Academies of Sciences, Engineering and Medicine, “Review of the Environmental Protection Agency’s Draft IRIS Assessment of Formaldehyde,” Washington DC: National Academies Press, 2011, <https://nap.nationalacademies.org/catalog/13142/review-of-the-environmental-protection-agencys-draft-iris-assessment-of-formaldehyde>. In a follow-up review of the IRIS process in 2014, NAS recommended that IRIS adopt systematic review methods to improve transparency and reproducibility across its assessments. See National Research Council, “Review of EPA’s Integrated Risk Information System (IRIS) Process,” Washington DC: National Academies Press, 2014, <https://www.ncbi.nlm.nih.gov/books/NBK230074/>.

59. National Academies of Sciences, Engineering and Medicine, “Review of the Environmental Protection Agency’s Draft IRIS Assessment of Formaldehyde.”

60. National Academies of Sciences, Engineering and Medicine, “Review of the Environmental Protection Agency’s Draft IRIS Assessment of Formaldehyde;” National Research Council, “Review of EPA’s Integrated Risk Information System (IRIS) Process.”

61. Environmental Protection Agency, “IRIS Toxicological Review of Formaldehyde (Inhalation),” August 2024, <https://iris.epa.gov/document/&deid=361799#overview>.

62. Hazard analysis on its own is inadequate to determine risk. For example, household bleach is safe when used to clean bathroom surfaces at recommended dilutions, but can create dangerous chlorine gas if mixed with ammonia-based cleaners. The example illustrates how the exposure context matters for characterizing risks.

63. Angela Logomasini, “The Flawed EPA Program that Needs to be Cut From the Federal Budget,” Real Clear Policy, February 28, 2019, https://www.realclearpolicy.com/articles/2019/02/22/the_flawed_epa_program_that_needs_to_be_cut_from_the_federal_budget_111071.html.

64. Angela Logomasini, “EPA Should Revise Its Assessment of Medical Supply Sterilant,” Competitive Enterprise Institute On Point, No. 266, December 10, 2020, https://cei.org/wp-content/uploads/2020/12/Angela_Loomasini_-_EPA_Should_Revise_Its_Assessment_of_Medical_Supply_Sterilant.pdf.

65. Letter to EPA Administrator Michael Regan, Martha Williams, and Janet Coit from Representative Bruce Westerman, April 1, 2024, <https://westerman.house.gov/sites/>

evo-subsites/westerman.house.gov/files/evo-media-document/IRIS%20Letter_Final%2004.01.2024.pdf; Government Accountability Office, “High-Risk Series: Efforts Made to Achieve Progress Need to Be Maintained and Expanded to Fully Address All Areas,” GAO-23-106203, April 2023, <https://www.gao.gov/products/gao-23-106203>.

66. “High Risk List,” Government Accountability Office, accessed November 4, 2024, <https://www.gao.gov/high-risk-list>.

67. Government Accountability Office, “Chemical Assessments: Low Productivity and New Interagency Review Process Limit the Usefulness and Credibility of EPA’s Integrated Risk Information System,” GAO-08-440, March 2008, <https://www.gao.gov/products/gao-12-42>; Government Accountability Office, “Chemical Assessments: Challenges Remain with EPA’s Integrated Risk Information System Program,” GAO-12-42, December 2011, <https://www.gao.gov/products/gao-12-42>.

68. Lynn L. Bergeson and Carla N. Hutton, “GAO’s Priority Open Recommendations for EPA Include Recommendations Regarding the IRIS Program,” Bergeson & Campbell PC, June 6, 2023, <https://www.lawbc.com/gaos-priority-open-recommendations-for-epa-include-recommendations-regarding-the-iris-program/>; Government Accountability Office, “Priority Open Recommendations: Environmental Protection Agency,” May 9, 2023, GAO-23-106460, <https://www.gao.gov/products/gao-23-106460>.

69. Environmental Protection Agency, “ORD Staff Handbook for Developing IRIS Assessments,” December 2022, https://cfpub.epa.gov/ncea/iris_drafts/recordisplay.cfm?deid=356370.

70. National Academies of Sciences, Engineering and Medicine, “Review of EPA’s 2022 Draft Formaldehyde Assessment,” Washington DC: National Academies Press, p. 37, <https://nap.nationalacademies.org/download/27153#>.

71. Environmental Protection Agency, “ORD Staff Handbook for Developing IRIS Assessments,” p. 8-10; on problems with the LNT model, see James Broughel, “Myths and Facts in Radiation Risks: A simple solution to remove obstacles to nuclear power,” (Washington DC: Competitive Enterprise Institute, April 4, 2024), <https://cei.org/studies/myths-and-facts-in-radiation-risks/>.

72. Environmental Protection Agency, “ORD Staff Handbook for Developing IRIS Assessments,” p. 8-15.

73. American Chemistry Council, “EPA’s Final Formaldehyde IRIS Assessment Ignores Peer Reviews and Best Available Science,” August 19, 2024, <https://www.americanchemistry.com/chemistry-in-america/news-trends/press-release/2024/epa-s-final-formaldehyde-iris-assessment-ignores-peer-reviews-and-best-available-science>.

74. Melissa J. Vincent, Seneca Fitch, Lauren Bylsma, et al., “Assessment of associations between inhaled formaldehyde and lymphohematopoietic cancer through the integration of epidemiological and toxicological evidence with biological plausibility,” *Toxicological Sciences*, Vol. 199, No. 2, 2024, p. 188, <https://toxstrategies.com/publications/assessment-of-associations-between-inhaled-formaldehyde-and-lymphohematopoietic-cancer-through-the-integration-of-epidemiological-and-toxicological-evidence-with-biological-plausibility/>.

75. “Frank R. Lautenberg Chemical Safety for the 21st Century Act,” H.R. 2576, 114th Congress, <https://www.congress.gov/bill/114th-congress/house-bill/2576>.

76. Angela Logomasini, “EPA IRIS Program Is Hardly The ‘Gold Standard.’”

77. "About the Office of Chemical Safety and Pollution Prevention (OCSPP)," Environmental Protection Agency, accessed November 6, 2024, <https://www.epa.gov/aboutepa/about-office-chemical-safety-and-pollution-prevention-ocspp>.
78. Public Law 106-554 § 515.
79. Point of Departure is a dose-response level used as the starting point in deriving a reference value. For example, it might be the highest dose or exposure level at which no adverse effects are observed.
80. 15 U.S.C. chapter 53, <https://www.law.cornell.edu/uscode/text/15/chapter-53>.
81. PL 114-182, <https://www.congress.gov/bill/114th-congress/house-bill/2576/text>.
82. 15 U.S.C. § 2625(b).
83. 15 U.S.C. § 2625(h) and (i).
84. EPA, Procedures for Prioritization of Chemicals for Risk Evaluation Under the Toxic Substances Control Act, Final Rule, 82 FR 33753, July 20, 2017, <https://www.govinfo.gov/content/pkg/FR-2017-07-20/pdf/2017-14325.pdf>.
85. EPA, Procedures for Chemical Risk Evaluation Under the Toxic Substances Control Act, Final Rule, 82 FR 33726, July 20, 2017, <https://www.govinfo.gov/content/pkg/FR-2017-07-20/pdf/2017-14337.pdf>.
86. Procedures for Chemical Risk Evaluation Under the Toxic Substances Control Act (TSCA); Final Rule, 89 FR 37023; Final Rule, 89 FR 37028, May 3, 2024, <https://www.govinfo.gov/content/pkg/FR-2024-05-03/pdf/2024-09417.pdf>.
87. EPA, TSCA Inventory Notification Requirements, Final Rule, 82 FR 37520, August 11, 2017, <https://www.govinfo.gov/content/pkg/FR-2017-08-11/pdf/2017-15736.pdf>.
88. EPA, Fees for the Administration of the Toxic Substances Control Act, Final Rule, 83 FR 52694, October 17, 2018, <https://www.govinfo.gov/content/pkg/FR-2018-10-17/pdf/2018-22252.pdf>.
89. EPA, Fees for the Administration of the Toxic Substances Control Act (TSCA); Final Rule, 89 FR 12961, February 21, 2024, <https://www.govinfo.gov/content/pkg/FR-2024-02-21/pdf/2024-02735.pdf>.
90. American Chemistry Council, Chemistry in Everyday Products, <https://www.americanchemistry.com/chemistry-in-america/chemistry-in-everyday-products> (accessed November 5, 2024).
91. Hannah Ritchie, "After millennia of agricultural expansion, the world has passed "peak agricultural land," Our World in Data, May 30, 2022, <https://ourworldindata.org/peak-agriculture-land> (accessed November 5, 2024).
92. See e.g. Angela Logomasini, U.S. Should Stop Funding the International Agency for Research on Cancer, Competitive Enterprise Institute, September 18, 2019, <https://cei.org/studies/u-s-should-stop-funding-the-international-agency-for-research-on-cancer/>.
93. The American Chemistry Council's Web page, TSCA New Chemicals Review Tracking, shows the status of new chemical reviews: https://www.americanchemistry.com/better-policy-regulation/chemical-management/toxic-substances-control-act-tsca/tsca-new-chemicals-review-tracking?_gl=1*tq6few*_up*MQ..&gclid=CjwKCAjwyfe4BhAWEiwAkIL8sG3dgbal1VLlvmnKA7tSJOY3hRr4PnQJPY-KUL_ZhNLGDzhiBdz2h9xoCGY0QAvD_BwE (accessed November 19, 2024).

94. American Chemistry Council, EPA's New Chemicals Program Stifling Innovation, July 20, 2022, https://www.americanchemistry.com/better-policy-regulation/chemical-management/toxic-substances-control-act-tsca/resources/epas-new-chemicals-program-stifling-us-innovation?_gl=1*10vbqnq*_up*MQ..&gclid=CjwKCAjwyfe4BhAWEiwAkIL8sG3dgbal1VLlvmnKA7tSJOY3hRr4PnQJPY-KUL_ZhNLGDzhibDz2h9xoCGY0QAvD_BwE.
95. 15 U.S.C. § 2602(2)(B)(4).
96. 15 U.S.C. § 2605.
97. TSCA does not define either “best available science” or “weight of scientific evidence.” The EPA’s May 2024 risk evaluation procedures rule pointedly declined to define the terms. We may nonetheless infer their approximate meanings from the discussion in the rule’s preamble. Best available science is science that is “reliable and unbiased.” 89 FR 37028, 37043. Weight of scientific evidence is an “integrative” judgment “based on the strengths, limitations, and interpretation of data available, information across multiples lines of evidence, and how these different lines of evidence may or may not fit together when drawing conclusions.” 89 FR 37028, 37044.
98. Problems with IRIS risk assessments are discussed earlier in this chapter.
99. EPA, About Safer Choice, <https://www.epa.gov/saferchoice/learn-about-safer-choice-label#tab-1> (accessed November 20, 2022).
100. TSCA focuses on determining whether a chemical does or does not present an unreasonable risk. The chemical is either allowed or risks need to be mitigated before the use is allowed. The concept of one chemical being preferred because it is ‘safer’ than another does not exist in TSCA. And Congress has not authorized the EPA to develop a program that picks winners and losers based on this relative concept (though there may have been some appropriations language to keep Safer Choice afloat at one point, but it is not in TSCA).
101. EPA, About the Environmentally Preferable Purchasing Program, <https://www.epa.gov/greenerproducts/about-environmentally-preferable-purchasing-program> (accessed November 20, 2024).
102. 15 U.S.C. § 2605
103. Under Section 21, any person may petition the EPA to issue, amend, or repeal a rule or order that requires chemical testing, imposes regulatory controls on chemicals, requires information, or affects the management of a new chemical substance. 15 U.S.C. § 2620 – Citizens’ Petitions. Under Section 20, anyone may file a civil suit against any person, including the U.S. Government, alleged to be in violation of TSCA or certain of its regulations or orders. 15. U.S.C. § 2619 – Citizens’ Civil Actions. Section 4(f) requires the EPA to take action upon the receipt of any information providing a reasonable basis to conclude that a chemical substance or mixture presents a significant risk of serious or widespread harm to human beings. 15 U.S. Code § 2603 - Testing of chemical substances and mixtures. Section 7 authorizes the EPA to take civil action in district courts to seize an imminently hazardous chemical or mixture, and obtain relief from any person who produces, processes, distributes, or disposes such chemical or mixture. 15 U.S. Code § 2606 - Imminent hazards.
104. 15 U.S.C. § 2603(a)(4).
105. P.L. 112-177, 7 USC §136 et seq., <https://www.agriculture.senate.gov/imo/media/doc/FIFRA.pdf>.

106. EPA, Summary of the Federal Insecticide, Fungicide, and Rodenticide Act, <https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act>.
107. EPA, About Pesticide Regulation, <https://www.epa.gov/pesticide-registration/about-pesticide-registration>.
108. EPA, Summary of the Federal Insecticide, Fungicide, and Rodenticide Act.
109. 7 U.S. Code §136 (bb).
110. P.L. 104-170, 21 U.S.C. § 346a, <https://www.congress.gov/104/statute/STATUTE-110/STATUTE-110-Pg1489.pdf>.
111. 9 U.S. Code § 346a(b)(2)(C), <https://uscode.house.gov/view.xhtml?path=/prelim@title21/chapter9&edition=prelim>.
112. The EPA defines “tolerance” as the maximum residue level of a pesticide (usually measured in parts per million, or ppm) that legally can be present in food or feed. EPA, Pesticide Registration Manual: Chapter 11 - Tolerance Petitions, <https://www.epa.gov/pesticide-registration/pesticide-registration-manual-chapter-11-tolerance-petitions> (accessed November 6, 2024).
113. EPA, PRIA Overview and History, <https://www.epa.gov/pria-fees/pria-overview-and-history>.
114. EPA, About Pesticide Registration Fees under PRIA, <https://www.epa.gov/pria-fees/about-pesticide-registration-fees-under-pria>.
115. The Pesticide Registration Improvement Act of 2022 (PRIA 5; Division HH, Title VI-Pesticides, Consolidated Appropriations Act of 2023, P.L. 117-328), <https://www.congress.gov/117/plaws/publ328/PLAW-117publ328.pdf>.
116. EPA, PRIA 5 Implementation, <https://www.epa.gov/pria-fees/pria-5-implementation>.
117. Cabi, Global Burden of Crop Loss, <https://www.cabi.org/projects/global-burden-of-crop-loss/>.
118. Beyer, R.M., Hua, F., Martin, P.A. *et al.* Relocating croplands could drastically reduce the environmental impacts of global food production. *Commun Earth Environ* ,3 (2022) 49). <https://doi.org/10.1038/s6-00360-022-43247>.
119. Food and Agriculture Organization, Plant Production and Protein, <https://www.fao.org/plant-production-protection/about/en> (accessed December 3, 2025).
120. Thoma, G., Matlock, M., Lawrence, K., Taylor, B., Hickman, J. (2024). *Life cycle assessment of impacts of eliminating chemical pesticides used in the production of U.S. corn, soybeans, and cotton Final Report*, <https://static1.squarespace.com/static/5faeee45a363746603d1c6e1/t/661e95a6e057f947a1185c5e/171328.0424229/CLA+LCIA+ISO+Finalized+Report.pdf>.
121. Thoma et al. Life cycle assessment of impacts of eliminating chemical pesticides.
122. The average number of days late has increased each year over the past five years: 37 days in 2020, 49 days in 2021, 91 days in 2022, 117 days in 2023, and 133 days in 2024. EPA, Pesticide Program Dialogue Committee Meeting, November 13, 2024, Session 1-OPP Update, slide 24, <https://www.epa.gov/pesticide-advisory-committees-and-regulatory-partners/pesticide-program-dialogue-committee-16>.

123. OMB, M-94-3, Guidance for Implementing EO 12866, Oct. 12, 1993, https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/assets/info/eg/eo12866_implementation_guidance.pdf.
124. Under FIFRA, the EPA must protect against “unreasonable adverse effects on the environment,” but in determining what is unreasonable, the Agency must consider “the benefits of the use of any pesticide.” 7 U.S. Code §136(2)(bb), <https://www.epa.gov/pesticide-registration/about-pesticide-registration>.
125. The Court held that, in enacting the ESA, “Congress intended endangered species to be afforded the highest of priorities,” hence “sacrifice of the anticipated benefits” carries no weight in ESA regulatory decisions. See *Tennessee Valley Authority v Hill*, 437 US 153, 174 (1978).
126. 7 U.S. Code § 136(g)(1)(A)(iii), <https://www.agriculture.senate.gov/imo/media/doc/FIFRA.pdf>.
127. 7 U.S. Code § 136v – Authority of States, <https://www.law.cornell.edu/uscode/text/7/136v>.
128. EPA, Guidance on FIFRA 24(C) Regulations, <https://www.epa.gov/pesticide-registration/guidance-fifra-24c-registrations>.
129. 42 U.S. Code, Chapter 103—Comprehensive Environmental Response, Compensation and Liability, <https://www.govinfo.gov/content/pkg/USCODE-2011-title42/html/USCODE-2011-title42-chap103.htm>.
130. Public Law 96-510, December 11, 1980, <https://www.congress.gov/bill/96th-congress/house-bill/7020>.
131. EPA, What is Superfund? <https://www.epa.gov/superfund/what-superfund>.
132. EPA, Love Canal Niagara Falls, NY, Cleanup Activities, <https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0201290>.
133. EPA, Resource Conservation and Recovery Act (RCRA) Laws and Regulations, <https://www.epa.gov/rcra>.
134. EPA, Superfund Amendments and Reauthorization Act (SARA), <https://www.epa.gov/superfund/superfund-amendments-and-reauthorization-act-sara>.
135. EPA, About the Office of Land and Emergency Management, <https://www.epa.gov/aboutepa/about-office-land-and-emergency-management>.
136. EPA, Superfund Liability, <https://www.epa.gov/enforcement/superfund-liability>.
137. EPA, Superfund Liability.
138. Congressional Research Service (CRS), Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act, Updated June 14, 2012, <https://crsreports.congress.gov/product/pdf/R/R41039>.
139. CRS, CERCLA, A Summary of Superfund Cleanup Authorities and Related Provisions of the Act.
140. IRS, Superfund Chemical Excise Taxes, <https://www.irs.gov/businesses/small-businesses-self-employed/superfund-chemical-excise-taxes> (accessed December 7, 2024).

141. Kevin Bogardus, Ellie Borst, “Superfund tax shortfall; Trouble for cleanups, EPA budget,” E&E News, April 15, 2024, <https://www.eenews.net/articles/superfund-tax-shortfall-trouble-for-cleanups-epa-budget/>.
142. EPA, Brownfields, <https://www.epa.gov/brownfields>.
143. CRS, CRS, CERCLA, A Summary of Superfund Cleanup Authorities and Related Provisions of the Act, p. 7.
144. EPA, Superfund: National Priorities List (NPL), <https://www.epa.gov/superfund/superfund-national-priorities-list-npl> (accessed December 7, 2024).
145. Code of Federal Regulations Part 300 – National Oil and Hazardous Substances Contingency Plan, <https://www.govinfo.gov/content/pkg/CFR-2015-title40-vol28/xml/CFR-2015-title40-vol28-part300.xml>.
146. The requirement is set forth in CERCLA § 105(a)(8)(B), <https://www.govinfo.gov/content/pkg/COMPS-886/pdf/COMPS-886.pdf>.
147. Currently, a site must have an HRS score of 28.5 or higher to be eligible for NPL placement. EPA National Priorities List (NPL) Site Listing Process, <https://www.epa.gov/superfund/about-superfund-cleanup-process#npl>.
148. Hazard and risk are not the same, as discussed above in the sections on the precautionary principle and linear no threshold.
149. Summer L. Nastich and Diane R. Smith, Can You Trust a Trust? The Potential CERCLA Liability of Trustees and Beneficiaries, *J. Envtl. Law and Litigation*, Vol.23, 401-432, <https://scholarsbank.uoregon.edu/server/api/core/bitstreams/babf3f2f-1c48-4799-86ca-cd1d80275c94/content>.
150. Racer, “U.S. EPA highlights Racer Trust Development Successes,” press release, n.d., <https://www.racertrust.org/news/us-epa-highlights-racer-trust-redevelopment-successes> (accessed December 7, 2024).
151. Racer, Who We Are and What We Do, <https://www.racertrust.org/who-we-are-and-what-we-do> (accessed December 7, 2024).
152. Lawrence S. Kirsch, John C. Raffetto, Federal Environmental Liability under CERCLA and RCRA, Chapter 1 of Kevin Reid Murray, ed., *Environmental Aspects of Real Estate and Commercial Transactions: Acquisition, Development, and Liability Management*, Fifth Edition (Chicago, Illinois: ABA Book Publishing, 2021) <https://www.americanbar.org/content/dam/aba-cms-dotorg/products/inv/book/408778006/chap1-5350266.pdf>.
153. EPA, Portland Harbor Superfund Updates, June 2024, <https://semspub.epa.gov/work/10/100553045.pdf>.
154. EPA, General Information about New Bedford Cleanup, <https://www.epa.gov/new-bedford-harbor/general-information-about-new-bedford-harbor-cleanup> (accessed December 7, 2024).
155. EPA, Superfund chemical excise taxes, <https://www.irs.gov/businesses/small-businesses-self-employed/superfund-chemical-excise-taxes>.
156. Douglas W. Charles, “Superfund Tax Is Here—Are You Ready?” American Bar Association, July 11, 2022, https://www.americanbar.org/groups/business_law/resources/business-law-today/2022-july/the-superfund-tax-is-here-are-you-ready/#:~:text=The%20Superfund%20Tax%20is%20a,clean%20up%20hazardous%20waste%20sites.

157. Science Direct, Polluter Pays Principle, <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/polluter-pays-principle> (accessed December 8, 2024).
158. American Chemistry Council, Why Superfund Chemical Taxes Should Not Be Reinstated, <https://www.americanchemistry.com/content/download/6535/file/Why-Superfund-Taxes-Should-Not-Be-Reinstated.pdf> (accessed December 8, 2024).
159. Megan Glatzel, Bea Gordon, “The West’s Sleeping Giant: Abandoned Mines and the Role of the Good Samaritan,” Stanford, June 7, 2018, <https://waterinthewest.stanford.edu/news-events/news-insights/wests-sleeping-giant-abandoned-mines-and-role-good-samaritan>.
160. “Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2024,” S. 2781, 118th Congress, <https://www.congress.gov/bill/118th-congress/senate-bill/2781>.
161. “Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2024,” H.R. 7779, 118th Congress, <https://www.govinfo.gov/app/details/BILLS-118hr7779ih>.
162. Manuel Quiñones, “Senate approves abandoned mine cleanup bill,” E&E Daily, August 1st, 2024, <https://www.eenews.net/articles/senate-approves-abandoned-mine-cleanup-bill-2/>.
163. Manuel Quiñones, “Senate approves abandoned mine cleanup bill,” E&E Daily, August 1, 2024, <https://subscriber.politicopro.com/article/eenews/2024/08/01/senate-approves-abandoned-mine-cleanup-bill-00172197>.
164. EPA, Navajo Nation, Cleaning Up Abandoned Uranium Mines, <https://www.epa.gov/navajo-nation-uranium-cleanup/aum-cleanup> (accessed December 8, 2024).
165. EPA, Navajo Nation, Cleaning up Abandoned Uranium Mines.
166. The EPA has interpreted CERCLA to require reopeners – CERCLA §122(f)(6), <https://www.epa.gov/enforcement/negotiating-superfund-settlements>.
167. EPA, Technical Fact Sheet – Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), https://19january2021snapshot.epa.gov/sites/static/files/2017-12/documents/ffrrofactsheet_contaminants_pfos_pfoa_11-20-17_508_0.pdf; EPA, Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances, 89 FR 39124, May 8, 2024, <https://www.federalregister.gov/documents/2024/05/08/2024-08547/designation-of-perfluorooctanoic-acid-pfoa-and-perfluorooctanesulfonic-acid-pfos-as-cercla-hazardous>.
168. George H. Buermann, “Pandora’s Reopener Box: Lying in Wait when PFAS Compounds become ‘Hazardous Substances’ under CERCLA,” *Environmental Law Monitor*, April 27, 2023, <https://environmentallawmonitor.com/cercla/pandoras-reopener-box-lying-in-wait-when-pfas-compounds-become-hazardous-substances-under-cercla/>. See also 42 U.S. Code § 9622.
169. EPA, Consolidated Guidance on the Establishment, Management, and Use of CERCLA Special Accounts, October 4, 2002, <https://www.epa.gov/sites/default/files/2018-04/documents/congui-estmgt-specacct.pdf>. In CERCLA parlance, funds paid by a PRP are to be retained in a “site-specific account.” “EPA retains these funds in site-specific accounts, called ‘special accounts,’ which are subaccounts within the EPA Hazardous Substance Superfund (Trust Fund).”
170. EPA, Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances, 89 FR 39124, May 8, 2024.

171. Stephanie R. Feingold, Laurie Mathews, EPA Designates PFOA and PFOS As CERCLA Hazardous Substances, Morgan Lewis, April 23, 2024, <https://www.morganlewis.com/pubs/2024/04/epa-designates-pfoa-and-pfos-as-cercla-hazardous-substances>.
172. Comments of Daren Bakst, Rachel Wilfong, Heritage Foundation, on EPA, Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances, proposed rule, Docket ID No. EPA-HQ-OLEM-2019-0341, November 7, 2022, <https://www.regulations.gov/comment/EPA-HQ-OLEM-2019-0341-0499>. See also 42 U.S. Code § 9602.
173. Comments of the U.S. Chamber of Commerce Coalition of Companies and Trade Associations, on Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances, proposed rule, Docket ID No. EPA-HQ-OLEM-2019-0341, November 7, 2022, <https://www.regulations.gov/comment/EPA-HQ-OLEM-2019-0341-0569>.
174. Comments of the U.S. Chamber of Commerce Coalition of Companies and Trade Associations, on Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances.
175. Congressional Research Service, Environmental Laws: Summaries of Major Statutes Administered by the Environmental Protection Agency, December 20, 2013, <https://crsreports.congress.gov/product/pdf/RL/RL30798>.
176. RCRA sets forth basic requirements for non-hazardous waste but allows states to play the lead role in implementation. EPA, Resource Conservation and Recovery Act (RCRA) Overview, <https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview>. In contrast, RCRA requirements for hazardous waste are quite detailed.
177. EPA, Summary of the Resource Conservation and Recovery Act, <https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act>.
178. “Hazardous and Solid Waste Amendments of 1984,” H.R. 2867, 98th Congress, <https://www.congress.gov/bill/98th-congress/house-bill/2867>.
179. EPA, Summary of the Resource Conservation and Recovery Act.
180. EPA, Learn About Underground Storage Tanks, <https://www.epa.gov/ust/learn-about-underground-storage-tanks>.
181. EPA, Learn about the Hazardous Waste Electronic Manifest System (e-Manifest), <https://www.epa.gov/e-manifest/learn-about-hazardous-waste-electronic-manifest-system-e-manifest>.
182. EPA, Data Quality Issues with Hazardous Waste Manifests Submitted to EPA’s e-Manifest System, March 14, 2023, <https://www.lion.com/LionTech/media/Lion-Media-Library/News/EPA-RCRA-E-Manifest-Advisory-March-2023.pdf>. Part of the problem is a reliance on older technology. The current system requires at least two people to enter data—one person to manually complete the manifest and another to type the information into the database. The system should be updated so that one person fills out the form online and the information goes into the database.
183. 40 CFR §261.2(a)
184. EPA, Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions, <https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and->

hazardous-waste-exclusions#:~:text=RCRA%20states%20that%20%22solid%20waste,operations%2C%20and%20from%20community%20activities.

185. EPA, Legitimate Hazardous Waste Recycling Versus Sham Recycling, <https://www.epa.gov/hw/legitimate-hazardous-waste-recycling-versus-sham-recycling>.

186. EPA, What is a Circular Economy? <https://www.epa.gov/circulareconomy/what-circular-economy>.

187. Profit-seeking enterprises have been finding new uses for industrial byproducts for hundreds of years. Pierre Desrochers, Industrial ecology and the rediscovery of inter-firm recycling linkages: historical evidence and policy implications, *Industrial and Corporate Change*, Volume 11, Issue 5, November 2002, pp. 1031–1057, <https://academic.oup.com/icc/article-abstract/11/5/1031/774898?redirectedFrom=fulltext>.

188. EPA, Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard, February 2014, pp. 2-4, https://www.epa.gov/sites/default/files/2014-12/documents/ccr_bu_eval.pdf.

189. EPA, Clean Air Act Guidelines and Standards for Waste Management, <https://www.epa.gov/stationary-sources-air-pollution/clean-air-act-guidelines-and-standards-waste-management>.

190. EPA, EPA Response to Kingston TVA Coal Ash Spill, <https://www.epa.gov/tn/epa-response-kingston-tva-coal-ash-spill>.

191. EPA, Frequent Questions about the Beneficial Uses of Coal Ash, <https://www.epa.gov/coalash/frequent-questions-about-beneficial-use-coal-ash> (accessed December 3, 2024).

192. EPA, Frequent Questions about the Beneficial Uses of Coal Ash.

193. The EPA defines “reverse distributor” as “any person that receives and accumulates potentially creditable hazardous waste pharmaceuticals for the purpose of facilitating or verifying manufacturer credit.” EPA, “EPA’s Regulations on Reverse Distribution and Policy on Reverse Logistics,” guidance document, October 17, 2019, <https://rcrapublic.epa.gov/files/14915.pdf>.

194. EPA, Land Disposal Restrictions for Hazardous Waste, <https://www.epa.gov/hw/land-disposal-restrictions-hazardous-waste>.

195. EPA, The Dilution Prohibition, <https://www.epa.gov/hw/land-disposal-restrictions-hazardous-waste#dilution>.

196. FedEx Sense Aware Innovation, <https://www.fedex.com/en-us/senseaware/innovation.html#:~:text=FedEx%20now%20employs%20a%20form,security%2C%20and%20timeliness%20of%20deliveries> (accessed December 3, 2024).

Chapter 5

1. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60103, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>. “Greenhouse Gas Reduction Fund,” Environmental Protection Agency, accessed November 1, 2024, <https://www.epa.gov/greenhouse-gas-reduction-fund>.

2. Section 60103 of the IRA created a new section of the Clean Air Act, Section 134. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60103, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/>

text. “Greenhouse Gas Reduction Fund,” Environmental Protection Agency, accessed November 1, 2024, <https://www.epa.gov/greenhouse-gas-reduction-fund>. Daren Bakst and Jacob Tomasulo, “The Greenhouse Gas Reduction Fund: A slush fund for the EPA and favored nonprofits,” Competitive Enterprise Institute, February 08, 2024, <https://cei.org/blog/the-greenhouse-gas-reduction-fund-a-slush-fund-for-the-epa-and-favored-nonprofits/>.

3. Except for the \$30 million appropriated for administrative costs, the appropriated money was “to remain available until September 30, 2024, to make grants, on a competitive basis...” Section 60103 of the IRA created a new section of the Clean Air Act, Section 134. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60103, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.

4. The EPA announced on August 16, 2024 that it had obligated the \$27 billion. “EPA Awards \$27B in Greenhouse Gas Reduction Fund Grants to Accelerate Clean Energy Solutions, Combat the Climate Crisis, and Save Families Money,” Environmental Protection Agency, accessed November 11, 2024, <https://www.epa.gov/newsreleases/epa-awards-27b-greenhouse-gas-reduction-fund-grants-accelerate-clean-energy-solutions>. This chapter is not stating one way or another whether the EPA has properly met the timing requirements.

5. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60103, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.

6. Daren Bakst and Jacob Tomasulo, “The Greenhouse Gas Reduction Fund: A slush fund for the EPA and favored nonprofits,” Competitive Enterprise Institute, February 08, 2024, <https://cei.org/blog/the-greenhouse-gas-reduction-fund-a-slush-fund-for-the-epa-and-favored-nonprofits/>.

7. The White House, “Biden-Harris Administration Announces Historic \$20 Billion in Awards to Expand Access to Clean Energy and Climate Solutions and Lower Energy Costs for Communities Across the Nation,” April 04, 2024, <https://www.whitehouse.gov/briefing-room/statements-releases/2024/04/04/biden-harris-administration-announces-historic-20-billion-in-awards-to-expand-access-to-clean-energy-and-climate-solutions-and-lower-energy-costs-for-communities-across-the-nation/>.

8. Daren Bakst, “The Inflation Reduction Act’s EPA slush fund gets going: Now it needs to be stopped,” Competitive Enterprise Institute, April 11, 2024, <https://cei.org/blog/the-inflation-reduction-acts-epa-slush-fund-gets-going-now-it-needs-to-be-stopped/>.

9. “About the Office of the Greenhouse Gas Reduction Fund (OGGRF),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/about-office-greenhouse-gas-reduction-fund-oggrf>.

10. “Chair Rodgers Opening Remarks on Fighting the Misuse of Biden’s Green Bank Giveaway,” Energy and Commerce Committee, accessed November 2, 2024, <https://energycommerce.house.gov/posts/chair-rodgers-opening-remarks-on-fighting-the-misuse-of-biden-s-green-bank-giveaway>.

11. “What is Environmental Education?,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/what-environmental-education>.

12. This section is focused on the programs listed on the EPA’s own environmental education web site, “Environmental Education (EE),” Environmental Protection

Agency, accessed November 2, 2024, <https://www.epa.gov/education>. Office of Public Engagement and Environmental Education oversees these environmental educational programs. This section of the book is in no way addressing public engagement issues. “About the Office of Public Engagement and Environmental Education (OPEEE),” Environmental Protection Agency, November 2, 2024, <https://www.epa.gov/aboutepa/about-office-public-engagement-and-environmental-education-opeee>. The National Environmental Education Act of 1990 required the creation of an Office of Environmental Education at the EPA. It does not appear that there is currently a clear and distinct office just on environmental education. Regardless, Congress should repeal the National Environmental Education Act of 1990 and eliminate whatever “Office of Environmental Education” actually exists.

13. “Environmental Education Grants: National Statistics,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/environmental-education-grants-national-statistics>.

14. “Environmental Education Grants: National Statistics,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/environmental-education-grants-national-statistics>.

15. National Wildlife Federation - \$100,000, “Eco-Schools U.S. Atlanta,” accessed November 2, 2024, <https://www.epa.gov/education/environmental-education-grant-descriptions>.

16. Colorado Alliance for Environmental Education - \$100,000, “Preparing the Next Generation for Careers in Climate Change,” accessed November 2, 2024, <https://www.epa.gov/education/environmental-education-grant-descriptions>.

17. Missouri River Bird Observatory - \$80,000, “Empowering Kansas City residents to take Environmental Action,” accessed November 2, 2024, <https://www.epa.gov/education/environmental-education-grant-descriptions>.

18. “EPA Selects Educational Organizations to Receive Over \$3.6 million to Support Environmental Projects Nationwide,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/newsreleases/epa-selects-educational-organizations-receive-over-36-million-support-environmental>.

19. “Presidential Innovation Award for Environmental Educators,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/presidential-innovation-award-environmental-educators#eligibility>.

20. “Presidential Innovation Award for Environmental Educators,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/presidential-innovation-award-environmental-educators#eligibility>.

21. “Presidential Innovation Award for Environmental Educators,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/presidential-innovation-award-environmental-educators#eligibility>.

22. “The purpose of this program is to provide EE [Environmental Education] training and long-term support to formal and non-formal education professionals across the United States, bolstering their ability to effectively teach about environmental issues.” “National Environmental Education Training Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/national-environmental-education-training-program>.

23. The EPA proclaims about this program, “Encourage your students with an existing environmental stewardship project or an idea for a project to apply so that their achievements can be further recognized.” “President’s Environmental Youth Award,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/presidents-environmental-youth-award>.
24. The Council “is comprised of representatives from organizations other than the federal government who provide EPA with advice on environmental education.” “National Environmental Education Advisory Council (NEEAC),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/national-environmental-education-advisory-council-neeac>.
25. This includes repealing the National Environmental Education Act of 1990. See “National Environmental Education Act,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/education/national-environmental-education-act-0>.
26. The Office of Community Revitalization is located within the Office of Policy. “About the Office of Policy (OP),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/about-office-policy-op>.
27. “Local Foods, Local Places,” Environmental Protection Agency, accessed November 1, 2024, <https://www.epa.gov/smartgrowth/local-foods-local-places>.
28. “Healthy Places for Healthy People,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/smartgrowth/healthy-places-healthy-people>.
29. “Recreation Economy for Rural Communities,” Environmental Protection Agency, accessed February 14, 2025, <https://www.epa.gov/smartgrowth/recreation-economy-rural-communities>.
30. “Building Blocks for Sustainable Communities,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/smartgrowth/building-blocks-sustainable-communities>.
31. “Smart Growth,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/smartgrowth>.
32. Daren Bakst and Patrick Tyrrell, *Big Government Policies that Hurt the Poor and How to Address Them*, (Washington, DC: The Heritage Foundation, April 07, 2017, <https://www.heritage.org/poverty-and-inequality/report/big-government-policies-hurt-the-poor-and-how-address-them>).
33. Sustainable Marketplace: Greener Products and Services, Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts>.
34. “Location and Green Building,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts>.
35. “Sustainable Marketplace: Greener Products and Services,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts>.
36. “Greener purchasing” is terminology the agency uses on its Sustainable Marketplace web site. “Sustainable Marketplace: Greener Products and Services,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts>.

37. “Reducing Embodied Carbon of Construction Materials through the Inflation Reduction Act,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/reducing-embodied-carbon-construction-materials-through-inflation-reduction-act>. This page lists the relevant IRA sections for the EPA: Sections 60112 and 60116. See also “Grant Program: Reducing Embodied Greenhouse Gas Emissions for Construction Materials and Products,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/grant-program-reducing-embodied-greenhouse-gas-emissions-construction-materials-and>.
38. “What is Embodied Carbon,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/what-embodied-carbon/>.
39. “Buying Green for Consumers,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/buying-green-consumers>.
40. “Buying Green for Consumers,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/buying-green-consumers>. “Recommendations of Specifications, Standards, and Ecolabels for Federal Purchasing,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/greenerproducts/recommendations-specifications-standards-and-ecolabels-federal-purchasing/>.
41. “About the Office of Policy (OP),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/about-office-policy-op>.
42. “Clean Heavy-Duty Vehicles Grant Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/clean-heavy-duty-vehicles-program/clean-heavy-duty-vehicles-grant-program>.
43. “SmartWay Heavy-Duty Truck Electrification Resources,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/smartway/smartway-heavy-duty-truck-electrification-resources>.
44. Infrastructure Investment and Jobs Act, Public Law No: 117-58, Section 71101, accessed November 2, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>.
45. “Clean School Bus Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/cleanschoolbus>.
46. Joann Muller, “Electric School Buses are Practically Free Now,” Axios, December 19, 2022, <https://www.axios.com/2022/12/19/electric-school-buses>. Beia Spiller, “Why Are Electric School Buses So Expensive?,” Resources.org, April 22, 2024, <https://www.resources.org/common-resources/why-are-electric-school-buses-so-expensive/>.
47. “Clean Ports Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/ports-initiative/cleanports>.
48. Section 60102 of the IRA amends the CAA, creating a new section, Section 133. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60102, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.
49. Inflation Reduction Act of 2022, Public Law No. 117-169, Section 60102, accessed November 1, 2024, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.
50. “Clean Ports Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/ports-initiative/cleanports>.

51. “National Grants: Diesel Emissions Reduction Act (DERA),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/dera/national>.
52. Environmental Protection Agency Office of Transportation and Air Quality, *Diesel Emissions Reduction Act (DERA) Fifth Report to Congress*, August 2022, <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1015S8Q.pdf>. Republican Study Committee, *Fiscal Sanity to Save America*, March 20, 2024, pp. 157, https://hern.house.gov/uploadedfiles/final_budget_including_letter_word_doc-final_as_of_march_25.pdf.
53. “National DERA Awarded Grants,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/dera/national-dera-awarded-grants>.
54. “Diesel Emissions Reduction Act (DERA) Funding,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/dera>.
55. Environmental Protection Agency Office of Transportation and Air Quality, *Diesel Emissions Reduction Act (DERA) Fifth Report to Congress*, August 2022, <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1015S8Q.pdf>.
56. John Russell, “Costs, Performance Influence Decisions on Electric School Buses,” VOA News Learning English, March 03, 2024, <https://learningenglish.voanews.com/a/costs-performance-influence-decisions-on-electric-school-buses/7504773.html>.
57. Duggan Flanakin, “The \$200 Billion Electric School Bus Bust,” Real Clear Energy, May 29, 2023, https://www.realclearenergy.org/articles/2023/05/29/the_200_billion_electric_school_bus_bust_902230.html.
58. See e.g. how much broader EO 14096 is compared to EO 12898, Presidential Documents, “Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations,” Executive Order 12898, *Federal Register*, Vol. 59 No. 32 (February 16, 1994), pp. 7629-7633, <https://www.govinfo.gov/content/pkg/FR-1994-02-16/html/94-3685.htm>. Presidential Documents, “Revitalizing Our Nation’s Commitment to Environmental Justice for All,” Executive Order 14096, *Federal Register*, Vol. 88 No. 80 (April 26, 2023) pp. 25251-25261, <https://www.govinfo.gov/content/pkg/FR-2023-04-26/pdf/2023-08955.pdf>.
59. Environmental Protection Agency, *FY 2022-2026 Strategic Plan*, March 2022, <https://www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan.pdf>.
60. Environmental Protection Agency, “EPA Launches New National Office Dedicated to Advancing Environmental Justice and Civil Rights,” September 24, 2022, <https://www.epa.gov/newsreleases/epa-launches-new-national-office-dedicated-advancing-environmental-justice-and-civil>.
61. “Inflation Reduction Act Environmental and Climate Justice Program,” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-environmental-and-climate-justice-program>.
62. See Jeff Ordower and Daniel Hunter, “There’s a big pot of climate bill money waiting to be seized — activists can’t miss the opportunity,” Waging Nonviolence, February 22, 2023, <https://wagingnonviolence.org/2023/02/inflation-reduction-act-climate-bill-money-waiting-to-be-seized-activists-opportunity/>.
63. Environmental Protection Agency, *2023 Environmental Justice Collaborative Problem Solving (EJCS) Program Project Summaries*, 2023, Project Title: Building Capacity for Disadvantaged Working Waterfront Communities to Engage Constructively in

Offshore Wind Development in the Gulf of Maine and Project Title: Green Jobs Corps: Growing a New Generation of New Haven Environmental Justice Problem-Solvers, 2023-the-environmental-justice-collaborative-problem-solving-ejcps-program-project-summaries_0.pdf (epa.gov).

64. Environmental Protection Agency, *2023 Environmental Justice Collaborative Problem Solving (EJCPS) Program Project Summaries*, 2023, Project Title: New Jersey EJ Education Collaborative, https://www.epa.gov/system/files/documents/2023-10/2023-the-environmental-justice-collaborative-problem-solving-ejcps-program-project-summaries_0.pdf.

65. The EPA should certainly be making it as easy as possible for all Americans to participate in the agency's rulemakings and removing other obstacles of the agency's own creation that hinder meaningful public engagement. This includes providing better notice for rules, making underlying data and models of studies available, and properly responding to comments.

66. This program could be especially problematic if the EPA money is helping to fund parties to get involved in actions that the EPA is directly involved with or has a significant interest. For a useful report on the IRA's EJ programs and its problems, including "alarming award decisions," see "Exposing the Green Group Giveaway Behind the Biden-Harris Environmental Justice Programs," House Committee on Energy and Commerce (Republican Staff), November, 2024, https://d1dth6e84htgma.cloudfront.net/11_04_2024_EPA_EJ_Grants_Report_1_c180e1523f.pdf.

67. "The Environmental Justice Thriving Communities Grantmaking Program," Environmental Protection Agency, accessed November 4, 2024, <https://www.epa.gov/environmentaljustice/environmental-justice-thriving-communities-grantmaking-program>.

68. See e.g. "Mandate for Leadership: The Conservative Promise," The Heritage Foundation, pp. 441-442, https://static.project2025.org/2025_MandateForLeadership_CHAPTER-13.pdf.

69. The EPA itself has tried to do this, although whether its actions were consistent with Executive Order 12898 is unclear. See Environmental Protection Agency, "Environmental Justice Fact Sheet: EPA's Commitment to Environmental Justice," January 2006, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100ABGX.PDF?Dockkey=P100ABGX.PDF>. Presidential Documents, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," Executive Order 12898, Federal Register, Vol. 59 No. 32 (February 16, 1994), pp. 7629-7633, <https://www.govinfo.gov/content/pkg/FR-1994-02-16/html/94-3685.htm>. Loretta Ansah et. al., *EPA Needs to Conduct Environmental Justice Reviews of Its Programs, Policies, and Activities*, (Washington DC: Environmental Protection Agency, September 18, 2006), <https://www.epa.gov/sites/default/files/2015-11/documents/20060918-2006-p-00034.pdf>.

70. Steven F. Hayward, "Environmental Justice, EPA Style," American Enterprise Institute, June 09, 2013, <https://www.aei.org/articles/environmental-justice-epa-style/>.

71. "Drinking Water Grants," Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/ground-water-and-drinking-water/drinking-water-grants>.

72. For a concise summary over concerns regarding equity, see e.g. The Heritage Foundation, "The Biden Administration's Pursuit of Unequal Treatment," Factsheet No. 197, February 9, 2021, https://www.heritage.org/sites/default/files/2021-02/FS_197.pdf.

73. Regional and Geographic Offices, Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/regional-and-geographic-offices>.
74. Regional and Geographic Offices, Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/regional-and-geographic-offices>.
75. Environmental Protection Agency, “Message form the Acting Administrator,” 2018, <https://www.ecos.org/wp-content/uploads/2018/09/EPA-Reorganization-Message.pdf>.
76. “About the Office of Enforcement and Compliance Assurance (OECA),” Environmental Protection Agency, accessed November 2, 2024, <https://www.epa.gov/aboutepa/about-office-enforcement-and-compliance-assurance-oeca>. 40 CFR § 1.35, accessed November 2, 2024, <https://www.law.cornell.edu/cfr/text/40/1.35>.
77. See e.g. “Mandate for Leadership: The Conservative Promise,” The Heritage Foundation, pp. 441-442, https://static.project2025.org/2025_MandateForLeadership_CHAPTER-13.pdf.
78. This is also discussed in Kent Lassman et. al, “Shrinking Government Bureaucracy: Proposals for Reorganizing the Executive Branch to Boost Economic Growth,” Competitive Enterprise Institute, September, 2017, at p.7 <https://cei.org/sites/default/files/Shrinking%20Government%20Bureaucracy%20%282%29.pdf>.
79. “FY 2025 Budget,” Environmental Protection Agency, <https://www.epa.gov/system/files/documents/2024-03/fy-2025-epa-bib.pdf> For past budget summaries, see “Historical Planning, Budget, and Results Reports,” Environmental Protection Agency, accessed November 5, 2024, <https://www.epa.gov/planandbudget/archive>.
80. Environmental Protection Agency, “FY 2025: EPA Budget in Brief,” <https://www.epa.gov/system/files/documents/2024-03/fy-2025-epa-bib.pdf>.
81. The FY 2025 Justification of Appropriation Estimates for the Committee on Appropriations can be found at “FY 2025 Budget,” Environmental Protection Agency, accessed November 5, 2024, <https://www.epa.gov/planandbudget/cj>. The past Congressional justifications can be found at “Historical Planning, Budget, and Results Reports,” Environmental Protection Agency, accessed November 5, 2024, <https://www.epa.gov/planandbudget/archive>.
82. See e.g. H.R.8998, Department of the Interior, Environment, and Related Agencies Appropriations Act, 2025, 119th Congress, <https://www.congress.gov/bill/118th-congress/house-bill/8998>.
83. For a discussion of the problems with EPA budgeting, see e.g. William Yeatman, “Confusing EPA Budget Process Calculated to Resist Meaningful Oversight,” Competitive Enterprise Institute, May 22, 2017, <https://cei.org/blog/confusing-epa-budget-process-calculated-to-resist-meaningful-oversight/>.
84. Kent Lassman et. al, “Shrinking Government Bureaucracy: Proposals for Reorganizing the Executive Branch to Boost Economic Growth,” Competitive Enterprise Institute, September, 2017, at p.7 <https://cei.org/sites/default/files/Shrinking%20Government%20Bureaucracy%20%282%29.pdf>.



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