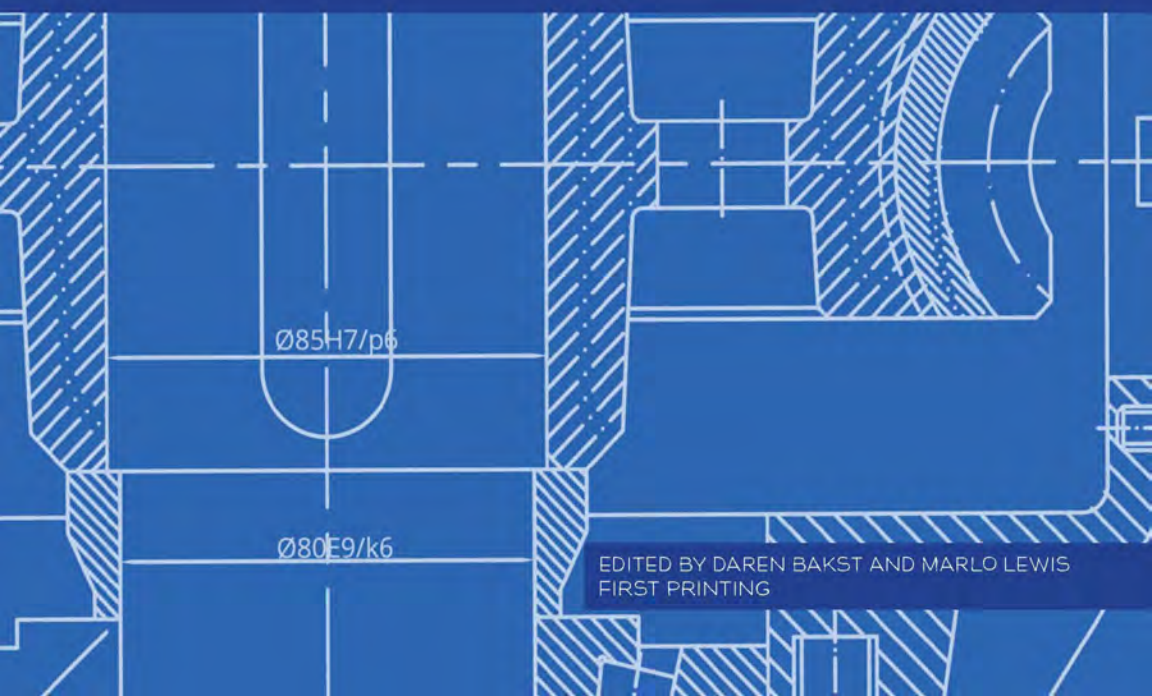
COMPETITIVE ENTERPRISE INSTITUTE

MODERNIZING THE EPA

A BLUEPRINT FOR CONGRESS



EDITED BY DAREN BAKST AND MARLO LEWIS

FIRST PRINTING

MODERNIZING THE EPA
A Blueprint for Congress

Edited by Daren Bakst and Marlo Lewis

CONTENTS

v Bios & acknowledgments

ix Foreword

xi Introduction

xix Key Issues: At a glance

1 Chapter 1: Modernizing EPA science policies

85 Chapter 2: Modernizing air regulation

133 Chapter 3: Modernizing water regulation

159 Chapter 4: Modernizing chemical regulations and other critical regulatory issues

211 Chapter 5: Beyond regulation: Program and organizational changes

233 Endnotes

BIOS & ACKNOWLEDGMENTS

Editors

Daren Bakst, an attorney, is Director of the Competitive Enterprise Institute's (CEI) Center for Energy and Environment and a Senior Fellow. In this role, he manages, develops, and leads the Center's coalition, advocacy, and research activities. Prior to CEI, Daren worked at the Heritage Foundation for a decade, including as a Senior Research Fellow, focusing extensively on environmental regulation and playing a lead role in the launch of the organization's new energy and environment center. His energy and environmental policy work also includes serving as Director of Legal and Regulatory Studies at the John Locke Foundation and as a Policy Counsel at the U.S. Chamber of Commerce. Daren has testified numerous times before Congress, regularly submits comments to federal agencies and has appeared in or been quoted by a wide range of media outlets such as The Wall Street Journal, USA Today, CNN, and The Washington Times. He is a member of the Federalist Society's Environmental Law and Property Rights Executive Committee and its Regulatory Transparency Project's Energy and Environment Task Force, and serves on the American Legislative Exchange Council's Energy, Environment and Agriculture Task Force.

Dr. Marlo Lewis is a Senior Fellow at CEI's Center for Energy and Environment. A prolific commenter on EPA and other federal agency

rulemakings, Marlo has been a leader in CEI's work on the Kyoto Protocol, *Massachusetts v. EPA*, climate science, the Paris Agreement, the Clean Power Plan, fuel economy regulation, air quality standards, the social cost of carbon, and carbon taxes. He has been published in *The Hill, The Federalist, CQ Researcher*, and other publications, and has appeared on various television and radio programs, including Oprah Winfrey, where he provided counterpoint to Al Gore on *An Inconvenient Truth*. Marlo served as a policy analyst in two State Department Bureaus during the second Reagan administration and as Staff Director for the House Government Reform Subcommittee on National Economic Growth, Natural Resources, and Regulatory Affairs in the 106th Congress.

Contributors

Tony Francois, Partner, Briscoe Ivester & Bazel LLP has practiced environmental, natural resources, real property, and water law for three decades. He has litigated Clean Water Act cases in several US District Courts and in most of the federal Circuit Courts. He was lead counsel for the Sacketts in the US District Court of Idaho and the Ninth Circuit, and their co-counsel in the Supreme Court of the United States, culminating in the unanimous *Sackett v. EPA* decision abrogating the significant nexus test for federal jurisdiction under the Clean Water Act. He has also served as litigation counsel for Duarte Nursery in US District Court and the Ninth Circuit in a long running dispute with the Army Corps of Engineers over Clean Water Act jurisdiction and the normal farming practices exemption. He advises property owners, developers, and businesses on Clean Water Act jurisdiction, storm water regulation, enforcement, and other compliance issues.

Dr. James Broughel is a Senior Fellow at CEI, where he specializes in regulatory institutions, risk analysis, and the economic impacts of regulation. His research challenges precautionary regulatory models, such as the linear no-threshold assumption in risk assessment, advocating for more evidence-based approaches to public policy. He is the author of the book *Regulation and Economic Growth: Applying Economic Theory to Public Policy* and is a regular columnist at Forbes,

where he writes on topics such as energy, environmental policy, permitting reform, and the unintended consequences of regulation.

Ben Lieberman, JD, is a Senior Fellow with CEI's Center for Energy and Environment. His numerous regulatory comments, opinion-editorial pieces, media appearances, and congressional testimonies on appliance energy efficiency standards are critical to CEI's leadership in defending consumer choice on gas stoves, dishwashers, washing machines, and air conditioners. Similarly, Ben's expertise on international environmental policy, particularly the Montreal Protocol on Substances that Deplete the Ozone Layer and the subsequent Kigali Amendment, make CEI an effective advocate for stripping China of its no-longer-deserved status as a "developing country" entitled to special treatment under multilateral environmental treaties. Ben brings considerable legislative experience to his work at CEI, having served for seven years as a senior counsel on the U.S. House Committee on Energy and Commerce.

Paige Lambermont is a Research Fellow at CEI's Center for Energy and Environment where she has worked on a wide range of energy and environmental issues, including grid reliability, nuclear power, and oil and gas policy. Before joining CEI she was a policy analyst at the Institute for Energy Research (IER). At IER, she coauthored "The Environmental Quality Index" a report which quantified the environmental benefits of domestic oil and gas compared to global alternatives. She holds a Bachelor of Arts in Political Science from American University, and a Master of Public Administration degree from the University of Idaho. She is also a visiting fellow at the Independent Women's Forum's Center for Energy and Conservation and a Catalyst Policy Fellow at the Independent Institute.

Acknowledgements

Many people made this book possible beyond the individuals listed above. The editors would like to express our deep appreciation to all those individuals. Of those who are colleagues at CEI, we are pleased to acknowledge the important contributions of Kent Lassman, Jeremy Lott, Ryan Smith, and Jacob Tomasulo.

FOREWORD

Kent Lassman, President of the Competitive Enterprise Institute

President Richard Nixon established the Environmental Protection Agency (EPA) through the Reorganization Plan No. 3 of 1970. At the time, the quality of the environment in America had suffered and the public was taking notice.

There are so many negative stories today about the environment that one might mistakenly believe our air and water is as dirty as it was more than 50 years ago. Yet there have been dramatic improvements, especially when it comes to air quality. The EPA deserves our gratitude because it has done a significant amount of good work.

However, the agency is also a prime example of what is so broken with the administrative state. The agency is constantly seeking to expand its power, ignoring basic principles such as the rule of law, property rights, and federalism. It frequently promulgates rules without properly considering the costs of its actions or whether its actions might do more harm than good. More than half a century after its conception, the EPA is in need of a drastic overhaul.

Congress has authorized a national regulator for major areas of the environment. Everyone should expect that institution to do its job well, only do the job Congress tells it to do, and adapt to new information. Yet the EPA regulates as if drastic improvements have not been made, regularly ignores the will of Congress, asserts questionable

statutory authority, and overreaches in ways that would have been unimaginable as recent as a decade ago, such as efforts to kill off gas-powered cars.

For decades, agency leaders have claimed a mantle of sound science. However, they frequently fail to recognize the many flaws in the science the EPA relies upon and they are antagonistic to efforts to improve transparency.

Modernizing the EPA: A Blueprint for Congress is a plan with specific recommendations to put the EPA on track. The *Blueprint* is focused on genuine environmental issues and strictly adheres to the proper scope of legal authority for the agency.

A modern and effective EPA requires action from Congress. We point toward potential amendments to the underlying environmental statutes that the agency administers and implements, from the Clean Air Act and Clean Water Act, to the Toxic Substances Control Act.

At CEI we have shelves of books on environmental law, liability, risk assessment, and the EPA. What you hold in your hands stands out and is different because it is designed for legislators serious about improving the environment, reshaping the lead agency responsible for environmental regulation, and the law that authorizes its scope of activity. Created with the help of dozens of experts in law, economics, science, and government, the *Blueprint* provides context and background for every recommendation without overwhelming the reader.

We know that before we can improve the environment in a thoughtful manner, we must have ideas that policymakers can implement.

Modernizing the EPA is a huge challenge. This *Blueprint* demonstrates that it is possible and with a focus on tangible steps for Congress, shows how to begin. We owe it to ourselves and to all those who come after us to create a modern environmental regulator.

INTRODUCTION

Daren Bakst and Marlo Lewis

Over a year ago, the Competitive Enterprise Institute (CEI) decided to undertake a major project to reform the Environmental Protection Agency (EPA). Other agencies could have been the focus of such an endeavor, but when it comes to its regulatory effect on Americans, there is no agency that arguably has a bigger effect than the EPA.

This is in part reflected in the costs of the EPA's rules. According to the Office of Management and Budget, EPA regulatory costs account for more than half of all federal regulatory costs.[1] Considering all the agencies across the government, this is a startling figure. Despite these incredible costs, this does not come close to capturing the concerns over the EPA.

The EPA is supposed to protect the nation's environment, but it has become an agency that uses this mission as a means to regulate major portions of the economy and affect how we live our lives. This can be seen by its recent rules to help kill off gas-powered cars and to shift electricity generation from reliable sources (coal and natural gas) to unreliable sources (wind and solar).[2]

The scope of these rules is alarming. Too often, the agency pursues rules covering matters of vast political and economic significance even when Congress has not spoken clearly on the issue or even hinted at wanting the agency to take such actions.

The EPA is well known for ignoring the will of Congress, and this problem is only getting worse. The agency also acts as if the only thing that matters is achieving whatever environmental objective it is pursuing, without properly considering the costs and tradeoffs of its actions and the harm it can cause Americans. It also too often ignores the important role that states are supposed to play in environmental protection, as reflected in key statutes like the Clean Air Act and Clean Water Act. Some of these problems, such as a failure to properly consider costs and tradeoffs, also derive from the underlying statutes that the agency administers.

CEI's project on reforming the EPA is intended to be a thoughtful and comprehensive process to modernize the agency. The use of the word "modernize" is important. The goal is for the EPA to protect the environment in a manner that makes sense in 2025, not to act as if it is the 1970s, and to ensure the problems that have plagued the agency in the past do not occur in the future. To help modernize the agency, CEI needed to develop specific and concrete recommendations for Congress. That is where this book comes in.

The project

Internally, as a matter of shorthand, CEI has simply called our work the "EPA Project." This started with getting insight and feedback from outside experts and speaking with allies. The next phase of the project is the book you are reading now.

CEI made specific decisions regarding the nature of this book. We wanted this to be a legislative blueprint for Congress. To make lasting changes, Congress needs to amend the many statutes that the EPA administers. It should be noted that while the book is focused on Congress, the recommendations throughout the book can help inform an administration about the policies it should focus on as well. While the recommendations may be legislative in nature, there are often ways that an administration can address the issues to some extent without Congress.

We wanted the book to be accessible to readers and to not simply jump in with recommendations. This meant we needed to explain the issues so that readers can understand why something is an issue in the first place.

The recommendations are intended to be specific and concrete and able to be turned into legislative solutions. We recognized that we needed to provide different types of reforms, even for the same specific issue. Therefore, in many instances, the book will discuss ideal solutions and then discuss secondary reforms. The chapters lay out initial background and then are followed by key issues that identify and distinguish the major problems that Congress needs to address through legislation.

After publication of the book, the next phase of the "EPA Project" will be working with whoever wants to join us in our effort to modernize the EPA. We want to work with legislators, the public, think tanks, and quite simply anyone, to modernize this agency so that it respects the rule of law and individual freedom, considers costs and tradeoffs of its rules, respects the role of states in environmental protection, and values scientific integrity and transparency, among other things.

But in this introduction, the focus obviously should be on the book, so let's discuss what is contained in the pages that follow.

Organization of this book

Key issues: At a glance

This brief section lists the key issues that Congress should address, with specific recommendations for reform. It is an easy-to-read, at-a-glance list of what is being recommended in the book.

Chapter 1: "Modernizing EPA science policies"

Marlo Lewis, a CEI Senior Fellow, provides an in-depth and comprehensive discussion about scientific integrity at the EPA. We chose to make the science chapter the first chapter because the issues it covers affect all regulations coming out of the agency.

In 2009, President Barack Obama issued a memorandum on scientific integrity, arguing that "the public must be able to trust the science and scientific process informing public policy decisions."[3] He was absolutely right. Unfortunately, the EPA's use of science does not make it possible for the public to have this trust. There is a lack of transparency. There is also a "trust us" mindset instead of making sure the public, including leading experts, can assess and challenge the

science used and disseminated by the agency. When the agency issues rules, the best available science should inform those decisions. Unless this is the case, the public would be right not to trust the agency's science nor the rules that are based on this flawed science.

Chapter 2: "Modernizing air regulation"

Daren Bakst, CEI's Director of the Center for Energy and Environment focuses on modernizing the Clean Air Act (CAA). It is difficult to overstate the importance of needing to amend the CAA. Most of the agency's greatest overreach and sweeping regulations are CAA rules. Almost all of the agency's regulatory costs are connected to air regulations.[4] This chapter provides extensive background before getting into the different issues that need to be addressed by Congress, from greenhouse gas regulation to reforming the National Ambient Air Quality Standards process.

Chapter 3: "Modernizing water regulation"

Tony Francois, an attorney at Briscoe Ivester and Bazel, LLP, focuses on reforming the Clean Water Act (CWA). The EPA, along with the US Army Corps of Engineers, in their implementation and enforcement of the CWA have consistently ignored the role of states and the importance of private property rights. Arguably, no environmental statute *directly* affects and hurts ordinary Americans more than the CWA. This includes horror stories of extreme enforcement of the law that hurts everyone from American farmers to families trying to build their homes. The chapter discusses the constant overreach of the EPA and the US Army Corps of Engineers in trying to regulate waters and what most people would consider to be land. It provides specific recommendations on how Congress should ensure that this overreach does not continue and how the due process rights of individuals are not trampled upon.

Chapter 4: "Modernizing chemical regulation and other critical regulatory issues"

The chapter, written by numerous contributors, notably CEI Senior Fellow James Broughel and CEI Research Fellow Paige Lambermont,

discusses some cross-cutting risk issues, such as the precautionary principle, and discusses statutes such as the Toxic Substances Control Act, providing detailed recommendations for reform. It also discusses hazardous waste-related statutes, the Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund) and the Resource Conservation and Recovery Act.

Chapter 5: "Beyond regulation: Program and organizational changes"

Daren Bakst, CEI's Director of the Center for Energy and Environment looks beyond the many EPA regulatory issues. There is rightfully a lot of attention paid to the regulatory problems, however, there are many other issues that Congress should fix at the EPA as well. This includes eliminating many programs addressing issues that are not the proper business of the federal government. Some of these programs, like environmental educational programs, are not just beyond what should be the substantive nature of the agency's work, but also inappropriately meddle in what should be state or local matters or can be addressed by the private sector. This chapter discusses EPA Inflation Reduction Act programs, including those that amount to agency slush funds. There are also many organizational changes that should be made at the EPA, and this chapter addresses some of them, primarily those to help facilitate communication and promote transparency at the agency.

The big picture

Everybody wants a clean environment. There are differences of opinion though on how the United States should go about achieving this objective. Too often, the level of concern for the environment is equated with the level of one's support for an increasing federal role in environmental protection. This mindset shows a lack of respect and appreciation for states and individuals. It also fails to properly acknowledge the current state of the environment and the proper role of government in our lives. Our nation needs a clean environment not a heavy-handed federal regulatory agency to achieve this objective.

This book does not recommend eliminating the EPA. However, it does recommend major and much-needed reforms that would help put an end to the EPA's overreach, including keeping its focus on environmental protection and not using its environmental mission to act like a central planner for the entire economy. Many of the recommended reforms are made to the underlying environmental statutes because that is where the regulatory abuses would need to be addressed for lasting change.

There are common themes to the recommendations, including:

- Requiring the agency to consider all relevant factors when deciding whether to regulate;
- Acknowledging the environment as it is in today, not as it was in the 1970s;
- Prohibiting the agency from promulgating rules that go beyond the scope of what Congress intended or authorized;
- Respecting the rule of law, private property rights, and due process;
- Making regulatory decisions based on science that is transparent and open to challenge;
- Reasonably evaluating and assessing risk; and
- Respecting the role of states in protecting the environment.

We expect and hope that most readers sympathetic to the need to modernize the EPA will find a lot to like about the book and its recommendations. The book is by no means exhaustive, and we recognize that more issues and recommendations could have been included. However, the book, while not exhaustive, is certainly extensive.

We also recognize and expect that those who favor an increasing federal environmental role and more intrusive EPA will find plenty to dislike. We welcome thoughtful discourse on the issues, including with people who disagree with us. Inevitably though, there will be those who criticize the book and its recommendations in a manner that is

less than thoughtful. As is common when it comes to environmental issues, the far left will engage in name-calling, scare-tactics, and other actions that do a disservice to an important national conversation that is needed to modernize the EPA.

Our goal in developing the book is to provide a strong foundation for making specific changes to the EPA. Legislative change, especially changes to statutes like the CAA and CWA, will be difficult to achieve. However, administrative measures alone cannot adequately and durably address the challenges posed by the EPA to scientific integrity, the rule of law, and the prosperity and well-being of Americans. Alexander Hamilton called love of fame "the ruling passion of the noblest minds,"[5] and he was doubtless familiar with the old adage that "noble things are hard."[6] Surely there are some in Congress today who will see opportunity in the hard task of modernizing the EPA.

CEI, through this book and the entire EPA Project, is prepared to start this much needed and important endeavor. Some reforms could get accomplished soon and others may take many years. Regardless, it is time for Congress to modernize the EPA. CEI is taking the initiative to help lead this effort, but it will take many people to help make meaningful changes at the EPA a reality.

We hope you will join us in this fight!

KEY ISSUES
AT A GLANCE

This section lists the key issues discussed in the book that Congress should address. Below these issues are specific recommendations for how Congress can address them.

Please note that some recommendations may preclude other recommendations. In many instances, the goal was to provide preferred options and then alternatives.

Chapter 1: Modernizing EPA science policies

Key issue: Require disclosure sufficient for replication

- Prohibit the EPA from funding particulate matter (PM) research or using such research to determine air quality standards or other critical metrics, unless all research materials are sufficiently transparent to facilitate independent validation
- Make data access a condition for receiving an EPA research grant or using a study to determine air quality standards or other critical metrics
- Facilitate independent review before a study is selected to inform rulemaking
- Require the EPA to weigh studies according to their reproducibility

- Prioritize quality over quantity in weight-of-evidence assessments
- Require each rulemaking to include a table showing whether the studies cited meet reproducibility criteria
- Require correction for the effects of Multiple Testing and Modeling
- Require p-value plotting to detect publication bias and data manipulation in meta-analyses

Key issue: Curb publication bias

- Replace the EPA-centric research funding regime with a decentralized system
- Limit EPA funding of PM research to the construction of datasets
- Require the EPA to set aside a percentage of PM health effects grants for replication studies

Key issue: Curb cherry picking

- Strengthen the Information Quality Act
- Facilitate public hearings on the scientific basis of rules
- Send the EPA questions it avoids answering

Key issue: Increase the balance and independence of EPA science panels

- Replace the EPA-centric funding regime with a decentralized system
- Disallow current recipients of EPA research grants from serving on advisory panels, and current panelists from applying for such grants

Key issue: Curb self-grading

- Strengthen and codify OMB's Information Quality Peer Review Bulletin

Key issue: Foster realism, balance, and objectivity in EPA climate assessments

- Codify, extend, and strengthen the D.C. Circuit's requirement that models used in rulemaking should have a "rational relationship" to the realities they purport to represent
- Require the EPA and other federal science agencies to use the most accurate model or models when assessing climate change impacts
- Facilitate public hearings

Key issue: Remove social cost of carbon from regulatory development and benefit-cost analysis

- Prohibit the EPA and other agencies from using SCC analysis to either inform regulatory development or quantify regulatory benefits
- Facilitate the use of public hearings to challenge agencies' use of SCC analysis in rulemakings
- Require agencies to publish side cases calculating SCC values with reasonable analytic alternatives

Chapter 2: Modernizing air regulation

Key issue: Eliminate or limit greenhouse gas regulation

- Expressly prohibit the regulation of greenhouse gases
- Clarify that the agency has the discretion *not* to regulate greenhouse gases
- Do not inadvertently authorize regulation of greenhouse gases or confuse greenhouse gases with "air pollutants" as properly understood
- Follow the recommendations in Chapter 1 including prohibiting the use of the "social cost" metrics of greenhouse gases
- Establish reasonable thresholds for the endangerment finding

Key issue: Reform the NAAQS process

- Set the standards
- Require Congressional approval
- Allow states to have a voice regarding more stringent standards
- Extend the time between reviews
- Clarify the role of science in regulatory decisions
- Require proper consideration of costs and tradeoffs
- Give states more flexibility with SIPs
- Change the exceptional events process
- Address problems with CASAC

Key issue: Remove language biased in favor of regulation

- Recognize that scientific conclusions alone should not trigger the decision to regulate
- Provide the EPA discretion on whether to regulate, while requiring that it properly consider the effects of regulations

Key issue: Reduce outside influence in setting EPA's air agenda

- Limit mandatory requirements, especially those triggering regulation

Key issue: Establish boundaries the EPA may not cross in its air regulations

- Prohibit shutting down types of businesses, banning or limiting types of goods, and other actions that common sense tells us Congress never authorized

Key issue: Repeal or limit California waivers and authorizations under Section 209

- Repeal waiver and authorization authority under Section 209

- Clarify that the waiver and authorization authority does not apply to greenhouse gases
- Prohibit the EPA from granting a waiver or authorization to California that would exceed the agency's own authority
- Require California to consider the same factors as the EPA

Key issue: Prohibit unreasonable technological requirements

- Clarify that cost means all costs
- Prohibit the consideration of subsidies in justifying technological requirements
- Clarify that technological requirements must be technically and economically feasible

Key issue: Address the abuse of co-benefits

- Allow ancillary benefits to account for at most a marginal amount of the benefits compared to the costs
- Alternatively, allow ancillary benefits to account for under 50 percent of the benefits compared to the costs

Key issue: Repeal or limit the Regional Haze Program

- Repeal the Regional Haze Program
- Restore state primacy on regional haze

Key issue: Repeal or constrain the AIM Act

- Repeal the AIM Act as well as Title VI of the 1990 Amendments and withdraw from the Montreal Protocol
- Repeal the EPA's authority to add new regulatory restrictions
- Create regulatory relief specific to homeowners who are being hit very hard under the AIM Act
- Add a safety valve should regulatory costs prove greater than anticipated

Chapter 3: Modernizing water regulation

Key issue: Restrict EPA regulation of non-navigable waters and transitory water features under the CWA

- Restore the traditional and clear definition of "navigable waters"
- Properly define adjacent
- Pursue other options to clarify the statute
- Use oversight and appropriations

Key issue: Put the exemptions back in the exemptions

- Make the exemptions more robust

Key issue: Require compliance with due process norms

- Provide Americans with the due process protections they deserve

Key issue: Make penalties rational and proportionate

- Eliminate annual inflation increases for daily penalties
- Limit fill violations to one and done
- Reduce penalties for non-polluting activities
- Protect innocent landowners

Key issue: Improve liability standards and citizen suit provisions

- Provide clear notice to landowners before citizen suits may be filed
- Improve the citizen suit provisions of the CWA

Key issue: Reform nationwide permits

- Remove bureaucratic limitations from nationwide permits
- Extend the availability of nationwide permits

Key issue: Reform the Section 401 certification process

- Clarify the limits of state 401 certification authority

Key issue: Eliminate the EPA's veto of Army permits

- Eliminate the EPA permit veto

Chapter 4: Modernizing chemical regulations and other critical regulatory issues

Key issue: Require the EPA to abandon the precautionary principle

- Review and revise environmental statutes to avoid precautionary logic
- Require comprehensive and transparent presentation of risk data
- Require consideration of substitutes

Key issue: Limit the EPA's use of the linear no-threshold model

- Require a comprehensive review of the scientific evidence supporting the LNT model
- Shift the burden of proof to the agency to demonstrate significant health risks from low-dose exposures
- Establish a "de minimis" dose below which regulation and safety measures can stop
- Adopt a mixed dose-response model for more tailored risk assessments or use alternatives to LNT to reflect the state of scientific uncertainty

Key issue: Eliminate the EPA's IRIS program

- Wind down the IRIS Program
- Prohibit the use of legacy IRIS values
- Mandate that evaluations consider real-world context
- Make hazard assessments legally accountable
- Prioritize central risk estimates while accounting for uncertainty

Key issue: Reform TSCA

- Ensure that TSCA is implemented consistent with a risk-based approach
- Clarify the conditions for mitigating unreasonable risk
- Improve the new chemicals evaluation process
- Improve the existing chemicals risk evaluation process
- Eliminate non-mandated EPA programs that take resources away from TSCA implementation
- Require implementation guidance for risk management
- Strengthen the Section 21 petition process
- Improve the approach to test orders

Key issue: Reform FIFRA

- Require the EPA to pay for fee program delays
- Improve the oversight of important registration decisions
- Ensure the robustness of evaluations
- Improve Endangered Species Act (ESA) implementation
- Ensure uniform pesticide labeling
- Reaffirm the importance of state lead agencies
- Remove barriers to biotechnology
- Recognize the importance of plant biostimulants
- Create certainty for registration review
- Give some more flexibility for state registrations
- Increase coordination between the EPA and USDA
- Provide advanced notification and account for existing stocks
- Eliminate duplicative permitting

Key issue: Reform CERCLA

- Prune the National Priorities List to focus resources on the most important sites
- Allow states to assume the responsibility for long term monitoring of sites
- Specify that federal funds are only to be used to meet federal standards
- Transfer large river and harbor sites to the Army Corps of Engineers
- Eliminate the Superfund tax
- Allow simple Good Samaritan projects without triggering CERCLA liability
- Create a separate program for uranium mines on tribal lands
- Allow buyout of "reopeners" for cleaned up sites
- Eliminate the PFOA and PFOS designation

Key issue: Reform RCRA

- Clarify the definition of solid waste
- Require regulation of air emissions related to waste management to be addressed under the Clean Air Act
- Require all regulation of wastewater discharges to be regulated under the Clean Water Act
- Allow coal ash reuse as an alternative to current regulation and enforcement
- Recognize benefits of coal ash
- Make it easier to reuse coal ash
- Remove reverse distribution from RCRA and support the circular economy
- Eliminate land disposal restrictions

- Repeal and replace the e-Manifest law with a real electronic manifest system and not allow the EPA to create it

Chapter 5: Beyond regulation: Program and organizational changes

Key issue: Eliminate the Greenhouse Gas Reduction Fund

- Congress should eliminate the Greenhouse Gas Reduction Fund

Key issue: Eliminate environmental education programs

- Congress should eliminate the EPA's environmental education work

Key issue: Eliminate the Office of Community Revitalization and all of its programs

- Congress should eliminate the EPA's so-called community revitalization work

Key issue: Eliminate EPA's green purchasing programs

- Congress should eliminate the EPA's green purchasing programs and related work

Key issue: Eliminate the Office of Climate Adaptation and Sustainability

- Congress should eliminate this office and its work

Key issue: Eliminate EPA programs to electrify vehicles and equipment

- Congress should eliminate all EPA programs to fund the electrification of goods, including vehicles and equipment, and other programs to upgrade vehicle fleets

Key issue: Reform environmental justice programs

- Return the agency's environmental justice and civil rights work to where it was before

- Eliminate the Environmental and Climate Justice Program and any related programs
- Clarify the concept of environmental justice
- Eliminate the use of "equity" throughout the agency's environmental justice work and across the agency

Key issue: Reform the regional offices

- Regularly review whether regional offices are serving their purpose
- Move or consolidate offices
- Create more political appointee positions

Key issue: Eliminate OECA and shift its work to other offices

- Eliminate the Office of Enforcement and Compliance Assurance and move existing OECA attorneys to the Office of General Counsel and OECA non-attorneys to the program offices
- Place greater emphasis on compliance assistance

Key issue: Require transparency in the EPA budget

- Require the EPA to provide a transparent budget

1 MODERNIZING EPA SCIENCE POLICIES

Marlo Lewis

"Science is the foundation that supports all of our work at EPA," the first sentence of the agency's *Peer Review Handbook* declares. The document continues: "The quality and integrity of the science that underlies our regulations are vital to the credibility of EPA's decisions and, ultimately, the Agency's effectiveness in pursuing its mission to protect human health and the environment."[1] Only an EPA dedicated to scientific integrity can effectively carry out its mission and deserve the public's trust.

A 50th anniversary Web page similarly declares that "every step" since the EPA's founding in 1970 "has been grounded in a solid foundation of science." EPA researchers and their partners across the scientific community "provided the data, knowledge, and tools needed to tackle the most pressing environmental and related health challenges the nation has faced." In fact, EPA researchers "pioneered the field of environmental science, defining it as an interdisciplinary field of research focused on illuminating the links between our own health and well-being and the natural environment we share."[2]

Risk assessments by early EPA researchers, including those who had worked in other agencies prior to the EPA's creation,[3] provided the "underpinnings of landmark environmental statutes" such as the Clean Air Act and Clean Water Act. In later years, EPA researchers

"helped to identify" the health hazards of environmental tobacco smoke and lead in gasoline.[4] Throughout its first 50 years, the EPA pioneered and supported most of the advances in air pollution measurement, monitoring, modeling, and abatement.[5] The agency also made significant contributions to water pollution management, safe drinking water technology, and soil remediation.[6] The EPA has much to be proud of.

Unfortunately, that is not the whole story. EPA regulations are among the most controversial promulgated by any federal agency. Although opponents typically attack those rules as too costly and beyond the EPA's statutory authority, some also question the agency's scientific rationale. Such skepticism is appropriate for two broad reasons. One is the "reproducibility crisis" of modern science.[7] Most published research findings in several disciplines are not independently validated. The other reason is institutional. The EPA's organizational interests and policy agendas influence how it funds, interprets, and disseminates science.

In a nutshell, research findings that are not independently verified, methodologies biased to favor one side in a scientific debate, and research products used to justify policies that courts later determine to be non-congressionally authorized raise legitimate doubts about the EPA's scientific opinions. When science is perceived to be biased, it fuels rather than quells controversy.

Only by enacting new and stronger scientific integrity standards can Congress ensure that the EPA effectively carries out its mission and deserves the public's trust.

Deficiencies in the EPA's management of air pollution epidemiology and climate science figure prominently in this chapter. That focus reflects the economic and political significance of the EPA's air and climate regulations, and the longstanding scientific controversies associated with those policies.[8] However, in many cases the same or similar defects occur in other research disciplines, and many of the solutions here apply broadly beyond the specific examples used to illustrate them. Of particular importance, many of the solutions are not inherently air or climate specific and are intended to apply to the EPA's use of science in general.

The present chapter is organized as follows. The first part provides background on the nature of science, the reproducibility crisis, the EPA's failure to acknowledge that crisis, and agency practices that fail to restrain or instead promote data inaccessibility, publication bias, cherry picking, and data manipulation. The second part delves more deeply into EPA research and science, examining chiefly the EPA's funding, assessment, and use of air pollution epidemiology, proposes solutions to those problems, and in the process helps to lay the foundations for strong EPA scientific integrity policies in general. The third part finds serious defects in EPA and US government climate risk assessments and social cost of carbon analysis and proposes remedies for those problems.

I. Science, transparency, and reproducibility

When evaluating the EPA's scientific work, it is useful to begin by reflecting on what science is—and is not. Popular exhortations to "follow the science" and "listen to the scientists" foster two common misconceptions. One is that science is any study published in a peer-reviewed journal. The other is that science is a "consensus" reached by expert panels conducting weight-of-evidence literature reviews.[9]

While peer review is a critical first step in preventing shoddy, trivial, or false research from being published, it is not a guarantee of scientific validity. Peer reviewers are not expected to perform an audit (i.e., an independent verification) and seldom do. Passing peer review may merely mean that some scientifically trained people spot no obvious errors in a study and think it worth publishing for any number of reasons (including potential policy impact).

As Kings College professor Stuart Ritchie's book, *Science Fictions*, documents in exhaustive detail, "peer review can't be relied upon to ensure scientists are honest, detached, scrupulous, or sober about their results."[10] Indeed, according to Ritchie, his book reveals a "dizzying array of incompetence, delusion, lies and self-deception" in the peer-reviewed literature.[11]

In a 2013 article titled "How Science Goes Wrong," the *Economist* reported: "When a prominent medical journal ran research past other experts in the field, it found that most of the reviewers failed to spot

mistakes it had deliberately inserted into papers, even after being told they were being tested."[12] Granted, that is just one internal review. But maybe that is because few journals bother to test their reviewers.

Laxity is not the only problem. When the reviewers are colleagues who co-author each other's work, attend the same academic conferences, or depend on the same funding sources, peer review may be little more than "pal review."

The late climate scientist Patrick J. Michaels pungently describes pal review's causes and consequences:

> Publishing in the scientific literature is supposed to be tough. Submit a manuscript to a reputable journal and it will go through "peer review," where your equals criticize your work, send their comments to a journal editor and then the editor will decide whether to accept your submission, reject it outright, or something in between.
>
> In order to limit any bias caused by personal or philosophical animosity, the editor should remove your name from the paper and send it to other experts who have no apparent conflict of interest in reviewing your work. You and the reviewers should not know who each other are. This is called a "double blind" peer review.
>
> Well, this is "the way it is supposed to be." But in the intellectually inbred, filthy-rich world of climate science, where billions of dollars of government research money support trillions of dollars of government policy, peer review has become anything but that.
>
> There is simply no "double blindness." For reasons that remain mysterious, all the major climate journals leave the authors' names on the manuscripts sent out for review.
>
> Economists, psychologists and historians of science all tell us (and I am inclined to believe them) that we act within our rational self-interest. Removing the double-blind restriction in such an environment is an invitation for science abuse.
>
> What about if my professional advancement is dependent upon climate change monies (which applies to just about every academic or government climatologist)? I'm liable to really like a paper that says this is a horrible and important problem,

> and likely to rail against an author who says it's probably a bit overblown. May God have mercy on any manuscript that mentions the rather large elephant in the room, which is that we probably can't do much about it anyway.
>
> Such "confirmation bias" has been noted and studied for years, but the response of science in general—and atmospheric science in particular—has only been to make things worse.
>
> Peer review has become "pal review." Send a paper to one of the very many journals published by the American Geophysical Union—the world's largest publisher of academic climate science—and you can suggest five reviewers. The editor doesn't have to take your advice, but he's more likely to if you bought him dinner at the last AGU meeting, isn't he? That is, of course, unless journal editors are somehow different than government officials, congressmen, or you.[13]

As Michaels also indicates, pal reviewers can become gatekeepers. Although cabals occasionally form to blacklist research rivals,[14] marginalizing scientists who hold the 'wrong' opinions can be accomplished without explicit coordination.[15]

As for the consensus assessments of expert panels, those are reliable only if the literature examined is not contaminated by publication bias and data manipulation. Even a fraudulent study that slipped through peer review may be cited hundreds of times—in some cases for years after its retraction.[16]

So, if science is neither anything published in a peer-reviewed journal, nor the latest consensus approved by a panel of experts, what is it?

Science is a mode of inquiry that tests hypotheses (guesses) against data (quantifiable facts). Caltech physicist Richard Feynman succinctly described the scientific method as follows. The scientist begins by making a guess about how the world works. He next computes the consequences we should find if the guess is true. He then compares those computational consequences to facts ascertained by experiment or observation. "It doesn't matter how beautiful your guess is, how smart you are, or what your name is. If it disagrees with experiment, it's wrong. That's all there is to it."[17]

Feynman goes on to clarify that the guess is wrong only "after the experiment has been checked, the calculations have been checked, and the thing has been rubbed back and forth a few times to make sure that the consequences are logical consequences from the guess, and that, in fact, it disagrees with our very carefully checked experiment."[18]

The whole process from hypothesis to experiment must be checked and rechecked for the simple reason that people are fallible. Even the best scientists need other scientists to check their work.

Such checking cannot occur if a study's authors hide their data, methods, and computations from reviewers. Ideally, each study should be an open book with a clear audit trail. Corporate filings to the Internal Revenue Service and Securities and Exchange Commission must meet strong transparency requirements. Similarly, as discussed below, Food and Drug Administration (FDA) regulations require investigators in new drug clinical trials to file and follow fully auditable research protocols.

The pivotal studies on which federal agencies base regulatory decisions with billion-dollar consequences should be comparably transparent. D.B. McCullough and Ross McKitrick explain:

> Scholars must have the unhindered right to publish their research and make their points of view known without fear of reprisal. But when a piece of academic research takes on a public role, such as becoming the basis for public policy decisions, then practices that obstruct independent replication, such as refusal to disclose data or the concealment of details about computational methods, prevent the proper functioning of the scientific process and can lead to poor public decision making.[19]

Beyond any considerations of ethics or public interest, transparency is also an epistemological imperative. Science assumes that whatever one person discovers, another can verify (assuming the latter has the requisite skills and tools). If a study's results cannot be repeated, it is not science. Ritchie explains:

> For a scientific finding to be worth taking seriously, it can't be something that occurred because of random chance, or a glitch in the

> equipment, or because the scientist was cheating or dissembling. It has to have really happened. And if it did, then in principle I should be able to go out and find broadly the same results as yours. In many ways, that's the essence of science, and something that sets it apart from other ways of knowing about the world: *if it won't replicate, then it's hard to describe what you've done as scientific at all.*[20]

British philosopher of science Karl Popper similarly emphasized the necessity for "repeatable experiments":

> Only when certain events recur in accordance with rules or regularities, as is the case with repeatable experiments, can our observations be tested—in principle—by anyone. We do not take even our own observations quite seriously, or accept them as scientific observations, until we have repeated and tested them. Only by such repetitions can we convince ourselves that we are not dealing with a mere isolated coincidence.[21]

"Replication is the cornerstone of science," McCullough and McKitrick contend:

> Research that cannot be replicated is not science and cannot be trusted either as part of the profession's accumulated body of knowledge or as a basis for policy. Authors may think they have written perfect code for their bug-free software and correctly transcribed each data point, but readers cannot safely assume that these error-prone activities have been executed flawlessly until the authors' efforts have been independently verified.[22]

Young and Karr (2011) provide the simplest explanation: "Science works by experiments that can be repeated; when they are repeated, they must give the same answer. If an experiment does not replicate, something has gone wrong."[23]

Technically, a distinction exists between *replicating* and *reproducing* scientific findings. Young et al. (2021) explain:

> The validation of scientific truth requires *replication* or *reproduction*. *Replicability* (most applicable to the laboratory sciences) most commonly refers to obtaining an experiment's results in an independent study, by a different investigator

> with different data, while *reproducibility* (most applicable to the observational sciences) refers to different investigators using the same data, methods, and/or computer code to reach the same conclusion....Scientific knowledge only accrues as multiple independent investigators replicate and reproduce one another's work.[24]

Replicating the results of an experimental study supports its claim to have found real causal relationships in the world. In contrast, reproducing the results of an observational study confirms that the study contains no serious computational errors.

Nonetheless, "replication" and "reproduction" both express the basic idea that research must be *repeatable* to be *science*. Because science journals as well as common parlance often use the terms interchangeably, we do so as well in this chapter.

To summarize, science tests hypotheses against data, repeatability is a hallmark of scientific knowledge, and transparency enables independent researchers to test whether a study's results can be repeated.

The reproducibility crisis and the EPA

How pervasive are reproducibility problems? That is unknown because replication tests are seldom performed outside the biomedical sciences. "In economics," Ritchie reports, "a miserable 0.1 percent of all articles published attempted replications of prior results; in psychology, the number was better, but still nowhere good, with an attempted replication rate of just over 1 percent."[25]

Biomedicine is a relatively "hard" science, using randomized clinical trials to test new therapies.[26] How often are biomedical research findings successfully replicated?

At the biotechnology company Amgen, researchers tried to replicate the results of 53 "landmark" studies of cancer drugs administered to lab animals or human cells in vitro. Only six replications (11 percent) were successful.[27] Baer researchers report that about 20-25 percent of the company's published findings on oncology, women's health, and cardiovascular diseases could be replicated. The authors also note the

general impression of academic and industry scientists that "many results that are published are hard to reproduce."[28]

Many biomedical studies cannot be tested for reproducibility because they do not provide enough information. In a random sample of 268 biomedical studies, "all but one of them failed to report their full protocol."[29] Another literature review found that "54 percent of biomedical studies didn't even fully describe what kind of animals, chemicals or cells they used in their experiment."[30]

Studies in other fields exhibit similar problems. An analysis of five leading economics journals found that the *Journal of Applied Econometrics* rigorously required the archiving of data, models, and code as a precondition for publication. Consequently, 99 percent of its published articles could be tested for replicability. The other journals had less rigorous archival policies. Lower percentages of their published studies could be tested: *Federal Reserve Bank of St. Louis* (49 percent); *Journal of Business and Economic Statistics* (36 percent); *Journal of Money Credit and Banking* (33 percent); and *Macroeconomic Dynamics* (14 percent).[31]

An analysis of GDP growth studies published in 13 high-quality economic journals could replicate 22 of 67 papers (33 percent) without contacting the authors. After excluding six papers with confidential data and two with unobtainable software, the reviewers could replicate 29 of 59 papers (49 percent), albeit only when assisted by the original authors. The reviewers conclude: "Because we are able to replicate less than half of the papers in our sample even with help from the authors, we assert that economics research is usually not replicable."[32]

The results of observational studies such as nutritional survey research and air pollution epidemiology are also often not reproducible. Young and Karr (2011) found 12 randomized clinical trials that collectively tested 52 claims in observational studies about the health benefits of nutritional supplements. None of the claims could be replicated. All are likely wrong.[33]

The EPA's fine particulate matter ($PM_{2.5}$) air quality standards and regulations are chiefly based on epidemiology, for two main reasons. First, clinical trials with human volunteers and animal

toxicology studies use concentrations much higher than ambient levels.[34] Consequently, clinical and toxicological studies can show the biological plausibility of health effects at ambient levels, not the existence of such effects. Second, clinical trials are also of relatively short duration (a few hours) and therefore cannot measure long-term exposure effects. In contrast, observational studies of large population cohorts are longitudinal. Subjects are followed over years to decades "with continuous or repeated monitoring of risk factors or health outcomes, or both."[35]

The results of such studies are seldom reproduced, for two reasons. First, independent researchers have often been denied access to the raw data in such studies. Second, the percentage of replication studies in any research discipline is small because funders, academic departments, and journals typically prefer studies with exciting new positive (hypothesis-confirming) results, not reviews that could undermine established conclusions, reputations, or policies. Nonetheless, the issue looms large among scientific researchers. Google Scholar lists 90,200 papers on the "reproducibility crisis" and 665,000 papers on the "replication crisis."[36]

Of 1,576 active researchers who answered several reproducibility questions posed by *Nature,* 52 percent judged reproducibility to be a "significant crisis" while 38 percent judged it to be a "slight crisis." Only 3 percent said there is no crisis while 7 percent did not know. "More than 70 percent of researchers have tried and failed to reproduce another scientist's experiments, and more than half have failed to reproduce their own experiments."[37]

In short, irreproducibility is real and raises serious questions about the quality of research informing policy decisions. Where does the EPA stand on replication issues?

The EPA published a scientific integrity policy in 2012,[38] a proposed update in January 2024,[39] and a final update in January 2025.[40] None of those documents evinces any awareness of the widely reported replication failures in several research disciplines. Neither the original 2012 scientific integrity policy nor the final 2025 update contains "reproduce," "replicate," or related words. The proposed 2024 update affirms that the EPA makes its data, models, and code publicly

available "to allow the public to reproduce EPA scientific results."[41] However, the EPA omits those words in the final scientific integrity policy. More importantly, none of the documents states a commitment or presents a plan to increase the reproducibility of studies funded or used by the EPA.

To its credit, the EPA's January 2021 Transparency Rule obligated the agency to give greater weight in rulemakings to studies with fully accessible data and models.[42] Activists, politicians, and former EPA staff condemned this modest proposal, claiming it would kill children and unleash a public health crisis.[43] That so many self-avowed champions of science excoriated a mild transparency measure unwittingly underscored the need for stronger scientific integrity standards.

Regrettably, the EPA stumbled over the objection of former staff that none of the statutes administered by the agency lists transparency as a science quality criterion.[44] The objection is easily rebutted. The same statutes also do not define "science," presumably because the agency is expected to have some grasp of what science is. As explained above, irreproducible research is not really science, and non-transparent science is not reproducible. The EPA was well within its rights to prefer see-for-yourself science to trust-me science. Indeed, in prior administrations, the agency affirmed the need for transparency ("full disclosure") for each step of an environmental risk characterization.[45]

Instead of insisting on the inherent linkages between science, repeatability, and transparency, the EPA invoked its housekeeping authority, claiming the Transparency Rule dealt solely with internal agency procedure.[46] Environmental groups challenged the rule in the United States District Court for the District of Montana. The court found the Transparency Rule to be a "substantive rule," as it would permanently narrow the EPA's discretion to consider certain types of research in rulemakings. And, according to the court, authority for a substantive rule can come only from statutes the agency administers, not general housekeeping authority.[47]

Congress now has an opportunity to prioritize transparency and reproducibility as essential elements of science quality and integrity. It should do so.

General problems in EPA research, science

The reproducibility crisis has several causes. Quality control standards are weak and seldom enforced. Financial and professional incentives encourage researchers to prioritize grantsmanship, publication frequency, media coverage, and policy impact over science quality. Research findings may be irreproducible due to negligence, publication bias, cherry picking, inaccessible data or code, data manipulation, or fraud.

The EPA's funding, assessment, and production of research tends to entrench rather than discourage those flaws. In the field of $PM_{2.5}$ epidemiology, the EPA implements no procedures to detect or prevent publication bias and data manipulation. It does not correct for the large number of false positive results that occur when researchers run multiple tests with multiple models on the same dataset. It does not condition research grants on data accessibility. It does not give more weight to reproducible than irreproducible research.

The EPA's climate science assessments similarly flout the "philosophy" of "transparency, clarity, consistency, and reasonableness" proclaimed in the agency's *Risk Characterization Handbook*.[48] The EPA's typical procedure is to run overheated climate models with inflated emission scenarios and depreciate humanity's remarkable capacity for adaptation.

Despite longstanding Office of Management and Budget (OMB) policy,[49] the EPA seldom provides a full range of sensitivity cases allowing the public to understand how reasonable alternative assumptions would change the outcomes of its projections. The agency's responses to comments are often too brief or dismissive to engage dissenting views on the merits. No provision is made for moderated public debate between competing experts on the scientific basis of EPA regulations. The EPA's science advisory and peer review panels often lack independence and viewpoint diversity.

A problem related to all those issues is the commingling of science and policy in regulatory decisions. Regulatory agencies are inherently tempted to hide policy choices behind a façade of neutral science (i.e. engage in "science charades") or selectively consider or fund research to justify predetermined policy choices (i.e. engage in "advocacy

science").[50] The Clean Air Act exacerbates that problem by establishing regulatory tripwires—so-called endangerment determinations that require the EPA to promulgate emission standards if it anticipates harm to public health or welfare.

Smart policy usually involves weighing and balancing competing equities. In contrast, an endangerment determination is a single-factor analysis of whether there is or is not a risk. If the answer is yes, the agency must regulate. A science-only regulatory trigger increases the EPA's inherent incentive to use science for support rather than illumination. It also fosters obtuseness about whether the rule's benefits are worth the costs or whether the cure might be worse than the disease.

The commingling of science and policy is a key theme of Chapter 2. Although not a specific focus of the present chapter, it contributes to the problems examined here.

II. Research and science problems in air pollution epidemiology

Inaccessible data

Epidemiological studies that examine potential correlations between airborne particulates and mortality collect health data from large numbers of individuals. The raw data thus include personally identifiable information (PII), which is protected by the Privacy Act of 1974, as amended.[51] To do their work, researchers sign confidentiality agreements barring the release of PII.

Protecting patient privacy is essential. However, authors of the foundational studies have used patient privacy as an excuse to hide their data from independent investigators—and from the EPA itself. Except when pressed by Congress, the EPA makes no effort to obtain such data. The EPA has never successfully obtained the raw PM data from the researchers it funds.[52]

Cecil and Griffith (1985) suggest that the EPA and other agencies deliberately decline to take possession of epidemiological research data to immunize the latter from scrutiny under the Freedom of Information Act (FOIA):

> Though the precedents are confusing and regulations vary from agency to agency, it appears that if an agency does not take possession of the research data, the agency can fund the research, participate in the design and development of the research, permit access by third parties to the data, base regulatory findings on the conclusions of the research, and yet thwart access to the records by persons and organizations the agency does not wish to have them.[53]

Cecil and Griffith contend that FOIA's limited application to federal agency data "invites agencies to structure their relationships with research grantees and contractors in such a way that controversial or sensitive federal research records relied on by the agencies will be beyond public scrutiny."

Only once did authors of the chief foundational PM-mortality studies, Dockery et al. (1993) and Pope et al. (1995), agree to share their data with a third party—the Health Effects Institute (HEI).

HEI's reanalysis, Krewski et al. (2000),[54] confirmed Dockery and Pope's finding of a significant $PM_{2.5}$-mortality nexus. However, oddities in Pope's and HEI's results raised questions about the reality of that nexus. As air quality analyst Joel M. Schwartz explains, the Pope study and HEI reanalysis reported that:

> $PM_{2.5}$ kills those with no more than a high school degree, but not those with at least some college; men but not women; and the moderately active but not the very active or sedentary. These odd variations in PM's ostensible effects don't seem biologically plausible and suggest that the apparent effect of $PM_{2.5}$ is actually spurious, resulting from failure to control adequately for confounding factors unrelated to air pollution.[55]

More importantly, no other research team was allowed to examine the Dockery and Pope data, and HEI's independence was potentially compromised by its financial dependence on EPA funding.[56]

HEI completed its reanalysis three years after the EPA promulgated its first rule establishing national ambient air quality standards (NAAQS) for $PM_{2.5}$.[57] The Dockery and Pope studies were the rule's principal scientific basis.[58] Reporting fundamental flaws in the Dockery/Pope

research would have undermined the EPA's landmark PM rule, putting HEI crosswise with its principal donor.

Granting HEI exclusive access to the Dockery and Pope data perpetuated the EPA's reliance on "secret science."[59] It also made no methodological sense. If HEI can review PII without compromising patient privacy, so can other researchers, including those who are not EPA-funded.

Survey research with PII can be placed in a restricted access data repository or secure data enclave. Reviewers can be bound by data access agreements equivalent to the original researchers' confidentiality agreements. Reviewers can be required to de-identify the raw data as a safeguard against accidental release.[60] They can be required to return or destroy copies of the original data after the audit is complete. Those are essentially the protocols HEI's reanalysis followed.[61]

Reproducibility testing requires independent scrutiny of a study's raw data along with its models and code. Except in the case of the ill-fated Transparency Rule, the EPA has made no serious effort to make the datasets of pivotal studies more accessible for independent review.[62] Only Congress can fix this problem.

Publication bias

Objectivity and balance are hallmarks of science quality. A field of scientific research can be objective and balanced only if all results are reported—negative results that support the null hypothesis as well as positive results that support the researcher's hypothesis.[63]

However, the entire research ecosystem comprising funders, academic departments, and journals has a strong preference for studies reporting statistically significant positive results. Young et al. (2021) explain:

> Well-published university researchers earn tenure, promotion, lateral moves to more prestigious universities, salary increases, grants, professional reputation, and public esteem—above all, from publishing exciting, new, positive results. The same incentives affect journal editors, who receive acclaim for their

> journal, and personal reputational awards, by publishing exciting new research—even if the research has not been vetted thoroughly. Grantors want to fund the same sort of exciting research—and government funders possess the added incentive that exciting research with positive results also supports the expansion of their organizational mission. American university administrations want to host grant-winning research, from which they profit by receiving "overhead" costs—frequently a majority of overall research grant costs.[64]

Due to those pervasive incentives, far fewer studies with null results are accepted for publication. Many are sent to the "file drawer" rather than submitted to a journal. Many are not even written up.[65]

The EPA contributes to publication bias by acts of both omission and commission. The agency does not require the studies it funds to report negative as well as positive results. It does not set aside a significant portion of research grants for replication studies or studies seeking to validate the null hypothesis.

In addition, the EPA contributes to publication bias simply by paying for the overwhelming lion's share of $PM_{2.5}$ epidemiology. In the early 1990s, the EPA funded investigators on both sides of the PM-mortality issue. It funded Harvard University professor Douglas Dockery and colleagues who found a significant association between airborne particulates and mortality.[66] It also funded Patricia Styer and her team at the National Institute of Statistical Sciences (NISS), who found no significant association.[67] However, in 1995, the EPA decided to renew funding for the Dockery group but not for NISS. It was a market signal the research community could not fail to notice.[68]

The signal soon became a roar. In 1998, the EPA provided research grants of $7.7 million to $8.7 million to each of five new research centers headquartered at prestige universities (University of Washington, New York University, University of Rochester, UCLA, and Harvard University). Two more centers were created in 2012 (University of California, Davis, and Johns Hopkins University), also with grants just shy of $8 million. By 2019, the EPA had awarded more than $210 million in grants to the seven PM centers and the Health Effects Institute. During 2000-2019, EPA grants to HEI totaled $87 million.[69]

"The mission statements of all those centers make it abundantly clear that their objective was not to investigate whether $PM_{2.5}$ had health effects, but to produce studies documenting the size and nature of those effects," University of Virginia law professor Jason Johnston observes.[70] In the words of one mission statement, "our goal is to lay a firm scientific foundation for effective intervention strategies."[71]

EPA funding created the $PM_{2.5}$ research industry and sustains it to this day. The resulting regulatory science eco-system may be summarized as follows. The EPA funds multimillion-dollar PM research centers. The centers produce scores of studies asserting or implying the need for new or stronger "intervention strategies." The resulting "weight of evidence" in the EPA-funded literature aligns with the agency's interests and ambitions.

Cherry picking

Cherry picking is the selective inclusion or exclusion of evidence to bias an analysis towards a predetermined conclusion. An obvious form of this practice is to cite studies that confirm a favored hypothesis and ignore studies that do not.

In $PM_{2.5}$ rulemakings, some commenters have provided lists of peer-reviewed, reproducible studies finding no association between $PM_{2.5}$ and mortality.[72] Such studies are typically not discussed in the final rule or included in its reference list.[73]

Cherry picking exacerbates publication bias. Not only are fewer studies with null results published. Those that make it through the publication gauntlet are overlooked or downplayed.

For example, the EPA's proposed (2023) and final (2024) $PM_{2.5}$ NAAQS rules do not mention Enstrom (2017)[74] and Young et al. (2017).[75] Enstrom's reanalysis of the foundational Pope et al. (1995) study finds that the reported association between $PM_{2.5}$ and mortality is due to "selective use" of both population and $PM_{2.5}$ exposure data.[76]

Young et al. (2017) examined potential associations between mortality and air pollution in the eight most populous California air basins over a period of 13 years, reviewing over 2 million deaths during 37,000 exposure days. They found that "daily death variability was mostly

explained by time of year or weather variables," and that "neither $PM_{2.5}$ nor ozone added appreciably to the prediction of daily deaths."[77]

The EPA is aware of those studies, which are briefly summarized in the agency's December 2019 Integrated Policy Assessment for Particulate Matter.[78] But subsequent rulemakings do not revisit such studies, unlike studies supporting the agency's regulations, which continue to be cited up to two decades after publication.[79]

A related form of cherry picking is selective interpretation of results. The EPA's most recent proposed and final $PM_{2.5}$ rules cite an agency-funded study, Greven et al. (2011).[80] The EPA mentions the study's technique for reducing uncertainties related to potential confounders, but not the authors' conclusion that at the local level, "we are not able to demonstrate any change in life expectancy for a reduction in $PM_{2.5}$."[81]

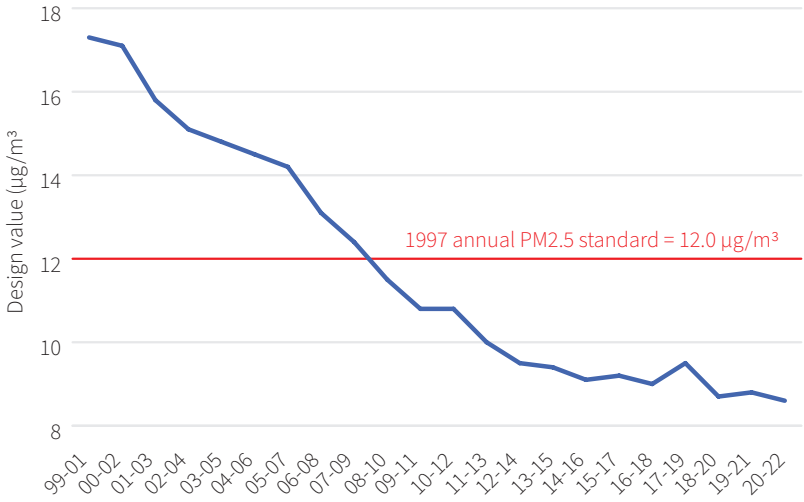
Another form of cherry picking is ignoring inconvenient data, arguments, or questions. In EPA rulemakings, commenters have submitted information and queries like the following.[82]

Residents of Arlington County, VA have an average life expectancy of 82.76 years.[83] Average life expectancy in Beijing is nearly identical: 82.2 years.[84] Yet annual $PM_{2.5}$ levels in Beijing are currently more than four times higher than those in the D.C. Metropolitan area and were more than ten times higher only a decade ago.[85]

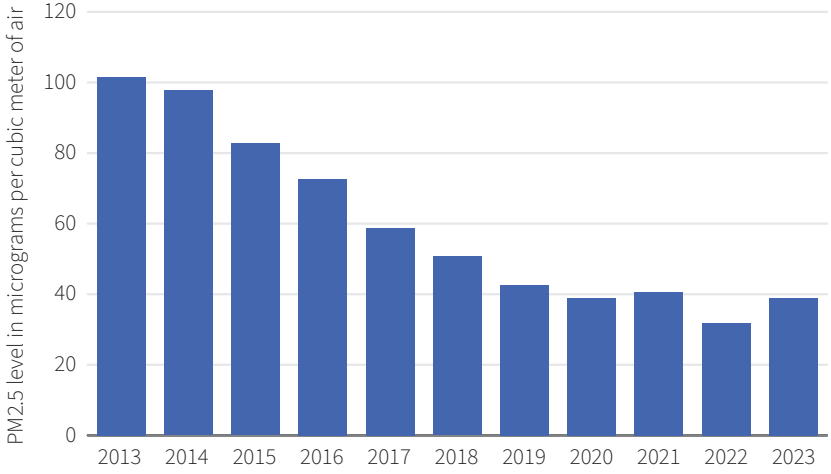
The chart based on Statista data goes back to 2013. Annual $PM_{2.5}$ levels during 2008-2012 were comparable to those during 2013-2015.[86] Going back further, Beijing had an annual $PM_{2.5}$ level of 147 micrograms per cubic meter (μg/m) in 2002.[87] Clearly, the elderly in Beijing have inhaled much higher doses of ambient $PM_{2.5}$ than Arlington County residents over the past two decades, yet average life expectancies are approximately equal. How does that information square with the EPA's assessment that US ambient $PM_{2.5}$ levels pose significant mortality risks? The EPA did not respond.

Commenters also noted that if ambient $PM_{2.5}$ concentrations are as lethal as the EPA contends, cardiovascular mortality from cigarette smoking should be much higher than it is. Pope et al. (2009) struggled to explain that anomaly.[88] As they point out, the average smoker inhales 7 to 17.5 milligrams of $PM_{2.5}$ per cigarette—roughly 1,000 times

Annual PM2.5 design values, metropolitan Washington region



Average annual PM2.5 air pollution levels in Beijing, China, 2013–2023



Sources: Statista 2024; US Department of State, website, www.airnow.gov.

the mass of $PM_{2.5}$ in a cubic meter of outdoor air in the US. Why then are smokers not dropping like flies from heart disease?

Pope et al. (2009) conclude that the "exposure-response relationship between cardiovascular disease mortality and fine particulate matter is relatively steep at low levels of exposure and flattens out at higher exposures." In other words, they postulate that $PM_{2.5}$ kills at small doses but that each additional dose does less harm as consumption increases. Do other toxins work that way? The EPA did not respond.

A study in the *New England Journal of Medicine* reported that people who stop smoking by age 35 have a normal life expectancy, which translates to about 80 years for a US white female.[89] Assuming such an individual had smoked half a pack of cigarettes per day until her 35th birthday, she would have inhaled over four pounds of $PM_{2.5}$. Science writer Steve Milloy poses this question: What does it say about the lethality of $PM_{2.5}$ on a long-term basis if a non-smoker and smoker can have the same life expectancy despite the vast differences in $PM_{2.5}$ inhaled—two sugar packets versus a four-pound bag's worth, respectively?[90] Milloy illustrates the question with this photo:

Commenters sent Milloy's question and photo to the EPA. The agency did not respond.

Non-independent advisory panels

Section 109(d) of the Clean Air Act requires the EPA to appoint a seven-member "independent scientific review committee" known as the Clean Air Scientific Advisory Committee. CASAC's job is to help the EPA appraise the adequacy and scientific basis of existing, new, or revised air quality standards—an exercise the agency is required to undertake every five years.[91]

The EPA, or CASAC with EPA's permission, may form subcommittees or work groups to address specific NAAQS related issues. Several members of the 2005 and 2010 particulate matter subcommittees were substantial recipients of EPA research grants. Eight out of nine members of the 2005 fine PM subcommittee were affiliated with the EPA funded PM research centers, and "every EPA fine PM center director was on the panel." By 2010, the EPA had "essentially eliminated" from the $PM_{2.5}$ subcommittee "any scientist who was not EPA-funded and/or affiliated with an EPA center."[92]

That pattern continues. Of the 19 members of CASAC's 2021 Lead Review Panel on revising fine PM air quality standards,[93] twelve were affiliated with organizations receiving EPA grants of hundreds of thousands to millions of dollars. Seven members had received multiple grants. Panel Chair Lianne Sheppard, who also chairs CASAC, is affiliated with the University of Washington's PM center, where she and colleagues have received over $53.5 million in EPA grants since 1999.[94]

Advisors affiliated with institutions that are substantially funded by the EPA are not in the best position to offer independent advice on policy-relevant scientific issues before the agency.

Grading their own homework

"No man is allowed to be a judge in his own cause; because his interest would certainly bias his judgment, and, not improbably, corrupt his integrity," James Madison wrote in *Federalist* No. 10.[95] The principle Madison invokes, often expressed as *Nemo Judex In Causa Sua* ("no one

should be a judge in his own cause"), is a rule of natural justice derived from Roman law and formalized by English Common Law jurist Edward Coke in the 17th Century.[96]

A pillar of the American judicial system, the principle requires judges to recuse themselves from any case in which they have, or appear to have, a vested interest in the outcome.

Being a rule of reason, the principle applies to many situations outside the courtroom. The owner of a baseball team should not also serve as umpire of the game. Similarly, in endeavors dealing with the acquisition or production of knowledge, no one should grade his own homework. Yet the EPA's advisors and peer reviewers often do just that.

Regarding the CASAC members affiliated with the EPA-funded PM centers, Professor Johnston comments: "By performing the research, summarizing what they deem relevant, and then recommending expensive policies, these centers are judge, jury, and executioner in one person."[97]

Self-grading is also endemic to EPA's climate science work. The EPA's December 2009 Endangerment Finding underpins all the agency's greenhouse gas regulatory activity. The Finding lists three "major assessments" as its "primary scientific and technical basis": the 2007 Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), the 2009 National Climate Assessment (NCA) of the U.S. Global Change Research Program (USGCRP), and various reports by the National Research Council (NRC).[98]

The EPA selected 12 individuals to peer review the Endangerment Finding's Technical Support Document (TSD). Each had served as author or reviewer of one or more of the "major assessments." Four had worked on all three assessments. For example, Virginia Burkett was an author of the AR4 report on climate change impacts, author of the 2009 NCA report, reviewer of an NRC report on the potential impacts of climate change on US transportation systems, and an author of reports on GHG emission scenarios, climate models, sea-level rise, and US transportation system climate vulnerabilities for the U.S. Climate Change Science Program (CCSP)—the USGSRP's name during 2002-2009. The EPA "effectively asked" all 12 TSD reviewers "to

judge their own work."[99] At the risk of belaboring the obvious, those reviewers were also positioned to judge their critics' work.[100]

Statistical significance

"Data manipulation" is not forgery or outright fraud. The term refers to a variety of computational tricks that produce the illusion of statistical significance where none exists.

Statistical significance is a somewhat paradoxical concept. For example, in an epidemiological study of the health effects of $PM_{2.5}$ air pollution on a population cohort, researchers do not directly estimate the probability that some level of exposure increases illness or death. Rather, they try to determine the probability that an observed correlation between $PM_{2.5}$ exposure and an adverse health effect is not due to random chance.

In other words, researchers try to refute the "null hypothesis"—the assumption that no relationship exists between the predictor (exposure) variable and the outcome (health effect) variable. Refuting the null hypothesis builds evidence that an observed correlation is statistically significant, hence that it may reflect a causal relationship.

In most scientific studies, a correlation is deemed to be statistically significant if there is less than a 5 percent probability that it is due to chance. Thus, the threshold of statistical significance is expressed as $p < 0.05$. Correspondingly, probability estimates are known as "p-values."

As noted, funders typically want to see "positive" results from their investment, academic departments want their research grants renewed, researchers want to be published, and journals want to be newsworthy. Accordingly, the entire research eco-system favors the production and publication of studies reporting statistically significant ($p < 0.05$) correlations rather than null results.

The bias in favor of finding and publishing results with low p-values not only encourages researchers to exaggerate the probability or strength of reported effects. It also hides information about what is not true. There is value in knowing that a disease is not caused by a suspected pathogen, or, conversely, that an apparently promising therapy is not effective.[101]

The value of negative results is well known. Nonetheless, researchers face continual financial and professional pressure to publish positive results, and data can easily be manipulated to make chance outcomes look significant.

Data manipulation

Clinical pharmacologist Chittaranjan Andrade has written a clear explainer on data manipulation.[102] P-Hacking is the most common form. In P-Hacking, the researcher keeps analyzing the data "until a statistically significant outcome is obtained." The objective is not to test a hypothesis but to find correlations with p-values lower than 0.05.

A common way to do that is to "experiment with different statistical approaches to test a hypothesis." For example, the researcher may divide up the subject population by gender, age, ethnicity, marital status, employment, body mass, income, education, etc. He may look for effect correlations one day, two days, one week after exposure, etc. He may "include or exclude" potentially confounding variables. "The researcher then reports only the approach that led to the desired result."[103]

Including or excluding potential confounders can massively affect purported statistical significance. For example, in late March 2020, four researchers at the Harvard T.H. Chan School of Public Health published a study purporting to link long-term $PM_{2.5}$ exposures to COVID-19 deaths.[104] The authors did not wait for peer-review before releasing the study. The study estimated that each 1 microgram per cubic meter ($\mu g/m^3$) increase in long-term $PM_{2.5}$ exposures accounts for 15 percent of all US COVID-19 deaths. They subsequently reduced the estimate to 8 percent.[105]

Politics may have been a factor in the study's early release. EPA Administrator Andrew Wheeler was expected soon to propose retaining rather than tightening the existing $PM_{2.5}$ NAAQS.[106] Regulatory activists cited the Harvard study as confirming the urgent need for stronger $PM_{2.5}$ standards.[107]

The researchers claimed they had accounted for all relevant confounders. However, they left out one of the most obvious: transit

ridership. Daily commuting in crowded trains and buses increases one's exposure to airborne viruses.

In June 2020, the National Bureau of Economic Research published two papers reanalyzing the Chan study. One reanalysis found that the statistical significance of the purported $PM_{2.5}$ correlation with COVID-19 mortality disappears when the "striking and robust relationship" between death rates and transit use is considered.[108] The other reanalysis found that elevated rates of COVID-19 mortality in African American and First Nations populations were not associated with "differences in income, poverty rates, education, occupational mix, or even access to healthcare insurance" but rather with "the use of public transit."[109]

Whether P-Hacking or carelessness explains the spurious $PM_{2.5}$—COVID mortality correlation, the example illustrates how easily epidemiological research can be tailored to produce the illusion of statistical significance and policy relevance. It also underscores the importance of transparency and reproducibility testing. To their credit, the Chan researchers made their data and code publicly available.

A more extreme form of data manipulation is HARKing—Hypothesizing After Results Are Known. HARKing occurs when "a researcher analyzes data, observes a (not necessarily expected) statistically significant result, constructs a hypothesis based on that result, and then presents the result and the hypothesis as though the study had been designed, conducted, and analyzed or at least oriented to test that hypothesis."[110]

HARKing is illegitimate because it presents as confirmatory a result that is only exploratory—a result that may be due to sheer chance. A hypothesis obtained by HARKing is not informative until statistical significance is found in a new study examining a different population cohort, different group of patients, or different collection of lab animals.

A similar form of data manipulation is outcome switching. In such cases, the published version of a study does not report outcomes the researcher originally undertook to investigate but rather other outcomes not predicted before data collection began. Ritchie likens

an outcome switcher to a boy who shoots holes in the side of a barn, secretly paints a bull's eye around each hole, and proclaims himself a Texas Sharpshooter.[111]

Outcome switching is most easily detected in randomized clinical trials. The FDA requires clinical researchers to specify their hypothesis and expected primary and secondary outcomes in a publicly accessible registry, before the first patient is enrolled.[112] In theory, registries deter publication bias (sending studies with negative results to the "file drawer") and selective outcome bias (reporting only results favored by the researchers).

Unfortunately, peer reviewers seldom compare registered and journal article versions of clinical trials, and many journals fail to enforce their registry policies. Nonetheless, widespread discrepancies have been found. Ben Goldacre's Compare-Trials project examined all clinical trials published in five high-impact medical journals from October 2015 through January 2016. Of 67 trials, nine reported just the outcomes specified in their registries. The other 58 trials reported nothing about 354 registered outcomes and instead reported 357 outcomes furtively added after trials began. Ritchie reasonably speculates that the 354 non-reported registry outcomes had p-values larger than 0.05.[113]

Unenforced quality control requirements

Epidemiological researchers face even less pressure than clinical researchers to register their analysis protocols prior to collecting data, archive the raw data prior to data cleaning and analysis,[114] record changes in research questions, and report all results, negative as well as positive.

The result is a permissive environment for publication bias, P-Hacking, and other trickery. S. Stanley Young explains:

> Environmental epidemiology essentially has few, if any, analysis requirements. In an environmental observational (EO) study, the researcher can modify the analysis as the data is examined. Multiple outcomes can be examined, multiple variables (air components) can be used as predictors. The analysis can be adjusted by putting multiple covariates into and out of the model.

> It is thought that effects can be due to events on prior days so different lags can be examined.... Seldom, if ever, is there a written, statistical protocol prior to the examination of the data. With these factors (outcomes, predictors, covariates, lags), there is no standard analysis strategy. The strategy can be try-this-and-try-that.[115]

Although lack of a preregistered research design is a sign of potential data manipulation, it also makes manipulation harder to detect, because researchers' actual steps cannot be compared to an original analytic baseline. Failure to record any significant step can render a study non-auditable and irreproducible.

Effects of multiple testing and modeling

An underappreciated point is how easily statistical significance can be contrived just by multiplying the number of potential correlations examined. Ritchie explains:

> The $p < 0.05$ threshold means that if our hypothesis is false (if the null hypothesis is true), then 5 percent of the time we'll get a false-positive result. But that 5 percent value is for a single test. Some straightforward math shows that in a world where our hypothesis is false, increasing the number of statistical tests snowballs our chances of obtaining false-positive results. If we run five (unrelated) tests, there is a 23 percent chance of at least one false positive; for twenty tests, it's 64 percent.[116]

Environmental epidemiological studies can include hundreds, thousands, and even larger numbers of statistical tests.[117] The term of art is Multiple Testing and Multiple Modeling (MTMM). Young et al. (2021) attempt to quantify the MTMM "search space" in each of 70 environmental epidemiology papers. Search space is a product of the number of outcome variables (e.g. health effects) times the number of predictor variables (e.g. pollutants of concern) times 2 to the power of the number of covariates (other factors that might influence the outcome). In a formula, search space = $O \times P \times 2^C$.[118]

Young et al. (2021) estimate that the median search space in the 70 studies exceeds 13,000 questions. That has two important implications.

First, with a search space of 13,000 questions, there is a 5 percent probability of generating 650 "statistically significant" results that are actually false positives produced by sheer chance.[119]

Second, the true threshold of statistical significance is no longer 0.05. It must be adjusted with the correction devised by Italian mathematician Carlo Emilio Bonferroni. The Bonferroni correction is simple: divide 0.05 by the number of statistical tests.[120] Thus, if five statistical tests are run on a single dataset, the significance threshold for any association discovered is 0.05/5 = 0.01. In other words, to be significant, the probability of an association occurring by chance must be less than one percent.

If the search space is 13,000, a correlation is significant only if the probability of obtaining it by chance is less than 0.000385 percent.[121]

When the EPA funds epidemiological studies, it does not require researchers to quantify their search space and apply the Bonferroni correction. Nor does the EPA apply the Bonferroni correction to studies it assesses.

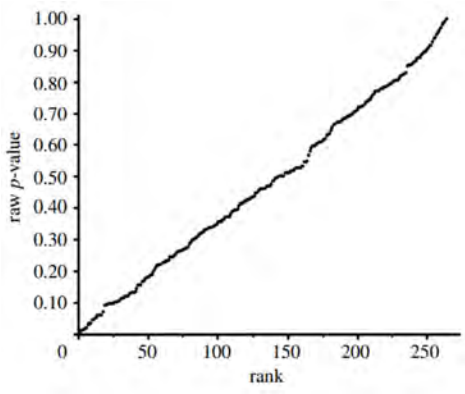
EPA does not use p-value plotting

P-values range from 0.0 to 1.0. Both the p-value of each statistical test (question) in a single study and the overall p-value of each study included in a meta-analysis can be plotted on a graph.[122] In a single study where the predictor and outcome variables have no real relationship, plotting the p-values of each test forms a line rising at a 45-degree angle (slope = 1). That is because the null hypothesis is true; hence every correlation between two variables has an equal probability of occurring.

For example, the graph below is a p-value plot derived from a study attempting to find whether women who eat any of 131 different foods have a higher probability of conceiving a male baby. The hypothesis is biologically implausible because it is the X or Y chromosome from the male parent, not anything the female ate before or during pregnancy, that determines the sex of the child.

Unsurprisingly, the p-values from the study's 262 survey questions form a line rising approximately at a 45-degree angle:

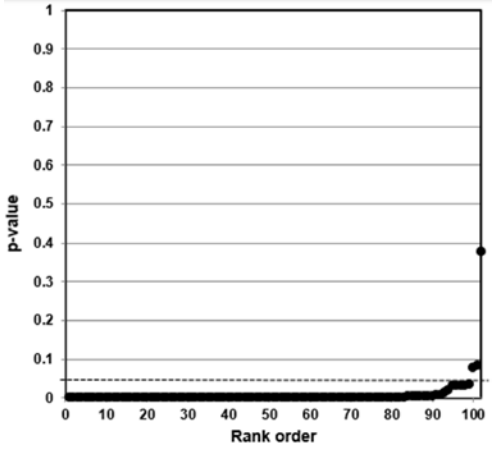
P-value Plot, 262 P-values, Drawn from Food Frequency Questionnaire, Questions Concerning Boy Baby Conception



Source: Young et al. (2008).[123]

In contrast, plotting the p-values of 102 epidemiological studies of cigarette smoking and lung cancer reviewed by Lee et al. (2012)[124] produces a single line with almost all datapoints well below 0.05.

P-value Plot, 102 Studies, Association of Smoking and Squamous Cell Carcinoma of the Lungs

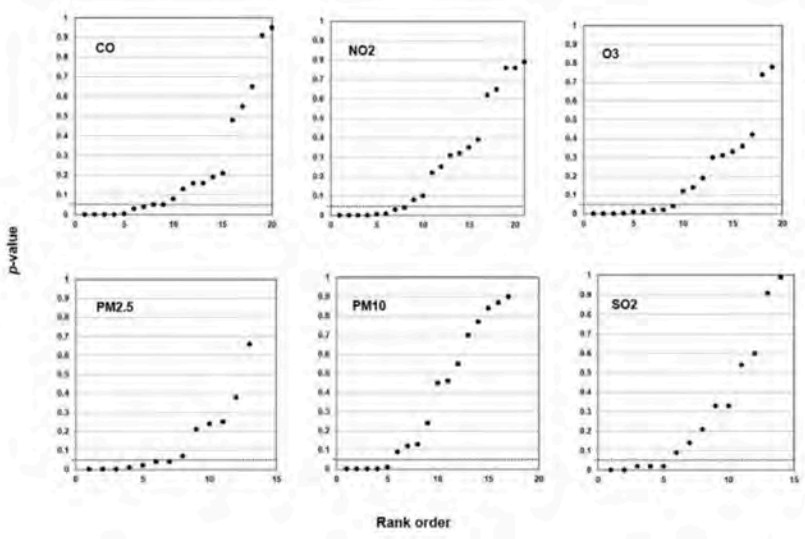


Source: Young et al. (2021)[125]

What happens when p-value plotting is applied to air pollution meta-analyses? Young et al. (2021) plotted the overall p-value of each study included in metanalyses examining relationships between air pollutant exposures and all-cause mortality, heart attacks, asthma development, and asthma attacks. The p-value of each individual study is plotted as a dot on a graph with p-values rising from 0.0 to 1.0 on the Y axis and the study's place in the rank order of p-values (lower to higher) shown on the X axis. In all cases, the plots are bilinear. The dots form one line suggesting statistical significance, and another line suggesting randomness.

For example, below is the p-value plot derived from Mustafic et al. (2012), a meta-analysis of studies examining potential relationships between six air pollutants and heart attacks.[126] For each pollutant, the plots are bilinear.

P-value plots, six air quality components, air quality,-heart attack meta-analysis



Source: Young et al. (2021)

Although a bilinear plot is not direct evidence of publication bias or data manipulation, it raises legitimate suspicions. Such plots have little

biological plausibility. Given the financial and professional incentives described above, it is more likely that statistical significance will be contrived out of randomness than that real relationships will be made to look random.[127]

The EPA does not conduct p-value plotting to detect potential publication bias and data manipulation. Nor does it require EPA-funded researchers who conduct meta-analyses to apply that diagnostic.

What EPA scientific integrity policies should look like

A modernized EPA would educate Congress and the public about the nature, extent, and seriousness of the reproducibility crisis, beginning with its Scientific Integrity Policy, which currently ignores the issue entirely.

The agency would implement procedural requirements to increase the transparency and reproducibility of studies it funds or assesses for regulatory purposes. Such reforms would chiefly target data secrecy, publication bias, and data manipulation.

To curb cherry picking, the EPA would be required to consider all replication studies and all studies with negative results if they conform to the strict new quality control standards.

The EPA would implement policies to increase the independence and viewpoint diversity of its science advisory panels. Moreover, science advisory panels would advise the agency strictly on scientific issues, not matters of law or policy.

However, there are limits to what procedural requirements can accomplish given the EPA's outsized role as the nation's dominant funder and interpreter of air pollution research. Congress should consider options to decentralize air pollution research funding.

The next section details key science quality and integrity issues Congress should address. Each key issue includes specific recommendations.

KEY ISSUE

Require disclosure sufficient for replication

Complete transparency of all phases of a study—hypothesis and outcome selection, research design, data collection, data cleaning, data analysis, and results reporting—enables independent researchers to check the math. Transparency both deters questionable research practices and facilitates their detection. By encouraging researchers to report all results, transparency also curbs publication bias.

Recommendations for Congress

Prohibit the EPA from funding PM research or using such research to determine air quality standards or other critical metrics, unless all research materials are sufficiently transparent to facilitate independent validation. Under this reform, which we may call the "Scientific Integrity in Rulemaking Act," researchers would be free to publish any study or report any findings they wish. However, if they want the EPA to fund their study, or use it to determine air quality standards or other critical metrics, the authors must provide a clear audit trail covering all phases of their research. The authors' data and methods must be sufficiently transparent to *facilitate*—not merely allow—independent validation.

Compliant studies would meet the following verifiable criteria:

- The study's hypothesis and research design are timestamped and archived prior to any data being collected.
- The original data are timestamped and archived prior to being cleaned.
- All models and code are accessible to reviewers, and any changes in research questions and methods are duly recorded.
- All results, negative as well as positive, are archived and reported.

McCullough and McKitrick (2012) propose a similar checklist of verifiable requirements:

a. The data have been published in a form that permits other researchers to check it;

b. The data described in the article were actually used for the analysis;

c. Computer code used for numerical calculations has been published or is made available for other researchers to examine;

d. The calculations described in the paper correspond to the code actually used;

e. The results listed in the paper can be independently reproduced using the published data and methods;

f. If empirical findings arise during the analysis that are materially adverse to the stated conclusions of the paper, this has been acknowledged in the article and an explanation is offered to reconcile them to the conclusions.[128]

"At present," McCullough and McKitrick observe, "readers of a study have no way of knowing which, if any, of the above conditions hold, without doing a great deal of work checking into such things themselves. And if the data and methods are not published, such checking is effectively stymied."[129] Indeed, they opine, if conditions (a) through (d) are not met, "then the academic debate cannot even begin, since other researchers will not have access to the research materials."[130] As there is no shortage of disputation, McCullough and McKitrick presumably mean that unless other investigators have full access to the research materials, a *proper* debate cannot begin—one with the potential to resolve disputed questions.

Creating strong new incentives to produce auditable studies would discourage P-Hacking, HARKing, and outcome switching. Facilitating independent review would motivate researchers to be diligent in handling and analyzing data, objective in drawing conclusions, and balanced in reporting results. Reporting negative results would help curb publication bias. Expanding the market for replication studies would produce more knowledge of what is not true. That, in turn, would help steer future research in more useful directions.

An obvious question is whether litigants could cite the new standards to challenge existing rules based on non-transparent, non-reproducible research. Yes. It is unreasonable to grant permanent immunity to regulations informed by research that cannot survive independent scrutiny. Relitigating issues that once seemed settled may displease business leaders who value regulatory predictability more than regulatory efficiency. However, in the long run, prioritizing science quality should make regulation more stable and less vulnerable to litigation.

To avoid excessive administrative burden, EPA reviews of previous rules to determine the reproducibility of their scientific basis should coincide with the agency's regularly scheduled reviews of existing pollution standards, as Young et al. (2021) recommend.[131] Such retrospective reviews should also target the most influential studies underpinning the most consequential regulations. The authors should receive ample time to make available all research materials required for reproducibility testing. If they decline to do so, or the study's results do not replicate, the EPA should "withdraw the regulation, if not in haste, then with all deliberate speed."[132]

If the comprehensive reform package outlined above is not adopted, Congress should:

Make data access a condition for receiving an EPA research grant or using a study to determine air quality standards or other critical metrics. This reform, which might be called the "Enhance Data Access Act," is a subset of the Scientific Integrity in Rulemaking Act described above.

The public pays for much of the health data used to develop regulations. Those regulations, in turn, may impose costs on the public in the form of higher consumer prices, lower wages, reduced innovation, and restricted liberty. Thus, transparency advocates have long argued that the public's right to know extends, in some form, to the health data underpinning regulatory decisions.

As the EPA's April 2018 proposed transparency rule put it: "When EPA develops significant regulations using public resources, including regulations for which the public is likely to bear the cost of compliance, EPA should ensure that the data and models underlying

scientific studies that are pivotal to the regulatory action are available to the public."[133]

In addition, there are clear downsides to data secrecy and upsides to data access. Keeping regulatory data inscrutable weakens quality control and encourages questionable research practices. Enhancing data access can "lead to better outcomes and strengthen public confidence in the health and environmental protections underpinning EPA's regulatory actions."[134]

Concerns about divulging personal medical information are exaggerated. Reviewing decades of technological development, the National Research Council concluded that data access can be increased "without damage to privacy and confidentiality rights."[135] The 2018 transparency proposal described several ways to increase data access while protecting patient privacy:

> These mechanisms may range from deposition in public data repositories, consistent with requirements for many scientific journals, to, for certain types of information, controlled access in federal research data centers that facilitate secondary research use by the public.... These strategies should be cost-effective and may also include: Requiring applications for access; restricting access to data for the purposes of replication, validation, and sensitivity evaluation; establishing physical controls on data storage; online training for researchers; and nondisclosure agreements.[136]

Cecil and Griffin (1985) note that the Privacy Act was intended to "correct administrative abuses of identifiable records" under the Freedom of Information Act. However, "no instance of research abuse of identifiable records was cited."[137] That is not surprising. As Milloy observes, "no bona fide researcher is interested in such information since it has no particular scientific value."[138]

Besides, if the original researchers could be trusted not to divulge PII, why not independent reviewers bound by identical nondisclosure agreements?

Facilitate independent review before a study is selected to inform rulemaking. Once a study has been cited in a proposed rule, administrative convenience, policy commitments, or reputational

pride may impel the agency to discount research flaws discovered after the fact. The best time to audit an epidemiological study is before the EPA chooses to rely on it.

If the EPA funds an environmental epidemiological study, or intends to use it in rulemaking, the agency should first take physical possession of the dataset and make it available for independent review. For highly influential or pivotal studies (as defined below), the data should be available to independent investigators for one year before the EPA proposes a rule informed by that research. This requirement might be called the "Adequate Data Review Period Act." It would strengthen the two previous reforms and should be enacted separately if those are not adopted.

Whether the previous reforms are adopted or not, Congress should:

Require the EPA to weigh studies according to their reproducibility. This reform, which might be called the "Prioritize Reproducible Research Act," is a modified version of the EPA's short-lived Transparency Rule. That rule required the EPA to give "greater consideration" to studies with accessible dose-response data and "lesser consideration" to studies with inaccessible data.[139]

Because literally thousands of environmental studies are published every year, the Transparency Rule confined its scope to "pivotal science." The EPA initially defined pivotal science as "the studies, models, and analyses that drive the magnitude of the benefit-cost calculation, the level of a standard, or point-of-departure from which a reference value is calculated."[140] The final transparency rule defined pivotal science as "the specific dose-response studies or analyses that drive the requirements or quantitative analyses of EPA significant regulatory actions or influential scientific information."[141]

Placing more weight on reproducible studies is a sensible policy. The Transparency Rule distinguished between replicable and non-replicable studies. It should also have distinguished between replicated studies—those that have been independently validated—and replicable studies—those that have not yet been replicated but are sufficiently transparent to allow independent validation. Other things equal, in proposed rules, independently validated studies should be

given greater consideration than replicable studies. The latter, in turn, should be given greater consideration than studies that fail replication tests or cannot be tested due to inaccessible data or code.

Prioritize quality over quantity in weight-of-evidence assessments. This reform is implicit in the Prioritize Reproducible Research Act discussed earlier, but the EPA and courts may balk at this policy unless it is spelled out in its own statutory provision.

Weight-of-evidence review easily becomes a popularity contest in which the hypothesis with the largest number of supportive studies wins. Since the EPA is the principal financer of environmental epidemiology, it is a foregone conclusion that most published studies will support the EPA's policy views.

This reform, which might be called the "Quality Over Quantity Act," would clarify that it is the quality of the underlying studies, not their sheer number, that determines the adequacy of a rule's purported scientific basis.

Whether the previous two reforms are adopted or not, Congress should:

Require each rulemaking to include a table showing whether the studies cited meet reproducibility criteria. The number of studies cited could be quite large, producing a table with many rows. The number of reproducibility criteria, arranged in columns, would be comparatively small—perhaps 10 or less.

For example, in column 1, the EPA would report whether the study has a timestamped preregistered hypothesis and research plan; in column 2, whether the study has a timestamped archive of the original data prior to data cleaning; in columns 3, 4, and 5, whether all data, models, and code are accessible for independent review; in column 6, whether all results, negative as well as positive, are reported; in column 7, whether changes in research methods are duly recorded; in column 8, whether the study has been tested for reproducibility; in column 9, whether researchers estimated the study's search space; in column 10, whether researchers applied the Bonferroni correction when determining statistical significance.

This reform might be called the "Reproducible Science Checklist Act."

Require correction for the effects of Multiple Testing and Modeling. This reform, which might be called the "Truth in Regulatory Reporting Act," would enhance every other reform discussed above. It should be paired with them or adopted as a standalone measure if no others are adopted.

As explained above, the search space in a typical epidemiological study is vast, with many studies examining thousands of potential relationships. As search space grows, so does the probability of false positive results. The same math dictates that as search space increases, the threshold of statistical significance decreases.

For each pivotal study, the EPA should be required to estimate and report the search space (i.e., the total number of statistical tests), the probable number of false positives (0.05 multiplied by the number of tests), and the threshold of statistical significance per the Bonferroni correction (0.05 divided by the number of tests).

The Truth in Regulatory Reporting Act would help the public understand how easily chance correlations can be made to look statistically significant and why the actual threshold of statistical significance is often far below 0.05.

Require p-value plotting to detect publication bias and data manipulation in meta-analyses. This reform, which might be called the "P-Hacking Detection Act," should also be combined with all the other reforms discussed above or enacted separately if no others are adopted.

As previously explained, when the p-value of each study in a meta-analysis is plotted on a graph, and the form of the plot is bilinear, we are entitled to suspect that overall statistical significance is a product of publication bias and/or data manipulation. In such cases, the EPA should not count the meta-analysis as evidence until independent reviewers have validated the component studies with the low p-values.

Note, this diagnostic is fallible. As publication bias and data manipulation get closer to purging all studies with null results, the associated p-value plot will increasingly form a single line with most p-values < 0.05.

KEY ISSUE

Curb publication bias

Requiring researchers to archive and report all results, negative as well as positive, would help curb publication bias, while requiring the EPA to use p-value plotting would help detect it. Requiring the EPA to give more weight to replicated and reproducible studies could also alleviate publication bias. However, such quality control measures would leave intact the EPA's outsized influence as the nation's chief financer of air pollution research.

The financial dependence of academic research on agenda-driven agencies is a government-wide problem that predates the EPA's creation. Notably, in his 1961 Farewell Address, President Dwight D. Eisenhower warned that federal funding could both corrupt the scientific community and undermine democratic accountability.[142]

Because a "steadily increasing share" of scientific research "is conducted for, by, or at the direction of the Federal government," a government contract has become "virtually a substitute for intellectual curiosity," Eisenhower observed. With federal funding comes the danger of federal control. In his words: "The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present—and is gravely to be regarded."

Eisenhower's admonition to "guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex," is well known. Less remembered is his exhortation to "be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite."

During the past quarter century, federal agencies have provided nearly all funding for climate change research, while the EPA has provided the lion's share of air pollution research dollars. Thus, most research in those fields is "conducted for, by, or at the direction" of the federal government.

Given the economic and political significance of climate and air pollution policies, it is predictable that (a) federal agencies will preferentially fund researchers who share the agencies' policy goals, (b) universities will preferentially hire and promote scientists who win federal agency grants, and (c) journals will preferentially select peer reviewers affiliated with agency-funded research programs.[143]

Publication bias is pervasive and entrenched because funding is massive and centralized in Washington, D.C. A solution readily suggests itself: decentralize air pollution and climate research funding. Since federal climate science research is spread across ten agencies comprising the USGCRP, and the EPA has a relatively small part of the action ($8 million out of $3.754 billion in FY 2022),[144] the recommendations below apply chiefly to the EPA's funding of PM health effects research.

Recommendations for Congress

Replace the EPA-centric research funding regime with a decentralized system. Congress should phase out EPA funding of the seven PM centers and HEI. State environmental agencies, non-governmental organizations, and for-profit companies should increasingly assume responsibility for PM health effects research. This reform might be called the "Diversify Funding of Environmental Research Act."

Some may blanche at the prospect of a coal company 'buying' an air pollution study. Isn't that a conflict of interest? Yes, it is. However, the EPA-centric regime is also conflicted.

To begin with, the EPA is conflicted simply by virtue of being a regulatory agency. Rulemaking is an adversarial process. In regulatory proceedings, the agency is always the primary stakeholder, the most interested party, the big dog in the fight. The agency is in the arena, not above the fray. No matter how honest its leadership and staff may be, the agency is an advocate, not an honest broker.

Beyond that generic reality, the EPA is conflicted in more specific ways. The EPA funds and interprets the research justifying the rules it promulgates and enforces. It often funds the research of the science

advisors it appoints to provide "independent" advice. It hires and pays administrative law judges to preside over the prosecution of persons accused of violating EPA rules.[145]

The aim of decentralization is not to banish self-interest from policymaking, which is impossible, but to foster diversity and competition among a larger pool of funders and researchers. An analogy is the Framers' extended commercial republic, which curbs the "violence of faction" not by trying to abolish faction, the causes of which are "sown in the nature of man," but by multiplying the number and variety of factions.[146]

The choice facing Congress is not between interested and disinterested environmental research but between funding that reflects a single dominant interest and funding that reflects a multiplicity of interests. Decentralized funding would, over time, allow a competitive marketplace of ideas to replace the current cartelized marketplace.

The agency's traditional allies have ample resources to compete in an open market. Consider the following numbers. The EPA's FY 2024 Budget request for its Air, Climate, and Energy Research program is $137,835,000.[147] That is a princely sum for a single funder, making the EPA the PM research industry's financial center of gravity. However, $137.8 million is barely three percent of the annual gross receipts of the nation's top 25 environmental NGOs ($4.7 billion).[148] The New York Department of Environmental Conservation's budget for 2021 was $7.8 billion.[149] The land-based segment of the US wind power industry invested $12.5 billion in 2022.[150] Harvard University's endowment in 2023 was estimated at $50.9 billion.[151]

However, Congress should not create a matching grant program to subsidize state, NGO, or corporate funding of PM health effects research. Federal subsidies would come with federal strings, spawning another era of centralized publication bias.

The goal of diversifying environmental research funding is to enable all studies to compete on a level playing field, regardless of who funds them, provided the grants meet federal legal requirements and the studies are evaluated under the quality control standards outlined above.

If full decentralization of PM research funding is not adopted, Congress should:

Limit EPA funding of PM research to the construction of datasets. Under this proposal, which might be called the "Independent Dataset Construction Act," the EPA would finance the building of population cohort datasets, which is a major expense, take possession of the datasets, and maintain them in a secure archive. However, the EPA would not fund, directly or indirectly, the analysis of the data. Any qualified researcher or research group would be free to analyze the data but with grants obtained from state environmental agencies, NGOs, or for-profit businesses. No researcher or group analyzing the data would have a direct financial interest in advancing the EPA's policy agenda.

If that reform is not adopted, Congress should:

Require the EPA to set aside a percentage of PM health effects grants for replication studies. Only researchers and organizations genuinely independent from the original authors would be eligible to compete for replication grants.

This is an inferior policy to the diversification options outlined above. The EPA would continue to be the largest funder of both dataset construction and analysis. Consequently, it would still exert central direction over PM health effects research. However, a set-aside of 10 percent or more would at least create a market space for studies that are marginalized under the current funding system.

KEY ISSUE

Curb cherry picking

Under the Administrative Procedure Act, as interpreted by the Supreme Court, a rulemaking is arbitrary and capricious if the agency "entirely fail[s] to consider an important aspect of the problem."[152] Selective exclusion of disfavored studies enables an agency to duck important aspects of a regulatory problem.

To be sure, no agency can review all studies, and some studies are not worth considering. Nonetheless, that does not mean cherry picking cannot be distinguished from winnowing based on valid quality control concerns or administrative necessity. For example, Calabrese and Agathokleous (2021) find that the EPA ignores an ever-growing body of evidence (6,000-plus studies) that, at very low doses, radiation and other toxic agents can beneficially stimulate the immune system—a phenomenon known as "hormesis."[153]

As discussed earlier, research results that are not repeatable are not really science. The distinction between reproducible and irreproducible research is objective and verifiable. Congress should clarify that ignoring or giving short shrift to replicated and reproducible studies in favor of non-transparent irreproducible studies is prima facie evidence of cherry picking.

Recommendations for Congress

Strengthen the Information Quality Act. Congress enacted Section 515 of the FY 2001 Consolidated Appropriations Act (P.L. 106-554), commonly known as the Information Quality Act (IQA).[154] This law directed the Office of Management and Budget (OMB) to issue government-wide guidelines, and each agency to issue agency-specific guidelines, establishing standards and procedures to improve the quality of agency-disseminated information. In OMB's guidelines, objectivity (e.g. accuracy, lack of bias in presentation and content) is the leading element in the overall definition of quality, which also includes utility (value to users) and integrity (security from tampering).[155]

The IQA has been a toothless tiger. As interpreted by a federal district court in *Salt Institute v. Tommy Thompson* (2004), "Neither the Act itself nor its very limited judicial history provide a mechanism for judicial review of information quality or any avenue for judicial relief."[156]

Under the IQA, each agency is to establish administrative mechanisms allowing affected persons to seek and obtain correction of information maintained and disseminated by the agency that does not comply with its information quality guidelines. However, the Act specifies no legal consequences, not even for agency-disseminated information that is inaccurate or biased in content or presentation.

Congress should amend the IQA to:

- Clarify that the requirements of the IQA, including the right to seek and obtain correction, are legal requirements that must be met by agencies, and are subject to judicial review.
- Codify the ruling in Motor Vehicle Mfrs. Ass'n that failure to consider "an important aspect of the problem" renders a rulemaking arbitrary and capricious.
- Clarify that selective exclusion of reproducible research is one form of such failure.

This reform might be called the "IQA Modernization Act."

Facilitate public hearings on the scientific basis of rules. The Administrative Procedure Act (APA) authorizes two types of rulemakings, "formal" and "informal." Nearly all regulatory determinations are made through "informal" rulemakings. The usual pattern is for the agency to publish a notice of proposed rulemaking (NOPR) in the *Federal Register*. The NOPR presents the proposal's factual and legal basis, specifies a comment period, and invites public input. The agency subsequently publishes a final rule along with updated supporting analyses and responses to comments.

A formal rulemaking is a trial-like proceeding ("public hearing") in which opposed parties testify under oath, present oral and documentary evidence, and cross-examine each other before an administrative law judge (ALJ) or other hearing officer.[157] The officer has authority to "issue subpoenas for evidence and witnesses, rule

on evidentiary and procedural matters, hold settlement conferences, order parties to submit to alternative dispute resolution, and make final decisions regarding the rule."[158] The officer may not have *ex parte* contact or communication with other agency officials during the proceeding.

The hearing officer's decision "typically becomes the final rule" and "may be subject to review by a higher court." The record for decision is "exclusive," meaning the officer's decision must be based solely on the evidence and testimonies presented at the hearing.[159]

No formal rulemaking has been held since the early 1970s, partly because, like other forms of litigation, such proceedings can drag on interminably and obsess on issues of no particular concern except the parties directly involved. For example, the Federal Drug Administration's "notorious" Peanut-Butter Rule "took more than a decade of protracted proceedings to decide whether peanuts must comprise 87 percent or 90 percent of peanut butter."[160]

However, the proposal here is not to convene a formal rulemaking—a process designed to settle all legal challenges to a regulatory proposal, including by means of negotiations. Rather, the idea is to create a judicial forum in which an agency and its critics can have an officiated, on-the-record debate, with sworn testimony and cross examination overseen by a hearing officer, about the scientific basis of the agency's regulatory proposals.

Such a forum would be an inhospitable environment for cherry picking. Petitioners could summarize studies the agency ignored or depreciated in the proposed rule, challenge the agency's selection or interpretation of the relevant science, and critique studies on which the agency relied. In the presence of opposing counsel and under judicial supervision, an agency would have to address petitioners' case on the merits. Although the hearing would not culminate in a legal determination, critics of a rulemaking's scientific basis would have their "day in court" in the form of an officiated scientific debate. Ideally, such debates would inform public comments on proposed rules and could be cited in subsequent litigation on final rules.

Under this reform, which might be called the "Level Playing Field in Regulatory Science Act," Congress would create a process whereby interested parties may petition the EPA to convene public hearings on the scientific basis of its rulemakings.

Important details would need to be worked out. Exactly what role would the administrative law judge or hearing officer play in such proceedings? Would the officer primarily state the questions before the court and enforce rules of conduct and evidence? Or would the officer also deliver a final verdict on the merits of the parties' conflicting views? If the latter, what legal consequence would the officer's judgment have either directly on the rulemaking at issue or indirectly on subsequent litigation in other courts?

Other details require clarification as well. Should petitioners be limited to challenging the scientific basis of "major" (≥$100 million) or "high impact" (≥$1 billion) rules? Although cost should be a factor, even a minor rule may raise important scientific issues.

In general, public hearings should examine what the Transparency Rule called "pivotal science" and what the EPA's 4th Edition Peer Review Handbook and U.S. Office of Personnel Management call "influential scientific information" (ISI).[161]

All or nearly all scientific and technical work products on which the EPA relies to regulate PM, regulate greenhouse gases, or calculate the social cost of carbon qualify as influential scientific information or highly influential scientific assessments.

Send the EPA questions it avoids answering. Members of Congress always have this prerogative as individual lawmakers and often as committee members. The worst that can happen is the EPA answers evasively or not at all.

Several questions relevant to issues raised above leap to mind:

- California has some of the highest $PM_{2.5}$ levels in the country. Yet multiple studies find no PM effect on mortality in the Golden State.[162] Why is that?
- If $PM_{2.5}$ is as deadly as the EPA claims, why is average life expectancy in Beijing about the same as in Arlington County, even

though Beijing residents inhaled 4.5 to 17 times as much ambient $PM_{2.5}$ during the past two decades?

- If $PM_{2.5}$ is as deadly as the EPA claims, why is the life expectancy of a smoker who quits at 35 about the same as that of a non-smoker, despite the former inhaling ~ 30 times as much $PM_{2.5}$ over a lifetime?
- If air pollution is a major cause of asthma, why have asthma rates gone up as air pollution has gone down?[163]
- If air pollution is a major cause of asthma, why does Texas rank among states with the lowest asthma rates and Vermont among states with the highest rates, despite Texas having the greatest concentration of fossil fuel infrastructure and Vermont no fossil fuel infrastructure?[164]
- If ground level ozone is a major trigger of asthma attacks, why are asthma attacks less frequent during peak ozone season (June-August) than during September-November, when ozone concentrations are lower?[165]

KEY ISSUE

Increase the balance and independence of EPA science panels

Many members of the agency's scientific review panels receive substantial EPA funding or work in organizations literally created by EPA funding. Such advisors are unlikely ever to conclude that current regulatory standards should be relaxed or repealed.

Recommendations for Congress

Replace the EPA-centric funding regime with a decentralized system. In other words, phase out EPA grants to the seven PM centers and HEI and invite (not subsidize) air pollution research funding by states, NGOs, and for-profit companies. That would end panelists' financial dependence on the EPA by sunsetting the agency's patronage. Or, as discussed above, limit EPA funding to the construction of epidemiological datasets.

Under the Federal Advisory Committee Act (FACA), advisory panels are to be "fairly balanced in terms of the points of view represented," and the "advice and recommendations of the advisory committee" are not to be "inappropriately influenced by the appointing authority."[166] Those requirements are clearly not being met today.

Requiring viewpoint diversity could raise concerns about compelled speech and science politicization, while limiting the EPA's discretion to select its own advisors could raise separation of powers concerns.

The best solution is to end the EPA-dominated patronage system that can foster subservient advisors and disciplinary groupthink, or scale it back by limiting EPA financial support to the data construction phase of PM research.

If those reforms are not adopted, Congress should:

Disallow current recipients of EPA research grants from serving on advisory panels, and current panelists from applying for such grants. Enacting that policy would require amending the Environmental

Research, Development, and Demonstration Authorization Act (ERDDAA) (42 U.S.C. 4365) and the Clean Air Act (CAA) 42 U.S.C. §7409(d)(2).

Service on the EPA's Science Advisory Board (SAB) and Clean Air Scientific Advisory Committee (CASAC) is generally for a three-year term.[167] Under the proposed reform, which might be called the "Advisory Panel Decent Interval Act," a researcher may not serve on the SAB or CASAC if she, or her academic department or institute, received an EPA grant during the previous three years. Similarly, a researcher serving on a panel may not apply for an EPA grant until one year after her term of service expires.

This is an imperfect solution. A short-term pause in the agency's patronage may do little to enhance the independence of researchers in whom the EPA has long invested. Worse, some will view it as mean spirited. Why should someone be penalized by being barred from the honor of serving on a federal advisory board just because she recently won a competitively awarded research grant?

That criticism overlooks the bureaucratic interests and regulatory ambitions that influence the "competitive" grant selection process. Competition limited to applicants whose research supports the agency's agenda is biased. That has been the status quo since the late 1990s. It's time for a change.

KEY ISSUE

Curb self-grading

This is a thorny problem. On the one hand, appointing researchers to grade their own work can produce a rigged system with public policy "captive to scientific-technological elite." On the other hand, disqualifying a researcher from providing peer review just because he is prolific seems counterproductive and unfair.

FACA requires advisory committees to be "fairly balanced in terms of the points of view represented," and groupthink can stifle scientific curiosity and objectivity. However, no constitutionalist wants to combat viewpoint discrimination through an affirmative action-type quota system. What is to be done?

Recommendation for Congress

Strengthen and codify OMB's Information Quality Peer Review Bulletin. It is hardly surprising that all 12 peer reviewers of the EPA's endangerment finding had worked on the scientific assessments being reviewed. The "EPA did not consider allowing the public, including scientific and professional societies, to nominate potential reviewers," note CEI attorneys Devin Watkins and Sam Kazman.[168] That flouted OMB's Information Quality Bulletin for Peer Review, which states: "Agencies shall consider requesting that the public, including scientific and professional societies, nominate potential reviewers."[169]

OMB's Bulletin also affirms the need for balance on peer review panels, explaining that "while expertise is the primary consideration, reviewers should also be selected to represent a diversity of scientific perspectives relevant to the subject." OMB goes on to observe that on "most controversial issues, there exists a range of respected scientific viewpoints regarding interpretation of the available literature." That is certainly the case with $PM_{2.5}$ epidemiology and climate science. Stating the obvious, OMB opines that inviting "reviewers with competing views on the science may lead to a sharper, more focused peer review." OMB reports that some organizations, such as the National Academy

of Sciences, "specifically recruit reviewers with strong opinions to test the scientific strength and balance of their reports."[170]

Congress can counter the self-grading and one-sidedness of peer review and advisory panels without resorting to quotas or inappropriate meddling in agency business. One potential reform, which might be called the "Curbing Bias in Peer Review Act," would have the following features.

First, Congress should not merely require agencies to "consider" requesting public nominations of potential reviewers. When the science at issue is "pivotal," "influential," or "highly influential," Congress should require agencies to ask for public nominations.

Second, Congress should create a right of action to uphold IQA and FACA standards of balance in the appointment of peer reviewers and advisors. Specifically, citizens should be able to sue an agency when it: (1) treats the public nominations process as mere window dressing; (2) misclassifies science as non-pivotal or non-influential to evade a public nominations requirement; or (3) selects one-sided peer-review and advisory panels to address "controversial issues" on which there is a "range of respected scientific viewpoints regarding interpretation of the available literature."[171]

Congress need not specify percentages (quota) to ensure a "range of respected scientific viewpoints." As Supreme Court Justice Potter Stewart famously said, even though he may not be able to intelligibly define pornography, "I know it when I see it."[172]

A move hard to square with respect for viewpoint diversity was EPA Administrator Michael Regan's summary termination of all Trump-appointed CASAC and SAB members. Former EPA staff spearheaded this action in August 2020, urging that the agency "Re-compete all board/committee positions after lifting the exclusion for EPA grant recipients," and "Take steps to Change the CASAC Chair."[173] John Graham, who had led the EPA's disbanded Science Advisory Board, said about the purge: "Now for the first time in the agency's 50-year history, we have an administrator interested in scientific advice only from those scientists he has personally appointed."[174]

III. Overview of EPA climate science problems

Mainstream climate research has a scientific integrity problem due to its reliance on a triply biased methodology. The usual practice is to run overheated models with inflated emission scenarios and ignore or belittle humanity's remarkable capacity for adaptation. That approach is wired to exaggerate the physical impacts of greenhouse gas emissions and the harmfulness of such impacts.

Because climate "solutions" are mostly coercive plans to reallocate billions and ultimately trillions of dollars in private capital investment, such policies are fraught with controversy. Supporters often spin "the science" for media and political impact, insisting that climate change is a "crisis" and "existential threat" even though IPCC reports do not use those terms.

The EPA is of course only one actor in the climate "space." However, the EPA plays a leading role within the USGCRP, providing the quantitative sectoral impacts analysis for the 2018 Fourth National Climate Assessment.[175] In 2015, the EPA took the lead in presenting the Obama administration's scientific case for the Paris Agreement.[176] The EPA has also been at the forefront since 2009 of US government efforts to estimate the social damages of an incremental ton of carbon dioxide (CO_2) emissions—a metric known as the social cost of carbon. In November 2023, the EPA published a major report with new, ostensibly more accurate social cost estimates than those published by federal agencies since February 2010.[177] In the EPA's reboot, each ton of CO_2 emissions causes over three times as much damage as federal agencies estimated in February 2021.

In a series of cases dealing with the EPA's modeling of air pollutant risks, the D.C. Circuit Court of Appeals has repeatedly held that an agency's use of a model is "arbitrary" if the model bears "no rational relationship to the reality it purports to represent."[178] Logically, the same verdict should apply to emission scenarios and adaptation assumptions.

Overheated models

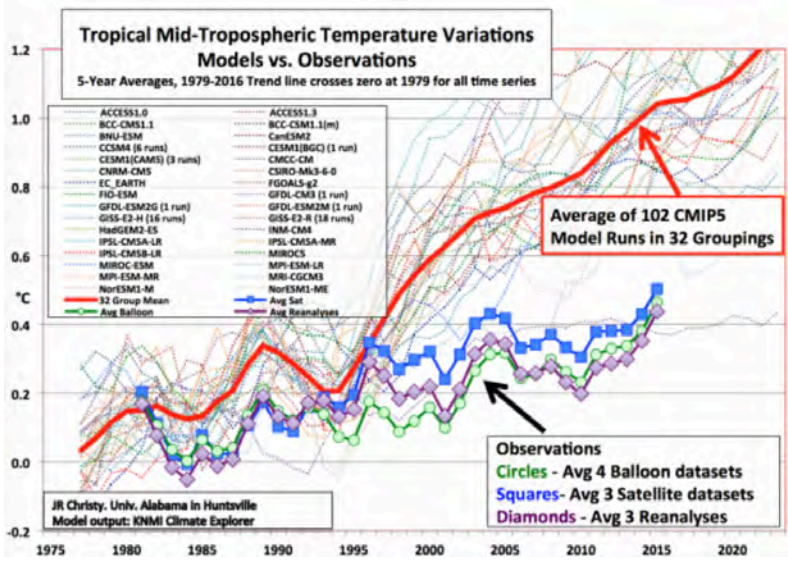
To project the physical impacts of climate change, the USGCRP, IPCC, and other "mainstream" researchers run general circulation models

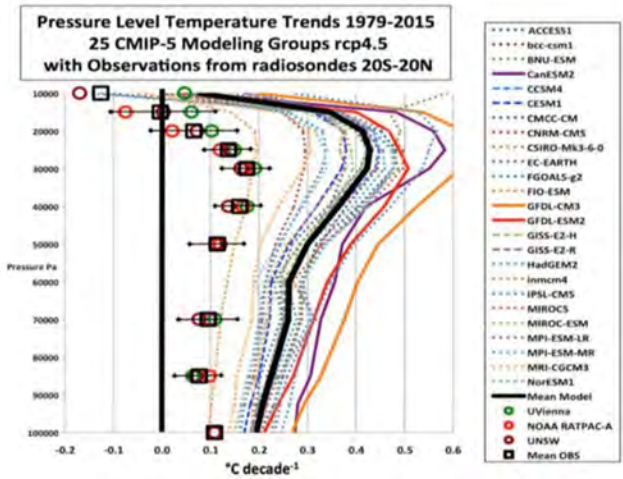
(GCMs) and earth system models (ESMs) with various emission scenarios.[179] The IPCC works with climate modeling groups around the world to produce and evaluate the models used in its assessment reports. This exercise is called the Coupled Model Intercomparison Project (CMIP).[180] Each generation of models is numbered after the assessment report that it informs. Thus, the IPCC used the CMIP5 model ensemble in its 2013 Fifth Assessment Report (AR5)[181] and the CMIP6 model ensemble in its 2021 Sixth Assessment Report (AR6).[182]

CMIP models make projections about the evolution of global annual average temperatures out to the year 2100 and beyond. There is no way to directly test the accuracy of those projections. However, the models can hindcast global temperature changes in the past, and those projections can be compared to observations. That is what atmospheric scientist John Christy and colleagues have done in a series of studies over the past decade or so.

The next chart below shows the mean and spread of CMIP5 model projections in the tropical mid-troposphere compared to the averages of three independent empirical datasets: satellites, balloons, and reanalyses.[183] Compared to the observations, the models on average project more than twice the mid-troposphere warming during 1979-2016.[184] The following chart shows that only one CMIP5 model, the Russian INM-CM4, accurately tracks temperature change through the depth of the tropical troposphere.[185]

The superior accuracy of INM-CM4 likely has something to do with its climate sensitivity estimate, which is the lowest of any CMIP5 model. Climate sensitivity is customarily defined as the amount of warming that occurs after the climate system fully adjusts to a doubling of carbon dioxide-equivalent (CO_2e) greenhouse gas concentration. INM-CM4 has a climate sensitivity of 1.8°C.[186] In contrast, GFDL-CM3, which has a sensitivity of 4.8°C,[187] projects a warming trend that is literally off the chart.[188]

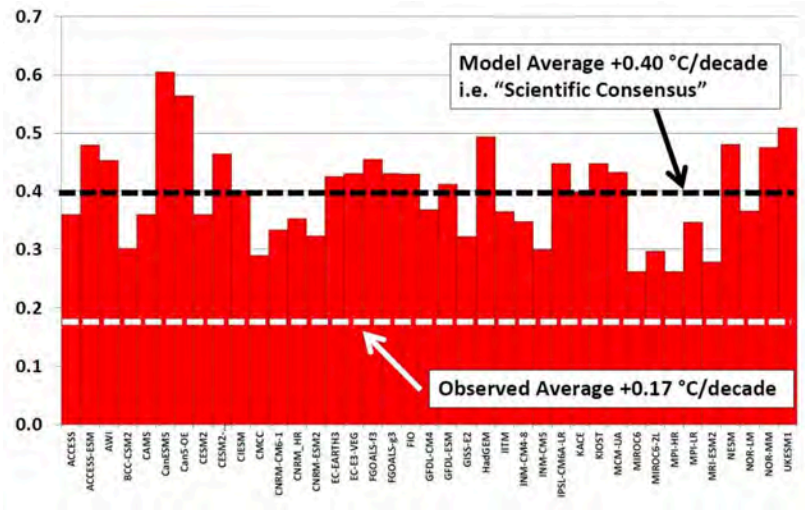




Sources: Christy (2017). Solid red line—average of all the CMIP5 climate models; thin colored lines—individual CMIP-5 models; solid figures—weather balloon, satellite, and reanalysis data for the tropical troposphere. Christy and McNider (2017). Tropical atmosphere temperate trends from 25 CMIP5 models compared to four radiosonde (weather balloon) datasets.

One might suppose the new and improved CMIP6 models used in AR6 would be more accurate. Not so—instead, they are worse. On average, CMIP6 models hindcast about 2.3 times the warming rate measured by satellites and weather balloons not only in the tropical troposphere but also in the global troposphere. Warming rates in all CMIP6 models are higher than the observed trend, in most cases significantly so.[189]

39 IPCC Climate Model Simulations CMIP6, 300–200 hPa Temperature Trend, 1979–2019



Source: Adapted from McKitrick and Christy (2020). Red bars are CMIP6 temperature projections. White dashed line is the average of observations. Black dashed line is the model average projection.

Readers may wonder why Christy and colleagues often compare modeled and observed temperature trends in the tropical mid-troposphere. After all, nobody lives there!

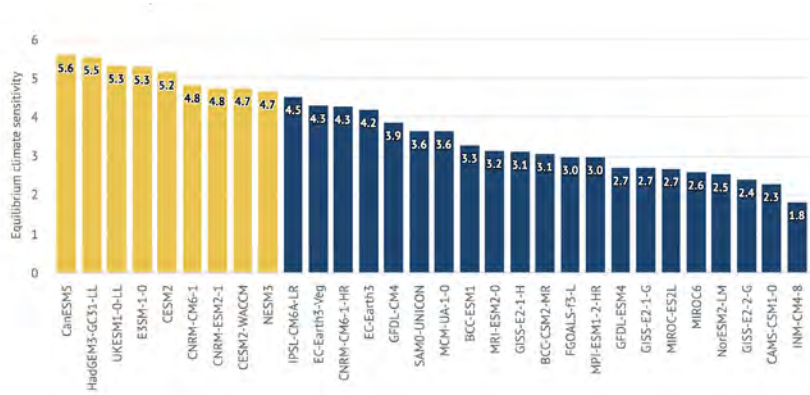
The tropical mid-troposphere is uniquely suited for testing the validity of climate models. That is because: (1) Nearly all models predict strong positive feedbacks in the tropical mid-troposphere; (2) the region is well-monitored by satellites and weather balloons; (3) the mid-troposphere is too distant from the surface to be influenced by the temperature effects of land use changes; and (4) the models were not

previously "tuned" to match the historical climatology in that region, hence are genuinely independent of the data used to test them.[190]

That last point is the most critical. Modelers try to make their models realistic by adjusting climate parameters until hindcasts match historical climate phenomena. For example, a modeler may adjust a GCM's climate sensitivity estimate to keep it within an "acceptable range."[191] However, hindcasting data already used to calibrate a model is like peeking at the answers before taking a quiz. The only real way to test a climate model's predictive skill (other than waiting 30+ years to see how things evolve) is to compare the model's hindcasts to data that have not already been used to train the model. In other words, the model must be applied to data that are "out of sample."[192] That is Christy's procedure. The results speak for themselves. The models are not realistic. They run too hot.

A reasonable explanation is that even when tuned to keep climate sensitivity within an "acceptable range," the models overestimate climate sensitivity. One might suppose that after the mismatch between the CMIP5 models and observations, the CMIP6 models would have lower climate sensitivity estimates. Instead, about 35 percent of CMIP6 models have higher climate sensitivities than the warmest CMIP5 model.[193]

Climate sensitivity in CMIP6 models



Source: Hausfather (2020). Yellow bars show CMIP6 models with higher sensitivity than any CMIP5 model. Blue bars show CMIP6 model sensitivities within the CMIP5 range.

Zhu et al. (2020) exposed the surrealism of the high-sensitivity CMIP6 models. They ran the CESM2 model, which has a sensitivity of 5.2°C, with an emission scenario in which CO_2 concentrations reach 855 parts per million (ppm) by 2100. The model produced a global mean temperature "5.5°C greater than the upper end of proxy temperature estimates for the Early Eocene Climate Optimum."[194] That was a period when CO_2 concentrations of 1,000 to 2,000 ppm persisted for millions of years.[195] Moreover, the CESM2 tropical land temperature exceeds 55°C, "which is much higher than the temperature tolerance of plant photosynthesis and is inconsistent with fossil evidence of an Eocene Neotropical rainforest."[196]

The authors conclude: "Our study illustrates that the development and tuning of models to reproduce the instrumental record does not ensure that they will perform realistically at high CO_2." More colloquially, tuning models with historical climatology does not ensure they have predictive skill.

How did the IPCC cope with the "hot model problem" reported by Zhu et al. and other investigators? In previous IPCC reports, Hausfather et al. (2022) explain, the IPCC "simply used the mean and spread of models to estimate impacts and their uncertainties"—a method dubbed "model democracy" because each model counted equally in the overall assessment. In AR6, the IPCC decided to apply weights to the models before averaging them.[197]

While "weighting" avoids the embarrassment of treating all projections, even the most outlandish, as equally credible, it does not correct the basic methodological flaw—a reliance on persistently errant models.

Inflated emission scenarios

The IPCC, USGCRP, and other government actors typically run the CMIP ensembles with unrealistic emission scenarios that tacitly assume the world returns to a coal-dominated energy system over the course of the 21st century.

Although the Shale Revolution began in 2007,[198] many scenarists assumed until quite recently that learning-by-extraction and economies of scale would make coal the increasingly affordable backstop energy for the global economy.[199]

The IPCC and USGCRP have been the main legitimizers of the two most influential scenarios used in recent climate impact assessments—RCP8.5 and SSP5-8.5.[200] RCP8.5 is the high-end emission scenario in the IPCC's 2013 Fifth Assessment Report (AR5), the USGCRP's 2017/2018 Fourth National Climate Assessment (NCA4), and the IPCC's 2018 *Special Report on Global Warming of 1.5°C*. SSP5-8.5 is the high-end emission scenario in AR6 and the USGCRP's 2023 Fifth National Climate Assessment (NCA5).

Although neither scenario was originally designed to be *the* baseline or business-as-usual scenario, both have been widely misrepresented—including by the USGCRP and IPCC—as official forecasts of where 21st century emissions are headed.[201]

Nothing like that is happening or expected to happen. For example, in RCP8.5, global coal consumption roughly doubles during 2020-2050. In contrast, in the Energy Information Administration's 2023 International Energy Outlook, global coal consumption during 2022-2050 increases by 19 percent in the high economic growth case and declines by 13 percent in the low economic growth case.[202]

RCP8.5 tacitly assumes global coal consumption increases almost tenfold during 2000-2100.[203]

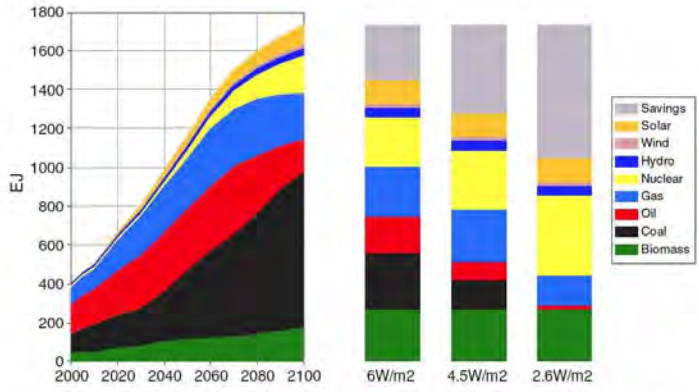


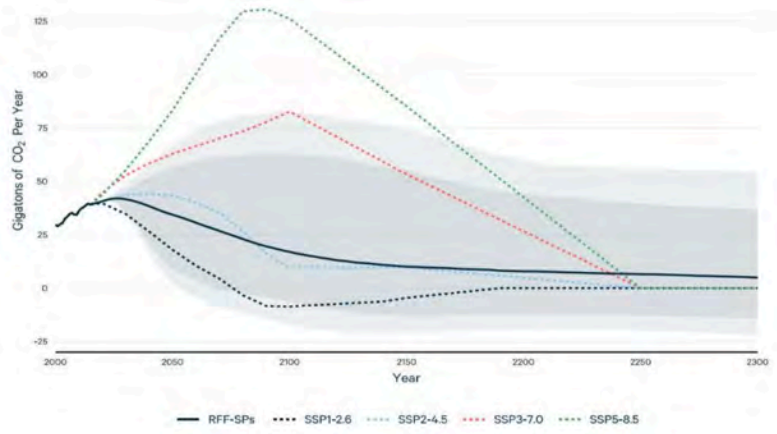
Fig. 5 Development of global primary energy supply in RCP8.5 (*left-hand panel*) and global primary energy supply in 2100 in the associated mitigation cases stabilizing radiative forcing at levels of 6, 4.5, and 2.6 W/m^2 (*right-hand bars*). Note that primary energy is accounted using the direct equivalent method

Source: Riahi et al. (2011).

The increasing affordability of natural gas and the plethora of policies mandating and subsidizing renewables invalidate RCP8.5 as a business-as-usual emission scenario, but so does coal industry economics. Coal producer prices more than doubled during 2000-2010 and are now 3.5 times higher than in 2000.[204] Accordingly, in the International Energy Agency's (IEA) baseline emission scenarios, global CO_2 emissions in 2050 are less than half those projected by SSP5-8.5.[205]

In 2022, Resources for the Future (RFF) published updated baseline emission scenarios, informed by IEA and other market forecasts. In the RFF's baseline projection, global CO_2 emissions are less than half those projected in SSP5-8.5 in 2050 and less than one-fifth those projected in 2100.[206]

Net Annual Emissions of CO_2 from RFF-SPs and SSPs



Notes: Lines represent median values, and dark and light shading represent the 5th to 95th (darker) and 1st to 99th (lighter) percentile ranges of the RFF-SPs.
Source: Kevin Rennert et al. (2022). The solid black line is the RFF's baseline projection. The dotted green line is SSP5-8.5.

For perspective, in NCA4, RCP8.5 was the business-as-usual scenario and RCP4.5 was the policy (climate change mitigation) scenario. RCP4.5 was estimated to reduce harmful climate change impacts on labor productivity, extreme heat mortality, and coastal property by 48 percent,

58 percent, and 22 percent respectively.[207] The new RFF baseline closely aligns with SSP2-4.5, which has the same radiative forcing as RCP4.5.

However, the RFF baseline may already be out of date. Recent information suggests that the most realistic emission scenario is not SSP2-4.5 but an even "cooler" scenario, SSP2-3.4. In other words, the current global emissions trajectory adds 3.4 W/m^2 of warming pressure by 2100. Assuming 3°C climate sensitivity, SSP2-3.4 results in 2.0°C-2.4°C of warming by 2100.[208]

It is difficult to overstate the distorting influence RCP8.5 and SSP5-8.5 have had on climate research and public discourse. Google Scholar lists 47,200 papers on RCP8.5 and 9,360 on SSP5-8.5.[209] Cursory sampling suggests that very few studies challenge the plausibility of those scenarios. Of the first 50 entries for both RCP8.5 and SSP5-8.5, all are studies that use those scenarios to model climate change impacts.

In AR6, the IPCC finally acknowledged the "low" likelihood of RCP8.5 and SSP5-8, citing "recent developments in the energy sector" and the IEA's baseline emission scenarios.[210] However, the extreme scenarios continue to dominate, with RCP8.5 and SSP5-8.5 receiving 41.5 percent of scenario mentions. When combined with another unrealistic high-end scenario, SSP3-7.0 (the orange dotted line in the RFF figure above), total mentions of extreme scenarios in AR6 rise above 50 percent.[211]

Ignore or depreciate adaptation

Several big-picture trends indicative of increasing climate resilience and safety are never mentioned in federal agency assessments of climate change impacts and risks:

- Over the past 70 years—roughly the modern warming period—humanity achieved unprecedented improvements in global life expectancy,[212] per capita income,[213] and per capita food supply.[214]
- US and global corn, wheat, and rice yields (tons per hectare) increased decade by decade since the 1960s.[215] Combined global corn, wheat, rice, and soybean output doubled since 1980.[216]
- Globally, the decadal annual average number of people dying from climate related disasters declined from about 485,000 per year in

the 1920s to about 14,000 per year in the past decade—a 97 percent reduction in annual climate-related mortality.[217]

- Factoring in the fourfold increase in global population since the 1920s, the average person's risk of dying from extreme weather has decreased by 99.4 percent.[218]
- From 2000 to 2020, global incidence of malaria (number of new cases per 1,000 population at risk) declined by 27.5 percent[219] while global deaths from malaria declined by 30 percent.[220]
- The number of excessive heat days in US cities increased since 2010. However, US heat related mortality was lower in 2010-2018 than in any previous eight-year period since 1975.[221]
- Globally, climate-related economic losses have increased as population and exposed wealth have increased. However, losses as a percentage of exposed wealth declined almost five-fold from 1980-1989 to 2007-2016, with most of that progress occurring in low-to-middle income countries.[222]
- Despite a rising number of "billion-dollar disasters" (due to increases in population and exposed wealth), US annual average weather-related losses as a proportion of GDP declined from slightly over 0.2 percent in 1990 to somewhat below 0.2 percent in 2019.[223]

Omitting such data from climate impact assessments is cherry picking and flouts scientific norms of balance and objectivity.

EPA climate science bias and hype, examples

Benefits of Global Action

The EPA's June 2015 *Benefits of Global Action* report presents the Obama administration's scientific case for negotiating and joining a climate treaty like that adopted in Paris six months later.[224]

The report *(*hereafter "*Global Action*"*)* compares two scenarios—one where climate policies limit global warming to 2°C above preindustrial levels by 2100 (the Paris Agreement's minimal goal)[225]—and a "business-as-usual," "reference," or "no action" scenario in which global warming reaches 5°C.

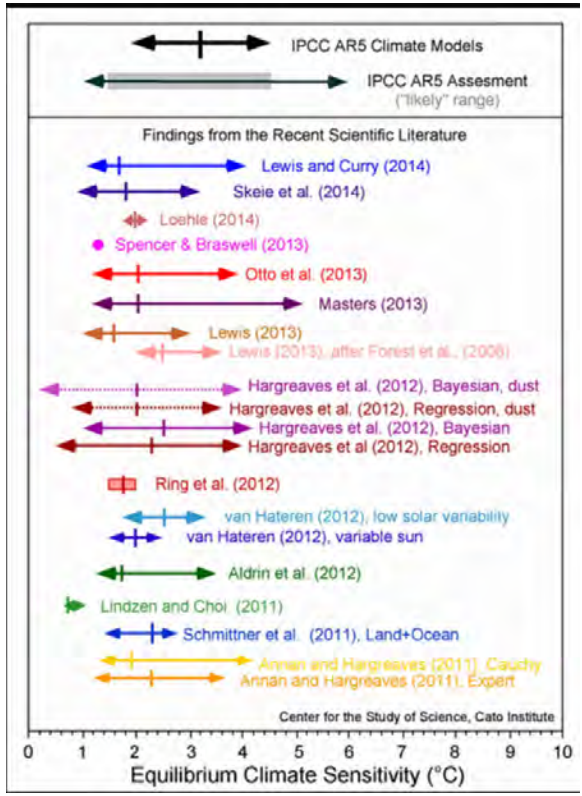
In essence, *Global Action* asks Americans to choose between safety and ruin. If we do nothing, warming will reach 5°C by 2100, and in that year, the United States will experience 57,000 preventable air pollution deaths and 12,000 preventable heat-related deaths. Or we can avoid such harms by working with other nations to keep warming below 2°C.

The core problem with *Global Action* is the triply biased methodology described above. The EPA's "no action" emissions scenario has a radiative forcing of 8.6W/m^2. Projected emissions are somewhat lower than in RCP8.5 but the radiative forcing is slightly higher.[226] In short, the EPA's "reference case" is another improbable worst-case scenario. Characterizing it as "business as usual" is misleading at best.

Most of the climate impacts featured in *Global Action* assume a climate sensitivity of 3°C, because 3°C is the "best estimate" of climate sensitivity in the IPCC's 2007 Fourth Assessment Report (AR4).[227] However, during 2011-2014, researchers published several empirically constrained studies[228] reporting lower climate sensitivities.[229] The average sensitivity in those studies is about 2.0°C, or 33 percent lower. See the chart below.

Global Action does not mention the significant debate on climate sensitivity that emerged since AR4, just as it does not mention the growing divergence between models and observations in the tropical mid-troposphere.

Even if the planet does warm as fast as *Global Action* projects, the report's impact projections would still be dubious. Consider first the projection of 12,000 preventable US heat stress deaths in 2100 if policymakers reject "global action." The EPA acknowledges that adaptation "equal to that of Dallas," if achieved in 49 US cities, could reduce the death toll to 5,500.[230] However, it is implausible that Dallas in 2015 represents the peak of human adaptive capability—especially if the future is as hot as the EPA's "business-as-usual" scenario projects. The EPA's adaptation assumption is unreasonably pessimistic.



Source: Michaels and Knappenberger (2014). The gray bar indicates the "likely" (greater than a 66 percent probability) sensitivity range in AR5. Colored arrows indicate the 5 to 95 percent confidence bounds for each estimate. Colored vertical lines indicate each study's best estimate. The red box encompasses four sensitivity estimates reported by Ring et al. (2012). Spencer & Braswell (2013) produce a single estimate from ocean heat content observations.

The EPA estimates that global action would avoid approximately 13,000 premature US deaths in 2050 and 57,000 in 2100 from poor air quality, the theory being that warming will increase ozone and $PM_{2.5}$ formation.[231] Leaving aside the issue of whether $PM_{2.5}$ and ozone are as dangerous as the agency assumes, EPA data clearly show that air pollutant emissions and concentrations keep declining despite increases in urban summer temperatures.[232]

Long before 2100, perhaps even by 2050, most significant remaining US air pollutant emissions could be eliminated. If so, the impact of

warming on US air quality would be minimal. Yet the EPA claims global action would deliver $160 billion and $930 billion in US air quality-related health benefits 2050 and 2100, respectively.[233] How is that possible?

As explained in a text box, *Global Action* does not really estimate the impact of projected warming on air pollutant emission levels expected to occur in 2050 and 2100. Rather, the report estimates the impact of warming on "present-day [emission] levels." The EPA claims that holding present-day levels "fixed" allows the agency "to isolate the climate change-related impact on air quality."[234]

Not so. That procedure hypes the putative benefits of "global action." The only way to "isolate" the impact of global warming on air pollution in 2050 and 2100 is to compute its effects on projected pollutant emission levels in those years, not emission levels in 2015. The EPA should have modeled air quality impacts under assumptions of low, moderate, and high rates of industrial turnover from older, dirtier capital stock to newer, cleaner technologies. Instead, it unreasonably assumed technological stasis over a period of 85 years.

Worse, *Global Action* does not really estimate the impacts of future warming on *present-day* emissions. For "more information on the approach, models used, and results for the air quality sector," the EPA refers readers to Garcia-Menendez et al. (2015).[235] In that study, the "present day" or baseline year is 2000, not 2015. By 2015, US annual air pollutant emissions were already significantly lower than in 2000.

The table below shows the annual tonnages in 2000 and 2015 of the four pollutants chiefly responsible for US ozone and fine PM pollution, with the percentage reductions achieved by 2015.

Pollutant	SO_2	NO_X	VOC	$PM_{2.5}$
Tons 2000	16,278,000	22,335,000	16,989,000	2,600,000
Tons 2015	3,437,000	10,970,000	12,125,000	1,599,000
% Change	-78.8	-50.8	-23.5	-38.5

Source: Statista (August 27, 2024).236

Because ambient temperatures can influence air pollution concentrations, cutting air pollutant emissions is a form of climate change adaptation. The EPA's pollution mortality analysis not only assumes no further progress in cutting emissions. It also implicitly assumes negative adaptation—as if the substantial emission cuts of the prior 15 years never happened.

That error is fatal to the EPA's air quality benefits assessment, as economist Oren Cass points out in a 2018 Manhattan Institute report. Cass notes that in Garcia-Menendez et al. (2015), "global action" averts 57,000 preventable US air pollution deaths in 2100 by reducing the average US resident's exposures to ozone and $PM_{2.5}$ by 2.6 parts per billion (ppb) and 1.2 $\mu g/m^3$, respectively.[237] However, during 2000-2015, US average concentrations of ozone and $PM_{2.5}$ dropped by 13 ppb and 5 $\mu g/m^3$, respectively. Those reductions in ambient concentrations are multiples of the reductions purportedly achieved by "global action."

Thus, even if we unrealistically assume no further declines in US annual ozone and $PM_{2.5}$ emissions after 2015, a rejection of "global action" would by 2100 merely "return" US air quality from 2015 to 2011 levels.[238]

To sum up, by assuming constant annual emissions relative to an out-of-date "present day" baseline, the EPA both highly exaggerates the costs of rejecting "global action" and hides the superior potency of adaptation to mitigation in managing climate-related risks.

Fourth National Climate Assessment (NCA4)

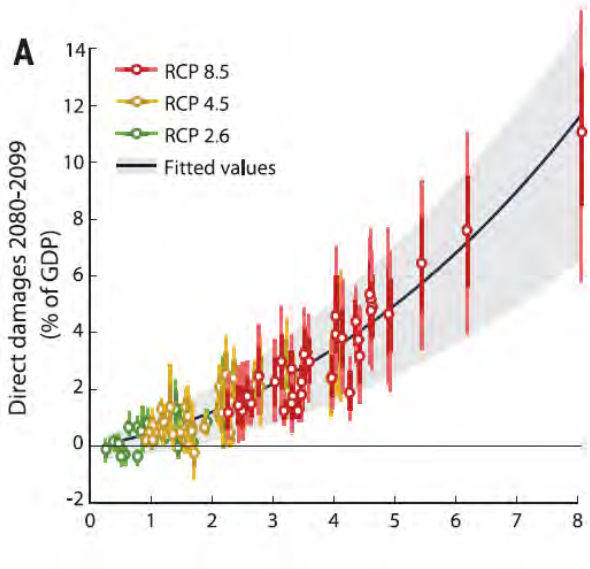
The USGCRP published NCA4 in two installments—Volume I on climate change science, in October 2017, and Volume II on climate change risks, impacts, adaptation, and mitigation, in 2018. The latter volume is our topic here.

Although Volume II weighs in at a whopping 1,515 pages, the *New York Times* was ready with a review article on the day of the report's release. Moreover, the reporters were able to spot the report's big takeaway though it appears only once, on a single page in Chapter 29, and depicted in a graph rather than expressly stated.[239]

Here's what the *Times* reported, which is probably the only thing anyone not directly involved might remember: Unchecked greenhouse gas emissions could increase global annual temperatures by 8°C in 2100, which would reduce US annual GDP by 10 percent.[240]

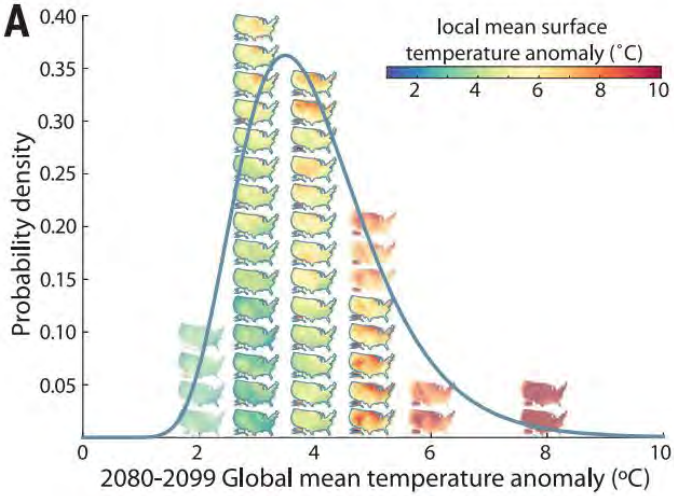
That estimate comes from a single study: Hsiang et al. (2017).[241] Specifically, NCA4's bottom line derives one chart in that study.

The chart, which is reproduced in NCA4, purports to show how US GDP declines as global average temperature increases:



Source: Hsiang et al. 2017. Total direct damages to the U.S. economy, summed across all assessed sectors, as a function of global mean temperature change.

But how likely is it that global warming will hit 8°C in 2100? Hsiang et al. also have a chart showing the probability distribution of different warming outcomes when the CMIP5 model ensemble is run with RCP8.5. That chart is not reproduced in NCA4.



Source: Hsiang et al. (2017). Probability distribution of global mean surface temperature responses under RCP8.5.

As the chart above reveals, even when the warm-biased CMIP5 model ensemble is run with the warm-biased RCP8.5 emission scenario, global warming has only a 1 percent probability of reaching 8°C by century's end. NCA4 does not mention that detail. Nor does the *Times*. In the IPCC's likelihood scale, anything with a 0-1% probability is deemed "exceptionally unlikely."[242] The USGCRP hid that good news from the public, fostering the misperception of looming global disaster and economic collapse.

On p. 1359, NCA4 presents a sectoral breakdown of climate change damage under RCP8.5 and avoided damage under RCP4.5. The estimates come from the EPA's 2017 sectoral impacts analysis mentioned above.

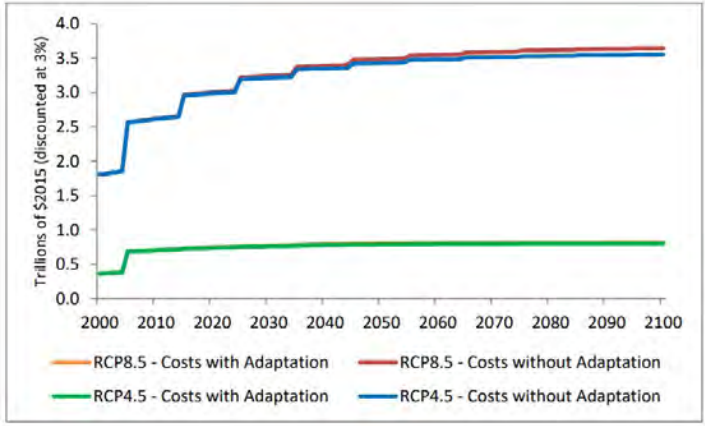
Annual Economic Damages in 2090		
Sector	Annual damages under RCP8.5	Damages avoided under RCP4.5
Labor	$155B	48%
Extreme Temperature Mortality◊	$141B	58%
Coastal Property◊	$118B	22%
Air Quality	$26B	31%
Roads◊	$20B	59%
Electricity Supply and Demand	$9B	63%
Inland Flooding	$8B	47%
Urban Drainage	$6B	26%
Rail◊	$6B	36%
Water Quality	$5B	35%
Coral Reefs	$4B	12%
West Nile Virus	$3B	47%
Freshwater Fish	$3B	44%
Winter Recreation	$2B	107%
Bridges	$1B	48%
Munic. and Industrial Water Supply	$316M	33%
Harmful Algal Blooms	$199M	45%
Alaska Infrastructure◊	$174M	53%
Shellfish*	$23M	57%
Agriculture*	$12M	11%
Aeroallergens*	$1M	57%
Wildfire	−$106M	−134%

The text accompanying the table states that "results assume limited or no adaptation." It notes that adaptation "was shown to reduce overall damages in sectors identified with the diamond symbol," those being extreme temperature mortality, coastal property, roads, rail, and Alaska infrastructure. However, no numbers are provided.

For additional information, the NCA4 refers readers to the EPA's 2017 sectoral impacts analysis. There we find, for example, that "proactive adaptation to protect roads against climate change-related impacts is projected to decrease costs over the century by 98 percent under RCP8.5 and 83 percent under RCP4.5."[243] In other words, for roads, the most effective way to reduce RCP8.5-related damages is adaptation, not mitigation.

Figure 15.1. Cumulative Costs of Sea Level Rise and Storm Surge to Coastal Property

Costs are presented with and without adaptation under RCP8.5 and RCP4.5[279] in trillions of $2015, discounted at 3%.



Source: EPA (2017) Multi-Model Sectoral Analysis.

Unless motivated to dig into an EPA technical report, policymakers, reporters, and the public may mistakenly conclude that mitigation is always or usually the better option or higher priority.

The EPA's sectoral impacts analysis also reveals that adaptation provides much more protection from sea level rise. The EPA estimates that cumulative coastal property damages through 2100 will total $3.6 trillion under RCP8.5 and $3.508 trillion under RCP4.5. In other words, reducing RCP8.5 emissions to RCP4.5 levels decreases cumulative coastal property damages by $92 billion or 2.6 percent (not 22 percent, as reported in the table above). In contrast, proactive adaptation would decrease RCP8.5 costal property damages to $820 billion—a 77.2 percent reduction. Moreover, combining proactive adaptation with mitigation to RCP4.5 level emissions avoids an additional $20 billion or 0.5 percent of coastal property damages. The contribution from mitigation is so small it is barely discernible in the EPA's chart.

To its credit, the USGCRP reproduces the chart above in NCA4. However, the chart appears in Chapter 8 (Coastal Effects),[244] not Chapter 28 (Adaptation) or Chapter 29 (Mitigation). The requisite information is in plain sight but scattered across hundreds of pages.

Most readers will not connect the dots unless the USGRCP connects them. It does not do so. Consequently, most readers (including reporters) are apt to mis-prioritize mitigation over adaptation.

Too few side cases

A primary safeguard against climate impact assessments becoming propaganda exercises is the inclusion of side cases. Such "sensitivity analyses" reveal how the authors' analytic choices drive results by showing how results change when investigators substitute reasonable analytic alternatives.

For example, modelers could run INM-CM4 (the most accurate model) with SSP2-4.5 and SSP5-8.5; run the CMIP6 ensemble with SSP2-3.4 (the most accurate baseline); or run INM-CM4 with SSP2-3.4. They could also assume all major US cities achieve the heat stress adaptation of present-day Phoenix by 2050; assume pollutant emissions decline practically to zero by 2060; assume coastal communities invest tens of billions of dollars on adaptation to avoid trillions of dollars in coastal property damages;[245] and present the results in a single table.

Side cases discourage bias and hype. They also give the public enough information to raise legitimate questions about an assessment's analytic choices and conclusions.

KEY ISSUE

Foster realism, balance, and objectivity in EPA climate assessments

Rather than require the EPA to police itself, Congress should empower citizens to challenge bias and hype in official climate science assessments. Congress should clarify that reliance on any unrealistic scientific or factual premise, not just unrealistic models, is arbitrary and capricious. Congress should also clarify that interested parties may contest the scientific basis of any EPA rulemaking, including climate policy rules, in officiated, on-the-record, public debates.

What EPA climate science policy should look like

A modernized EPA would be a strong voice for balance, objectivity, and transparency in climate research. It would prioritize realism in the selection of climate models, emission scenarios, and adaptation assumptions. It would test its climate assessments with side cases that use reasonable alternative analytic choices. It would make the side cases easy for policymakers and the public to access. It would explain the scientific basis for preferring its assumptions and analytic choices to those in the side cases.

More broadly, the EPA would candidly discuss peer-reviewed studies challenging either the methodologies on which it relies or its interpretation of the refereed literature. It would ensure that its reference lists reflect "the range of respected scientific viewpoints regarding interpretation of the available literature."[246]

Recommendations for Congress

Codify, extend, and strengthen the D.C. Circuit's requirement that models used in rulemaking should have a "rational relationship" to the realities they purport to represent. Although all forecasting involves guesswork, some assumptions and analytic choices are less reasonable than others. As noted above, the D.C. Circuit Court of Appeals has repeatedly held that an agency's use of a model is "arbitrary" if the model bears "no rational relationship to the reality

it purports to represent."[247] Logically, the same verdict applies to emission scenarios and adaptation assumptions. A rational-relationship-to-reality standard should apply to all important scientific assumptions that underpin agency regulations.

Moreover, the standard should be strengthened. In a constitutional republic, government should have the burden of proving that restrictions on economic liberty serve the public interest. Accordingly, to prevail in litigation, the EPA would need to show that its climate models, emission scenarios, and adaptation assumptions have a *clear* rational relationship to the realities they purport to represent. This reform might be called the "Climate Assessment Realism Act."

If that reform is not adopted, Congress should at least give effect to the D.C. Circuit's reasoning about models.

Require the EPA and other federal science agencies to use the most accurate model or models when assessing climate change impacts. As discussed above, the climate science underpinning EPA greenhouse gas regulations projects climate change impacts is based on the average and spread of all models. That is not what meteorologists do. Rather, they use the model or models with the best record in forecasting specific types of weather in specific regions.[248]

Congress should require the EPA and other USGCRP agencies to similarly use the model or models that most reliably hindcast observed temperatures in the troposphere. This reform might be called the "Need a Weatherman Act."[249]

Facilitate public hearings. Congress should allow interested parties to challenge the scientific *bona fides* of all EPA regulations, including climate policy rules, in public hearings, where opposing parties can cross-examine each other under judicial supervision.

Such proceedings could examine the scientific basis of climate policy rules as presented by the EPA and its advisory boards or peer-review panels. Multiagency and intergovernmental scientific climate assessments should also be fair game if those form part of a challenged rule's scientific justification. To reiterate, this reform could be called the "Level Playing Field in Regulatory Science Act."

KEY ISSUE

Remove social cost of carbon from regulatory development and benefit-cost analysis

The social cost of carbon (SCC) is a monetized estimate of the cumulative social damage from one ton of CO_2 emitted in a particular year. Conversely, the SCC is a monetized estimate of the social benefit of avoiding one ton of CO_2 emissions in that year.[250] Federal agencies have incorporated SCC values into their regulatory benefit calculations since 2010 or earlier. By one estimate, as of June 2021, federal agencies had used the SCC to calculate climate benefits in at least 80 rules.[251]

Illusory climate benefits

A notable recent example is the EPA's April 2024 model year 2027-2032 greenhouse gas emission standards for new motor vehicles. The EPA estimates the rule add will add $760 billion to auto industry compliance costs, which in turn will add $2,000 to the average cost of a new car in 2032. The rule's climate benefits are estimated to be much larger—$1.6 trillion.[252] The EPA obtains that figure by multiplying the rule's projected CO_2 emission reductions (7.2 billion tons during 2027-2055) by the agency's SCC estimates.

That is deeply problematic. The EPA and other federal agencies use a model called MAGICC to estimate the temperature impacts of emission reduction policies.[253] Select a baseline emission scenario, choose a climate sensitivity estimate, type in a projected emissions reduction, click "Run," and MAGICC computes the quantity of global warming averted by 2050 and 2100. Even assuming a high (4.5°C) climate sensitivity, MAGICC estimates that the EPA's auto rule would avert only 0.0068°C of warming by 2100.[254] That change is far too small for scientists to detect or for people to experience.[255]

Unverifiable, non-experiential effects are "benefits" in name only. Notional benefits should not be netted against multibillion-dollar compliance costs that verifiably impose measurable burdens on identifiable firms and consumers.

User manipulation

The auto rule's $1.6 trillion climate benefit estimate underscores the almost limitless potential of SCC analysis to predetermine results for political objectives. As MIT economist Robert Pindyck put it:

> The modeler has a great deal of freedom in choosing functional forms, parameter values, and other inputs, and different choices can give wildly different estimates of the SCC and the optimal amount of abatement. You might think that some input choices are more reasonable or defensible than others, but no, "reasonable" is very much in the eye of the modeler. Thus these models can be used to obtain almost any result one desires.[256]

By adjusting the knobs and dials, an SCC modeler can make fossil fuels—or gasoline-powered cars—look unaffordable no matter economical, convenient, or enabling of human welfare. Similarly, they can make hugely expensive climate policies look like a bargain at any price. SCC estimation easily becomes computer-aided hucksterism.

Warm-biased analytic choices

The federal government's Interagency Working Group (IWG), of which the EPA is a leading member, published technical support documents (TSDs) on the social cost of carbon in February 2010 and May 2013.[257] It later published TSDs on the social costs of carbon, methane (CH_4), and nitrous oxide (N_2O)—collectively, the social cost of greenhouse gases (SC-GHG)—in August 2016[258] and February 2021.[259]

All the IWG's major analytic choices tilt towards SCC estimates supporting "global action."

Choice 1: Run the social-damage calculators — formally known as "integrated assessment models" (IAMs) — with climate sensitivity estimates derived from GCMs and ESMs that significantly overshoot observed warming in the global troposphere. Overly sensitive IAMs will project too much warming and, hence, too much heat-related mortality, sea-level rise, and agricultural loss.

Choice 2: Run the IAMs with discount rates lower than those recommended by the OMB, thereby increasing the estimated present value of future emission reductions.[260]

Choice 3: Project cumulative damages over a 300-year period—well beyond the limits of informed speculation about future emissions and adaptive capabilities. Extrapolating losses into the distant future increases SCC estimates without providing real information about public health and welfare in the 22nd and 23rd centuries.

Choice 4: Minimize the agricultural benefits[261] of atmospheric CO_2 fertilization[262] by averaging the results of three IAMs, two of which (DICE[263] and PAGE[264]) do not explicitly quantify such benefits.

Choice 5: Exaggerate social vulnerability by including an IAM (PAGE) that unrealistically assumes adaptation cannot reduce social damages once 21st-century warming and sea-level rise exceed 1 degree Celsius and ten inches, respectively.[265]

Choice 6: Inflate warming projections by running the IAMs with implausible emission scenarios in which coal increasingly dominates global energy through the 21st century and beyond.[266]

Choice 7: Conceal the aforesaid biases by not running the IAMs with reasonable alternative assumptions to show how the chosen inputs drive results, and by ignoring such sensitivity analyses in the peer-reviewed literature.

On that last point, note that the IWG reports' ever-growing citations do not include any of three sensitivity analyses published in the refereed literature by Heritage Foundation data scientist Kevin Dayaratna and colleagues.[267] The 33-page reference list in the EPA's November 2023 SC-GHG report also omits those studies.[268] Dayaratna et al. (2020), the most recent of the three, finds that when one of the IWG's damage calculators, the FUND model,[269] is run with updated empirical information about climate sensitivity and CO_2 fertilization, the SCC drops to very low numbers, with substantial probabilities of being negative through 2050. A negative SCC is another way of saying a net benefit.

Implausible emission baselines

The IWG estimated SCC values using an average of five emissions trajectories. Four are no-policy emission scenarios from a 2009 Stanford Energy Modeling Forum study known as EMF-22.[270] Each scenario plots socioeconomic development and emissions from 2000

to 2100. The fifth is a policy future, added by the IWG, in which CO_2 concentrations stabilize at 550 parts per million (ppm) in 2100.[271] The IWG then extended the five trajectories out to the year 2300, albeit in a manner that might be described as techno-pessimism.

Lacking socioeconomic scenarios for the 22nd and 23rd centuries, the IWG assumed that whatever rates of carbon intensity decline[272] were projected for 2090-2100 in the five trajectories would hold constant over the next 200 years.[273] In other words, the extensions implicitly assumed no technological breakthroughs would occur such as might dramatically accelerate rates of carbon intensity decline.

The IWG did not report the total quantity of emissions in each of the five trajectories over the 300-year analysis period or provide any context to assess their realism. Fortunately, the Electric Power Research Institute (EPRI) did just that in a 2014 technical review of the IWG's 2010 and 2013 TSDs. EPRI toted up the emissions and compared those quantities to total potential CO_2 emissions in the world's estimated fossil fuel reserves.[274]

Table 4-6
Cumulative fossil and industrial CO_2 emissions in the USG assumptions and estimated fossil fuel reserves

Cumulative CO_2 emissions ($GtCO_2$)		
	By 2200	By 2300
USG1	11,207	16,741
USG2	20,024	33,023
USG3	8,113	10,864
USG4	14,092	20,504
USG5	3,691	4,843
Estimated reserves ($GtCO_2$)	3,674 - 7,113	

Source: EPRI (2014). The IWG's baseline is the average of five emission trajectories (USG1-USG5) with gigatons of CO2 emissions held constant from 2100 to 2300 and compared to estimated fossil fuel reserves.

Cumulative emissions in the five trajectories average out to 17,195 $GtCO_2$—roughly 2.4 to 4.6 times estimated fossil fuel reserves. That should have raised eyebrows even in 2010. To produce emission totals that high, the same governments that negotiated the Kyoto Protocol in 1997 and Copenhagen Agreement in 2009 would have to abandon "climate action"

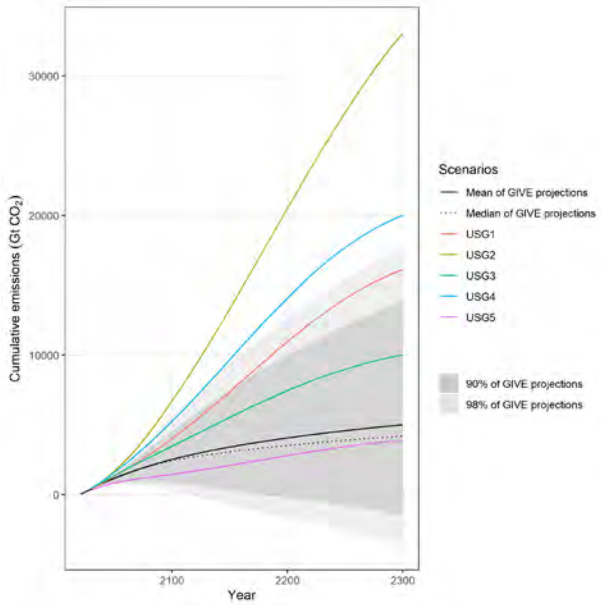
for almost three centuries and do so despite the IWG's expectation of increasingly damaging climate change impacts. It was a fanciful construct.

The IWG's 2016 TSD did not acknowledge any of the baseline issues raised by EPRI, and the 2021 TSD was also silent about the baselines' reasonableness (or lack thereof).

Less-is-more social cost paradox

As noted earlier, in 2022, Resources for the Future published updated emission baselines.[275] In addition to a new 21st century baseline comparable to SSP2.-4.5, RFF produced a new baseline projections out to 2300 for use in SCC estimation. Upon request, RFF lead author Kevin Rennert created a chart comparing the updated baselines to the IWG baselines. The EPA regards the RFF baselines as the most accurate available and uses them in its November 2023 SC-GHG report.[276]

Comparing the RFF and IWG baselines underscores the implausibility of the latter. The RFF baselines for 2000-2300 (labeled "GIVE" in the chart below) project less than one-third of the CO_2 emissions previously assumed in the IWG's 2010, 2013, 2016, and 2021 TSDs.[277]



Source: Kevin Rennert. The mean projection of GIVE in 2300 is 5,000 GtCO2—less than one-third of the USG1-5 mean of 17,195 GtCO2.

So far, so good. But then things get strange. The EPA's new 2000-2300 baseline projects less than one-third the total quantity of CO_2 emissions as the old IWG baseline. Yet the EPA now projects more than three times as much social damage from each ton of CO_2 emitted. In the 2021 IWG central estimate (3% discount rate), the SCC in 2050 is $85/ton. In the EPA's 2023 updated central estimate (2% discount rate), the SCC in 2050 is $310/ton.

Table ES-1: Social Cost of CO_2, 2020 – 2050 (in 2020 dollars per metric ton of CO_2)[3]

	Discount Rate and Statistic			
Emissions Year	5% Average	3% Average	2.5% Average	3% 95th Percentile
2020	14	51	76	152
2025	17	56	83	169
2030	19	62	89	187
2035	22	67	96	206
2040	25	73	103	225
2045	28	79	110	242
2050	32	85	116	260

Source: IWG (2021). Central estimate for 2050 is $85/ton CO2

Table 3.1.1: Social Cost of Carbon (SC-CO_2) by Damage Module, 2020-2080 (in 2020 dollars per metric ton of CO_2)

	Near-Term Ramsey Discount Rate and Damage Module								
	2.5% Near-Term Rate			2.0% Near-Term Rate			1.5% Near-Term Rate		
Emission Year	DSCIM	GIVE	Meta-Analysis	DSCIM	GIVE	Meta-Analysis	DSCIM	GIVE	Meta-Analysis
2020	110	120	120	190	190	200	330	310	370
2030	140	150	150	230	220	240	390	350	420
2040	170	170	170	280	250	270	440	390	460
2050	210	200	200	330	290	310	500	430	520
2060	250	220	230	370	310	350	550	470	570
2070	280	240	250	410	340	380	600	490	610
2080	320	260	280	450	360	410	640	510	650

Source: EPA (2023). Central estimate for 2050 is $310/ton CO2

That is perplexing because the most basic idea in SCC analysis is that the damage from the next ton of emissions chiefly depends on the cumulative quantity of tons projected in the baseline. To infer dramatically higher per-ton social costs from dramatically smaller quantities of total

emissions is highly paradoxical. Far from explicating this less-is-more paradox, the EPA's 170-page report does not even acknowledge it.

RCP8.5: EPA's "secret sauce." The EPA uses "transparent" and similar forms of the word 14 times to describe its new social cost methodology. However, the report contains nothing like a table, chart, or paragraph explaining which factors contribute what percentage of the more than threefold increase in social cost—despite the more than two-thirds reduction in baseline emissions.

One factor contributing to the higher SCC values is the EPA's reduction of the central discount rate from 3 percent to 2 percent (albeit with OMB's approval).[278] Through the miracle of compounding over a 300-year analysis period, one percentage point change in discount rates makes a substantial difference.

However, that is not whole story, as can be seen by comparing the two tables above. When discounted at 2.5 percent, the SCC in 2050 is $116/ton in the IWG's calculation and $200-210/ton in the EPA's calculation. The EPA's SCC estimate is 73-84 percent higher, even when both are discounted at the same rate.

In early December 2023, science writer Roger Pielke, Jr. identified RCP8.5 as the "secret sauce" in the EPA's updated SCC. Although the EPA abandoned RCP8.5 as a baseline emissions scenario, the agency now relied on three damage functions "based on RCP8.5 and not EPA's emissions scenarios or climate projections."[279]

By damage function, the EPA means a computer code that "translate[s] changes in temperature and other physical impacts of climate change into monetized estimates of net economic damages."[280] Despite the EPA's switch to more realistic baselines, each damage function selected by the EPA assumes that an incremental ton of emissions causes the same amount of warming as modelers might project under RCP8.5.

For example, the Data-driven Spatial Climate Impact Model (DSCIM) damage function developed by the Climate Impact Lab[281] incorporates RCP8.5 mortality damages from global warming up to 10°C by 2100. As Pielke, Jr. comments, that warming projection is not "remotely plausible."

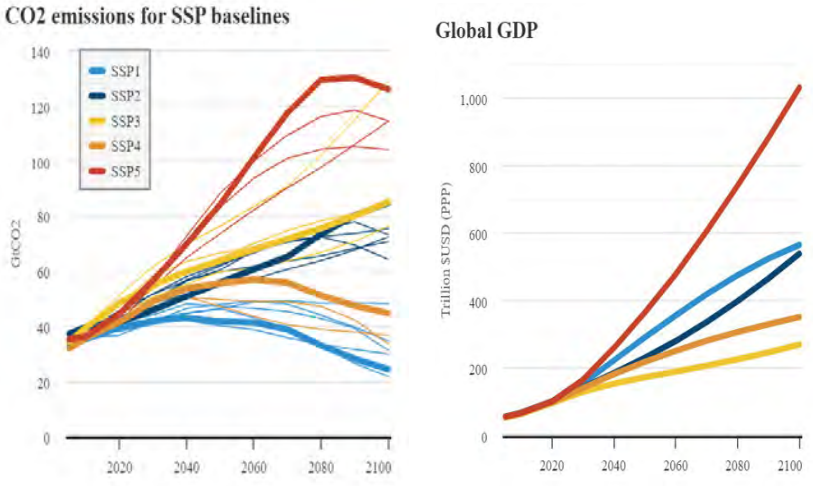
Citing Carlton et al. (2022),[282] a Climate Impact Lab study, Pielke, Jr. further observes that "More than 75 percent of the DSCIM SCC results from mortality due to extreme heat, driven by RCP8.5." Labor losses, which are the second-largest portion of SCC damages, are "also based on RCP8.5."

Franken-scenario. However, questions remain about the less-is-more paradox. We might expect the addition of RCP8.5-enhanced damage functions to balance out the loss of RCP8.5-style emission baselines, leaving SCC values roughly unchanged. Instead, SCC values more than triple. What else has the EPA not told us?
The X factor, Pielke, Jr. contends, is a new more pessimistic assessment of human adaptive capabilities. The EPA's SCC reboot assumes that societies are more fragile than the IWG thought.

Specifically, Pielke, Jr. finds that the EPA, following Carleton et al. (2022), combines the forcing trajectory of SSP5-8.5 with the socioeconomic storyline of SSP3.[283] The latter is a scenario in which investments in education and technology "decline" and economic growth is "slow." In contrast, SSP5, the fossil-fueled development scenario,[284] prioritizes "technological progress and development of human capital as the path to stainable development."[285]

The two scenarios differ drastically in terms of wealth and adaptive capabilities. In 2100, global per capita income in SSP3 is $20,000; in SSP5, it is almost $140,000. Of the five shared socioeconomic pathways, SSP5 has the greatest adaptive capabilities; SSP3, the least. But only SSP5 has the rapid, fossil-fueled development that produces a radiative imbalance of 8.5 W/m^2.

In short, EPA 2023's SCC estimates derive from a franken-scenario—an implausible amalgam of SSP3 social vulnerability and SSP5 emissions and warming. That is gobbledygook. As EPRI explained in its 2014 critique of the IWG process, a proper socioeconomic scenario provides "a complete and cohesive story with internal consistency between emissions drivers and emissions such that there are well defined relationships."[286] Combining the emissions of SSP5 with the poverty of SSP3 is not science. It is science fiction with an incoherent storyline.



Source: Carbon Brief (2018)

Recommendations for Congress

A modernized EPA would frankly acknowledge that SCC analysis is too speculative and prone to user manipulation to inform either regulatory development or benefit-cost analysis. The IWG and the EPA have been at this game for 13 years, through five iterations, and, if anything, the current estimates are the least realistic and transparent. It is time to declare that this "one number to rule them all" cannot safely be wielded by any rulemaking entity.

Pindyck observed in 2013 that social cost models "are so deeply flawed as to be close to useless as tools for policy analysis. Worse yet, their use suggests a level of knowledge and precision that is simply illusory and can be highly misleading."[287] Nothing has changed in the interim to invalidate that judgment.

When reality finally put paid to the IWG's inflated emission baselines, the EPA reimported RCP8.5 in the form of new, purportedly "evidence-based," damage functions, and imagined a future in which emissions from the richest SSP come from the poorest SSP. The EPA's 2023 SC-GHG reboot is a more artful construction than the IWG's

methodological sandcastle, but it produces more extreme results, posing greater risks to the liberties and prosperity of our republic.

SCC estimation remains politicized "science"—mathematics in the service of propaganda. A modernized EPA would abandon it. Congress should:

Prohibit the EPA and other agencies from using SCC analysis to either inform regulatory development or quantify regulatory benefits. This reform, which might be called the "The Social Cost Propaganda Prevention Act," is self-explanatory and follows logically from the critique presented above.

If that reform is not adopted, Congress should:

Facilitate the use of public hearings to challenge agencies' use of SCC analysis in rulemakings. This is yet another application of the Level Playing Field in Regulatory Science Act.

Whether that reform is adopted or not, Congress should:

Require agencies to publish side cases calculating SCC values with reasonable analytic alternatives. Such alternative analytics include low-end climate sensitivity estimates, an SSP2-3.4 baseline emission scenario, 150-year rather than 300-year analysis periods, robust CO_2 fertilization functions, and optimistic assessments of human adaptive capabilities.

Conclusion

Only an EPA dedicated to scientific integrity can effectively carry out its mission and merit the public's trust, as the agency itself avers. Yet the EPA does not acknowledge, and has no plan to address, what many scholars consider the major scientific integrity challenge of our time—the replication (or reproducibility) crisis.

In several policy-relevant disciplines, independent investigators frequently cannot reproduce the results of studies published in peer-reviewed journals. Moreover, attempts to replicate the results of published studies are few and far between. In economics, for example, perhaps only 0.1 percent of published studies attempt to reproduce the results of previous research.

Peer-reviewed journals have published tens of thousands of articles on the reproducibility crisis. Yet the EPA acts as if it does not see the elephant in the elevator. Similarly, the EPA acknowledges no conflict of interest in its massive and often exclusive funding of the research it uses to justify regulatory decisions.

Several more specific failings tarnish the EPA's scientific integrity record. The agency uses no diagnostics to detect publication bias and data manipulation in the research it funds or assesses. It accepts data concealment by EPA-funded researchers as an unalterable fact of life. It provides no forum for moderated public debate between competing experts on the scientific basis of EPA rulemakings. Members of its "independent" science advisory committees often work for organizations financially dependent on the EPA. Members of its peer-review panels often grade their own work. Both the committees and panels often lack reasonable viewpoint diversity.

Congress should not allow such substandard practices to continue. Scientific integrity is critical to efficient regulation. Only if high-quality science and economics inform regulatory decisions can the public reasonably expect the benefits to exceed or justify the costs.

More importantly, scientific integrity is critical to constitutional self-government. Our liberties are at risk when agencies are free to devise regulatory rationales based on non-transparent data, manipulated data, errant models, implausible scenarios, cherry picked studies, or meta-analyses skewed by selective outcome reporting and publication bias.

Congress should enact legislation obligating the EPA to prioritize transparency, reproducibility, objectivity, and realism in its funding, assessment, and use of scientific research. In environmental health policy, every study funded by the EPA, or used by the agency in regulatory development, should provide a clear audit trail covering all phases of the research. The authors' data and methods should be sufficiently transparent to *facilitate*—not merely allow—independent validation.

In climate policy, Congress should specify that a regulation is arbitrary and capricious if it is based on forecasting models, emission scenarios, or assessments of human adaptive capabilities that do not have a clear rational relationship to the realities they purport to represent. Congress should also determine that the social cost of carbon is too speculative and prone to manipulation to inform either regulatory decisions or benefit-cost analysis.

More broadly, Congress should ensure the independence and reasonable viewpoint diversity of EPA science advisory committees and peer-review panels. It should also ensure that the EPA candidly and thoroughly addresses thoughtful criticisms of its scientific assessments and methodologies.

To that end, Congress should create a procedure whereby interested parties may challenge the EPA to debate the scientific basis of proposed rules. Such on-the-record debates, which would feature sworn testimony, cross-examination, and supervision by a hearing officer, would help inform both public comment on proposed rules and subsequent litigation on final rules.

Ultimately, Congress should explore options to decentralize the funding of environmental research. It is unwise to perpetuate a status quo in which most researchers are beholden to a single grantmaker—the very agency with a vested interest in funding research that supports its regulatory agenda.

Implementing science integrity reforms of the sort presented in this chapter will help ensure the EPA effectively carries out its statutory mission, earns the public's trust, and furthers rather than undermines the American experiment in constitutional self-government.

2 MODERNIZING AIR REGULATION

Daren Bakst[1]

The United States has clean air. Over 50 years ago, nobody could have accurately made this claim. However, for decades, the nation's air quality has continuously improved and it is now cleaner than the air quality of almost every other country.[2] The Clean Air Act (CAA), which took its modern form in a law enacted in 1970,[3] with major amendments in 1977 and 1990,[4] has played a leading role.[5] While there may be some disagreement as to whether this improvement would have occurred independently of the statute or been achieved through more effective means,[6] there is no question that air quality has drastically improved since its enactment. The Environmental Protection Agency (EPA) deserves credit.

That is the good news. The bad news is the EPA, and specifically its Office of Air and Radiation that implements the CAA, acts as if it is still facing the same challenges that existed in the 1970s. The agency has repeatedly tried to tighten air quality standards even if it imposes massive costs to achieve marginal gains.[7] To justify much of its existing work, the agency uses questionable science that lacks transparency, plays fast and loose with alleged benefits from its actions, and minimizes the importance of costs or even ignores them altogether.

The agency has all too often used any ambiguities and discretion in the text of the CAA to promulgate regulations that are unprecedented in scope. This scope problem is even worse due to the inherently broad-based effect of regulating greenhouse gas emissions, which have nothing to do with air quality as commonly understood.

The EPA now regularly issues CAA rules that are so sweeping in nature that the agency's environmental mission has become, directly or indirectly, a means to drastically change the economy and the way Americans live. Recent examples include the agency's rule designed to limit the availability of gas-powered vehicles[8] and its new power plant rule[9] which, even after the spectacular demise of the 2015 Clean Power Plan rule[10] in the landmark 2022 Supreme Court case *West Virginia v. EPA*,[11] would once again have the agency functionally adopt the role of the nation's electricity grid manager.

The EPA and its approach to air regulations must be modernized. In the past 50 years, one of the agency's challenges may have been to make drastic improvements to the nation's air quality. However, that focus is not warranted today. This is not to say that maintaining or even improving air quality is not an important objective, but it should be carried out with due recognition of the current state of the environment and an appreciation for the incredible costs and tradeoffs that generally occur in air regulations. Congress needs to modernize the CAA so that it is a statute for the future not for the past.

Air quality

When analyzing federal air regulation, it is important to first understand the state of the nation's air quality. The EPA establishes National Ambient Air Quality Standards (NAAQS) for what are known as "criteria" pollutants. These are six principal air pollutants emitted from a wide range of stationary and mobile sources: carbon monoxide, lead, nitrogen dioxide, ground-level ozone, particulate matter, and sulfur dioxide.[12] While the EPA has statutory authority to identify additional criteria pollutants, it has not added to this list since the 1970s.[13]

EPA's data show how much air quality has drastically improved over time for these pollutants. The following data[14] on air concentration levels are shown in Table 1. Based on concentration levels, from 1980-2023, carbon monoxide concentration levels decreased 88 percent, nitrogen dioxide (annual standard) decreased 68 percent, ozone decreased 26 percent, and sulfur dioxide (one-hour standard) decreased 95 percent. For lead, concentration levels decreased by 98 percent from 1980-2005.[15] The agency changed its methodology for measuring concentration levels after 2005, which likely explains why there is no 1980-2023 number. However, the EPA does show that from 2010-2022, lead concentration levels declined by 87 percent.

For particulate matter, and specifically fine particulate matter ($PM_{2.5}$), concentration levels decreased by 37 percent from 2000-2023.[16] From 2010-2023, air concentration levels have continued to decline, even as it becomes increasingly difficult to make improvements. PM_{10} concentration levels (particulate matter with a diameter of 10 microns or less) remained constant, although as can be seen in Table 2 on emissions, direct PM_{10} emissions declined by 14 percent during that time.[17]

Table 1. Air Quality Trends, percent change in air quality

Pollutant	1980 vs 2023	1990 vs 2023	2000 vs 2023	2010 vs 2023
Carbon Monoxide	-88	-79	-65	-18
Lead	---	---	---	-87
Nitrogen Dioxide (annual)	-68	-62	-54	-30
Nitrogen Dioxide (1-hour)	-66	-55	-40	-23
Ozone (8-hour)	-26	-18	-12	-1
PM_{10} (24-hour)	---	-29	-36	0
$PM_{2.5}$ (annual)	---	---	-37	-15
$PM_{2.5}$ (24-hour)	---	---	-29	+1
Sulfur Dioxide (1-hour)	-95	-92	-87	-78

Source: EPA, Air Quality—National Summary

Table 2. Emissions Trends, percent change in emissions

Pollutant	1980 vs 2023	1990 vs 2023	2000 vs 2023	2010 vs 2023
Carbon Monoxide	-76	-71	-59	-28
Lead*	-99	-88	-78	-36
Nitrogen Oxides (NO_x)	-75	-73	-69	-55
Volatile Organic Compounds (VOC)	-58	-46	-26	-5
Direct PM_{10}	-62	-27	-24	-14
Direct $PM_{2.5}$	—	-28	-35	-11
Sulfur Dioxide	-94	-93	-90	-76

Source: EPA, Emissions Trends.

Note: Ozone itself is generally not emitted into the air directly by regulated sources, but rather is formed by a chemical reaction between nitrogen oxides and volatile organic compounds.[18]

From 1970-2023, even as aggregate emissions of the six criteria pollutants declined by 78 percent from 1970-2023, there were major increases in vehicle miles travelled (194 percent), population (63 percent), and energy consumption (42 percent).[19]

The EPA's primary criteria pollutant of concern is arguably $PM_{2.5}$. The EPA in 2020 explained how well the United States does in comparison to other countries regarding this pollutant:

> The U.S. has some of the lowest fine particulate matter levels in the world – approximately five times below the global average, six times below Chinese levels, and 20 percent lower than France, Germany, and Great Britain. Between 2000 and 2019, average PM2.5 concentrations in the U.S. fell by 44 percent and average PM10 concentrations similarly fell by 46 percent.[20]

Looking at a three-year average using the latest World Health Organization data (2017-2019),[21] the United States had the 22nd lowest fine particulate matter concentrations among 192 countries. Only eight advanced economies had lower concentration levels.[22] Further, only three European Union (EU) countries (Estonia, Finland, and Sweden) had lower $PM_{2.5}$ concentration levels than the United States. The other 24 EU countries[23] had higher concentration levels, with almost all of them having much higher levels (See Table 3).[24]

Table 3. PM2.5 concentration levels by country (3-year average for 2017-2019): EU countries compared to the United States

Country	Average PM 2.5 2017 to 2019
Finland	5.47
Sweden	5.99
Estonia	6.32
United States of America	7.76
Portugal	8.09
Ireland	8.21
Luxembourg	9.48
Spain	9.88
Denmark	9.88
Lithuania	10.47
France	10.99
Netherlands (Kingdom of the)	11.29
Germany	11.40
Belgium	11.92
Latvia	12.11
Austria	12.17
Malta	13.11
Romania	14.74
Cyprus	14.83
Greece	15.17
Italy	15.31
Hungary	16.04
Czechia	16.28
Slovenia	16.31
Croatia	17.50
Slovakia	17.82
Bulgaria	19.33
Poland	21.10

Source: SDG Indicator 11.6.2 Concentrations of fine particulate matter (PM2.5) (who.int)

Finally, while most of the attention on air quality is focused on the criteria pollutants, it is also important to note EPA's success when it comes to air toxics.[25] According to the EPA, these pollutants, also known as hazardous air pollutants, "are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects."[26] Examples of the currently listed 188 air toxics[27] include asbestos, benzene, and mercury.[28] The EPA explains that from 1990-2017, air toxics emissions declined by 74 percent.[29]

Problems with EPA's air regulations

America's clean air is a major achievement that often gets lost, in part because many environmental groups, other special interest groups, and the media paint a picture of doom and gloom.[30] As soon as the EPA establishes a new, stricter standard for a criteria pollutant, areas of the country that were perfectly fine under the earlier, less stringent standard are then portrayed as posing a new danger to the population. This moving of the goalposts helps create a constant narrative of fear. In part, the frequently changing standards are a result of Congress requiring the EPA to review, and if appropriate revise, the standards on a five-year basis. This does not mean the agency must keep making the standards stricter, but this statutorily created process has led to this outcome.

While the nation's air *quality* has gotten better, this does not mean that EPA's air *regulations* have gotten better for the nation. There are many problems with the EPA's air regulations, including:

Massive costs

In its 2017 "Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act,"[31] the Office of Management and Budget (OMB) analyzed the annual benefits and costs of major federal rules over the 10-year period of October 1, 2006 to September 30, 2016. According to OMB, EPA rules accounted for "55 percent to 64 percent of the monetized costs" from the rules across the federal government.[32] The Office of Air and Radiation rules accounted for 92 percent of the costs of EPA rules.[33] This means, if using the middle of the range (59.5 percent), the Office

of Air and Radiation rules accounted for 55 percent of all monetized costs from the federal rules analyzed.[34]

OMB also explained that EPA rules in general accounted for "71 percent to 80 percent of the monetized benefits" from the rules across the federal government and the Office of Air and Radiation rules accounted for over 95 percent of the monetized benefits of the EPA rules.[35] These claimed benefits are often questionable, as discussed in Chapter 1. Regardless, the costs and benefits of these rules show the incredible magnitude of the air regulations.

Using data from the American Action Forum's Regulation Rodeo web site,[36] during the Biden administration, air regulations accounted for almost all the EPA's regulatory costs (97 percent or higher in each of Biden's first three years). In two of those years, air regulations accounted for more than half of all regulatory costs across the entire federal government.[37]

One specific rule from 2024 provides a useful example of the massive costs from EPA air rules. The Office of Air and Radiation's final vehicle "tailpipe" rule regulating emissions from light-duty and medium-duty vehicles is projected to impose a compliance cost of $760 billion.[38] This number accounts only for compliance costs and does not even include the costs of the subsidies the agency relies upon to drive the massive shift away from gas-powered vehicles and towards electric vehicles that is the rule's central policy design, nor the costs incurred by Americans including through higher vehicle ownership costs and forced reliance on vehicles with inferior range and long charging times.[39]

To put this $760 billion cost in context, the projected cost of the 2009 stimulus bill (the American Recovery and Reinvestment Act) was $787 billion.[40] Therefore, the EPA, without Congress ever speaking clearly on whether it wants to authorize the agency to impose such a major change in policy, has imposed about the same projected costs in this one rule as Congress did with its 2009 controversial and massive stimulus package.

Excessive scope

There is a recurring theme with the EPA's air regulations: the agency repeatedly promulgates rules that are not just massive in scope due to their costs, but also due to their reach and effect. This includes

restricting freedom and consumer choice, influencing how Americans live, and changing major portions of the economy, such as the production of electricity. The environmental mission has morphed into a means to achieve economy-wide and societal objectives. Greenhouse gas regulation, which is a large part of this problem, is inherently going to be sweeping in nature due to the broad range of sources that emit greenhouse gases and the lack of affordable, proven ways of controlling greenhouse gas emissions. EPA's regulations of greenhouse gases have too often taken the form of reshaping the economy and directing investment away from one type of activity to another.

No agency, including the EPA, should have such wide powers. Congress should be making policy choices of this magnitude and not the EPA. The legislative process has numerous protections to ensure widespread public buy-in for major changes in national policy, starting with the fact that legislators are elected officials.[41] The regulatory process does not have such protections. The biggest decisions affecting Americans should be made by the legislators who have the lawmaking power under the US Constitution, not unelected officials at the EPA.

Lacking legitimacy

The scope of the rules undermines any legitimacy as does the agency's questionable authority. It is bad enough when Congress forces through major bills that most legislators have not even read. But it is far worse when an agency makes major changes in national policy with Congress never speaking directly on the issue.

The EPA, like other agencies, tries to get creative to achieve its ends by taking advantage of broad or ambiguous language to expand its powers into areas that Congress never authorized. Joseph Goffman, the Biden Administration's Assistant Administrator of the Office of Air and Radiation, has even been called (by supporters) the "EPA's Law Whisperer," because "his specialty is teaching old laws to do new tricks."[42]

The abuse of the CAA statutory language to achieve the agency's ends is just part of the legitimacy problems with the air rules. Three other examples include the problems with transparency, the agency's scientific process, and so-called "citizen suits." There are major

concerns regarding transparency because the public and outside experts are not able to properly evaluate the studies and data used by the agency to promulgate rules. The Trump administration finalized a transparency rule to address these concerns,[43] but the Biden administration not only refused to defend the rule, but managed to eliminate it without going through a public rulemaking process by supporting environmental groups in their efforts to have it vacated.[44]

EPA Administrator Michael Regan, shortly after his confirmation near the start of the Biden administration, purged *all* members of two statutorily required science panels, the Clean Air Scientific Advisory Committee and Science Advisory Board.[45] This shocking and unprecedented step was originally pushed by former EPA employees opposed to Trump administration policies.[46] John Graham, who had led the EPA's disbanded Science Advisory Board, stated after this purge: "Now for the first time in the agency's 50-year history, we have an administrator interested in scientific advice only from those scientists he has personally appointed."[47]

There is also the problem of citizen suits. The CAA is filled with mandatory requirements, including requiring the EPA to regulate if certain low thresholds are met, or to regularly review existing air quality standards, which can provide the basis for the agency to make regulations more stringent. Such requirements are enforceable by outside parties in citizen suits and Congress appears to have given little thought when it first enacted the citizen suit provision in the CAA, section 304,[48] as to how these many mandatory requirements, including the carousel of required review, would play out over the decades. One of the key problems is this has allowed outside organizations to use lawsuits to require the agency to conduct reviews and often to promulgate regulations due to the nature of the review processes. These lawsuits effectively help these organizations set the agency's agenda.

Failure to properly consider costs and tradeoffs

When promulgating its 2012 Mercury and Air Toxics Standards (MATS) rule,[49] the Office of Air and Radiation concluded that costs were unimportant and should not be considered. This is despite the fact that the costs were estimated to be as much as $9.6 *billion* a year,

while benefits of reducing emissions of mercury and other air toxics were only $4-$6 *million* a year.[50] Fortunately, in 2015, the Supreme Court in *Michigan v. EPA* struck down this complete disregard for the costs of the agency's rule, ruling that EPA could not legally disregard costs when making the statutorily required determination that it was "appropriate and necessary" to regulate power plants under the air toxics program.[51] Sometimes the agency not considering costs, as with the NAAQS process, is not the agency's fault due to language in the CAA, which the Supreme Court has held precludes considerations of costs when setting NAAQS standards.[52]

To the extent that the agency does consider costs, it often will move forward with rules even if the benefits are almost exclusively (and sometimes actually exclusively) attributable to the claimed ancillary benefits (or "co-benefits") of reducing other pollutants that are not the targeted pollutants subject to regulation under the statutory authority it is exercising. The EPA is particularly wont to use $PM_{2.5}$ ancillary benefits in this manner.

Improperly considering risk

The CAA is filled with language that triggers regulations based on very low and easily met thresholds based on the possibility of harm to health. There is a precautionary approach that captures the idea of "better safe than sorry" in which the unknown is an excuse to regulate. This mindset fails to properly consider risk and tradeoffs, including the potential of creating more harm than good, or even failing to understand the harm that is allegedly being avoided.[53]

In the 1970s, some may have been concerned that the new EPA would not properly enforce environmental laws. Therefore, reducing agency discretion whether to regulate may have been viewed as an appealing option. However, in 2025, such a concern is not only unjustified, but the opposite is true: the EPA is too quick to regulate and too expansive in the nature of its regulations.

What EPA's air regulations should look like

The EPA should continue to play an important role in protecting the nation's air quality. However, this role should be focused on actual

pollutants that dirty the air or directly harm human health, as opposed to greenhouse gases that meet neither of these requirements. The agency should stick to implementing specific statutory requirements and exercising specific statutory authorities detailed by Congress, rather than continuing to expand and twist longstanding statutory language to arrive at major new policy decisions and expansions of its own authority. The air regulations should not be so sweeping in nature that they reorganize major portions of the economy, reshape or kill off industries, restrict freedoms, or otherwise make decisions of such magnitude that Congress should make itself.

The agency should be not just authorized but required to consider costs and tradeoffs when it faces the choice whether to regulate. These considerations should be as objective as possible within the CAA to reduce the level of discretion the agency has in determining whether regulation is warranted.

Science should inform the agency's regulatory decisions. Whether a regulation is warranted or at what level of stringency a regulatory standard should be set are not questions science alone can answer. For example, science can help provide answers on the health effects of air pollutants at different concentration levels, but it does not answer what concentration level to set an air standard. The level to set the standard is a subjective question requiring a subjective answer. Judgments about other issues are always going to be involved when making regulatory decisions, such as costs and benefits, risk tradeoffs, and policy priorities, even if such judgments are not expressly acknowledged.[54]

However, that means an agency must be careful not to confuse its scientific conclusions with other judgments that inform its regulatory decisions. The agency's science should be focused on the science itself and not muddled with unrelated issues. In 2009, President Barack Obama issued a memorandum on scientific integrity, arguing that "the public must be able to trust the science and scientific process informing public policy decisions."[55] A major way to promote scientific integrity and for the public to trust agency science is to ensure that policy considerations do not influence the science used by agencies.

Except when Congress has expressly directed the agency to promulgate a specific rule, the CAA should provide the agency

discretion as to whether regulations are warranted, and whether and on what schedule to revise existing regulations. This discretion when to promulgate rules though should not be so broad that the agency can make decisions that Congress should be making.

A modernized Office of Air and Radiation would stay well within the bounds of the CAA and use sound and transparent science when making any decisions to regulate. Its air regulations would primarily be focused on ensuring no backsliding and addressing cross-state transport of pollutants that severely hinder meeting federal standards. States should be allowed to address air quality issues themselves instead of having the federal government imposing ever-stricter standards and more sweeping regulations that may not only be unnecessary but also inconsistent with the goals and priorities of the states. This is not the 1960's where environmental considerations may not have been that prominent in the public consciousness. Environmental issues are an important concern for the public and state policymakers are well aware of this.[56]

The next section of this chapter details key issues for Congress, which if addressed, would help to modernize air regulations. For each key issue, there are specific recommendations for Congress.

KEY ISSUE

Eliminate or limit greenhouse gas regulation

Congress never envisioned that the CAA would be used to regulate greenhouse gases.[57] The statutory language itself does not authorize such regulation,[58] although the Supreme Court in *Massachusetts v. EPA*[59] concluded otherwise. The Court held that the agency does have authority to regulate greenhouse gases under the statute.[60]

The following point may get lost, but the EPA *did not originally want to* regulate greenhouse gases under the provision at issue in *Massachusetts v. EPA*, Section 202(a)(1) of the CAA,[61] which authorizes EPA to establish standards for air pollutant emissions from new motor vehicles or new motor vehicle engines. The agency concluded that the CAA's definition of "air pollutant" did not allow it to regulate greenhouse gases. In addition, it concluded that due to a variety of factors, such as scientific uncertainty, problems with the models, and the greenhouse gas emissions of developing countries, regulation of greenhouse gases from new motor vehicles was not warranted at that time.[62]

The Court found the agency's reasoning to be insufficient, ruling that the EPA had to regulate greenhouse gases from new motor vehicles if in the Administrator's judgment those vehicles' greenhouse gas emissions, in the language of Section 202(a)(1), "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." This analysis regarding endangerment is what is referred to as the "endangerment finding." Other provisions of the CAA include the same or similar language[63] as a predicate for regulating air pollutants, not allowing the agency to consider costs and tradeoffs of adopting regulation.

The regulation of greenhouse gases is inherently sweeping in nature and involves decisions that no agency should have the discretion to make on its own. About 80 percent of US energy comes from fossil fuels, such as coal, natural gas, and oil, which produce greenhouse gas emissions.[64] It is hard to think of a single industry, including the renewable energy industry, which does not use energy derived from fossil fuels.

The assertion by the executive branch or interpretation of statutory text by courts to provide authority to regulate greenhouse gas emissions under the CAA gives the EPA incredible power to impose regulations that go way beyond environmental concerns and can be used, intentionally or unintentionally, to control energy production and use. Since energy affects every facet of our lives, there is little the agency could not regulate either directly or indirectly. The EPA is an agency that exists to protect the environment, within the bounds established by Congress, not to centrally plan the economy. Yet the power to control greenhouse gas emissions is a regulatory blank check enabling the agency to influence or even dictate what technologies can produce our electricity, provide our transportation, and even grow our food.

This is not a hypothesis, but a statement of reality, as illustrated by the EPA's new power plant rule[65] that uses greenhouse gas emission standards to dictate how electricity is generated in this country. As a plan that would help kill off existing coal generation and block investment in new natural gas generation, this new rule is arguably even more heavy-handed than the Obama administration's Clean Power Plan, which was struck down by the Supreme Court.

There is also the EPA's new vehicle tailpipe rule (its latest regulation under Section 202 regulating vehicle emissions), which sets *de facto* fuel economy standards automakers cannot meet without rapidly shifting production and sales from gasoline-powered cars to electric vehicles, regardless of what consumers want.[66] So long as the EPA acts under a claim of authority to regulate greenhouse gases, the agency will continue to push such extreme regulations, absent some limitations imposed by Congress or possibly through the courts.

There are other provisions within the CAA that are not regulatory in nature but do give the agency the power to address greenhouse gas emissions. One example is the Greenhouse Gas Reduction Fund[67] created through the Inflation Reduction Act.[68]

Recommendations for Congress

Expressly prohibit the regulation of greenhouse gases. Congress should expressly clarify in statute that the EPA does not have authority

to regulate greenhouse gases under the CAA. If the EPA were to have any authority to regulate greenhouse gas emissions, it should only be to implement a narrow and specific requirement expressly authorized by Congress that involves no judgement or discretion on the part of the agency. This qualification may be very difficult to achieve, which is yet another reason why expressly prohibiting EPA greenhouse gas regulation is the best solution.

If this solution is not adopted, then Congress should:

Clarify that the agency has the discretion not to regulate greenhouse gases. The Supreme Court in *Massachusetts v. EPA*[69] rejected strong arguments made by the EPA as to why it should not regulate greenhouse gas emissions from new motor vehicles, even if authorized to do so. For CAA sections that have been used or could be used to authorize greenhouse gas regulation, Congress should clarify that the EPA may only decide to regulate under the applicable section if it properly considers the costs and tradeoffs. This would include factors such as scientific uncertainty, problems with the models, energy reliability, vehicle safety, and consumer choice.

These factors should be specific so that the agency does not have too much discretion and the decision to regulate is based on clear Congressional requirements. The review of the factors should not be a mere box-checking exercise. It should require sufficient analysis to strongly support the agency's decision to regulate. This section should also expressly prohibit rules that would restrict or limit the availability of types or categories of cars. Language such as that in Section 202(a)(1) that states the agency "shall" promulgate regulations should be changed to "may."[70]

This recommendation ensures that agency science informs any regulatory decision but does not trigger the subjective policy decision that regulation is warranted. There are many factors that should be considered when making regulatory decisions, especially regulations of this magnitude. If Congress is not going to be making the choices as it should, then it at least should create some protections to ensure that the EPA properly considers the full range of effects of greenhouse gas regulations.

Do not inadvertently authorize regulation of greenhouse gases or confuse greenhouse gases with "air pollutants" as properly understood. This is an important point that applies to the above recommendation and all the recommendations in this book. Congress has not spoken directly to the issue of whether the EPA can regulate greenhouse gases. Legislators should make sure this does not change. They should also recognize that expressly prohibiting the regulation of greenhouse gases in one provision of the CAA may inadvertently suggest that Congress believes other provisions in the statute do authorize such regulation. Similarly, Congress should be sure to avoid stating that greenhouse gases are air pollutants in other legislation. Such language would only provide ammunition for those who want to demonstrate that the CAA authorizes greenhouse gas regulation.

The IRA did insert *references* to greenhouse gases at various places in the CAA,[71] and did create new Section 136 within the statute that authorizes EPA to charge a *fee* for "waste" methane emissions from the petrochemical sector above certain thresholds and subject to certain exemptions,[72] but the IRA provided the EPA with no new authority to *restrict* greenhouse gas emissions through binding, compulsory regulation. To leave no doubt that this language may not be used to assert the EPA has authority to regulate greenhouse gases, the language should be repealed.

Follow the recommendations in Chapter 1, including prohibiting the use of the "social cost" metrics of greenhouse gases. Chapter 1 of this book includes numerous recommendations, including how to improve transparency and the quality of science used and disseminated by the EPA. These recommendations are especially important when it comes to the regulation of greenhouse gases. The social cost of greenhouse gas metrics warrants special attention. The most discussed of these, the social cost of carbon, is the estimated present value of projected cumulative damages from one ton of carbon dioxide (CO2) emitted in a particular year, or conversely, the benefit of eliminating that ton of CO2 emissions.[73] It is a metric that has been regularly abused by the EPA and it unrealistically inflates harms to justify regulatory actions. Congress should prohibit the EPA from using these metrics[74] in any regulatory actions or disseminating any information that suggests agency support if that information uses these measures.

Establish reasonable thresholds for the endangerment finding. The standard "may reasonably be anticipated to endanger public health or welfare" should be replaced with a standard that is not unreasonably risk adverse and provides clarity from Congress as to what level of risk and harm the EPA is required to find before it regulates. The language was "which endangers the public health or welfare" before the CAA was amended in 1977 to create the existing standard.[75] The original language, if it were used again, would not mean that a pollutant must already be hurting humans. The term "endangers" captures the idea that the agency would need to identify ahead of time whether there is a risk of harm to public health or welfare.[76] The endangerment determination under the original language requires that some risk of harm, whatever that might be, does exist. In contrast, the "may reasonably be anticipated" language appears to suggest that the potential existence of a risk—the risk of a risk—constitutes endangerment. This is unreasonably risk averse.[77]

In both versions of the endangerment language, there is no clarity as to what level of risk or what level of harm is sufficient to qualify as endangerment. To help provide some clarification and create a more objective standard, "endangers" should be defined or replaced so that the threshold question is whether a pollutant "is reasonably likely to impose significant harm to public health or welfare" or comparable language. The term "reasonably likely" captures the level of risk and "significant harm" clarifies the level of harm (it should not be insignificant). Maybe these thresholds are too high or low for some, but regardless, Congress should answer what level of risk and harm should constitute endangerment, not the EPA.

KEY ISSUE

Reform the NAAQS process

The process for establishing the national ambient air quality standards (NAAQS) is inherently subjective in nature. There is no objective scientific answer as to the right level for the standards. The process is not somehow divorced from policy and subjective considerations.

As the air continues to get cleaner, it becomes increasingly difficult to identify ways to improve air quality.[78] The EPA is making NAAQS decisions that are sweeping in nature, from their effects on development, jobs, to infrastructure. For these reasons, Congress should be making the decisions regarding NAAQS. At a minimum, the EPA should properly address the costs and tradeoffs of their NAAQS decisions. This will also help ensure transparency in the decision-making process instead of trying to hide behind a façade of objectivity.

The improvements in air quality since the 1970s are so significant that the current NAAQS should be considered the floor—i.e., the final national standards. States could establish more stringent standards, as they are allowed to now,[79] but not less stringent standards. NAAQS are one-size-fits all, which is not ideal given the differences across the states. The ostensible need for the EPA to continue making the standards more stringent, which has become a norm, makes little sense now that so much progress has been made. States can certainly take air quality issues from here with the EPA making sure states comply with existing standards and there is no backsliding (i.e., not meeting existing federal standards).

States and local communities are the ones directly affected by air quality and have incentive to address any concerns. If they choose not to make their standards more stringent than the already very stringent federal standards, then that is a choice they should be able to make. There are other concerns and priorities that states might view as more important than air quality concerns. Alternatively, they very well might decide that making standards more stringent is appropriate. The federal role when dealing with interstate and international air transport issues should be to ensure these sources do not contribute significantly to a state being in nonattainment with federal standards.[80]

Background

Every five years, the EPA is required to review, and if appropriate revise, the standards that are established for criteria pollutants. There are two types of NAAQS: primary standards and secondary standards. The EPA explains:

> Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.[81]

In setting the primary standards, the Administrator must use his judgment to set standards that are "requisite to protect public health with an adequate margin of safety."[82] "Requisite" protection means establishing "standards that are neither more nor less stringent than necessary." Secondary standards are based on the Administrators judgment as to what is "requisite to protect the public welfare."[83] According to the Supreme Court, the agency may not consider the implementation costs when setting either of these standards.[84]

Subjective

Regardless of whether it is a primary or secondary standard, science does not by itself provide a definitive answer regarding the right level for the standard. Any Administrator is making subjective, values-informed decisions, including what level of risk is appropriate.

Regarding the primary standards, the DC Circuit of Appeals in *Mississippi v. EPA* explained, "In Lead Industries Association, we held that the choice of how to set a margin of safety is 'a policy choice of the type that Congress specifically left to the Administrator's judgment.'"[85] In *Whitman v. American Trucking Associations,* Justice Breyer wrote in his concurrence, "the statute [CAA], by its express terms, does not compel the elimination of all risk; and it grants the Administrator sufficient flexibility to avoid setting ambient air quality standards ruinous to industry."[86]

During the Obama administration, when the EPA was about to set more stringent ozone standards after reconsidering the existing

standards, President Obama explained that he was directing the agency to drop the pending rule in part due the effect on the economy.[87] The reconsideration of a standard is different from the regular five-year review process and therefore such economic discretion is arguably allowed. Even so, while not expressly done, economic and regulatory burden considerations are going to be part of the five-year review process.[88] The same concerns will exist for any administration be it a reconsideration or part of the regular review process. Not making the economic considerations transparent does not mean the EPA Administrator is not considering them. Policy considerations, including costs, are consciously or subconsciously going to affect the setting of standards.

There is not even objectivity in the agency science used to inform the standards. For example, in 2021, EPA Administrator Michael Regan dismissed every member of the Clean Air Scientific Advisory Committee that helps to inform the science underpinning NAAQS (as discussed earlier). While setting the standards inherently requires policy and subjective decisions, the scientific process should be as objective as possible.

Increasingly difficult to make improvements

There are fewer ways to achieve improvements in air quality given the improvements that have already been made. Ozone concentration levels are so low they are reaching background levels in some areas (the concentration levels that exist due to natural and foreign sources of the pollutants).[89] There is very little that can be done regarding $PM_{2.5}$ emissions, when most of the emissions come from non-point sources like wildfires and road dust.[90]

Implementation

The EPA sets the standards and then states are required to develop a "State Implementation Plan" (SIP). This is a plan for regulating emission sources in the state that will allow the state to "attain" the standards and ensure that it is not "significantly contributing" to "nonattainment" in neighboring states. The state must then submit its SIP to the EPA, which must either approve or disapprove it. Only

if a state does not submit an approvable SIP does the EPA have the authority (and the obligation) to issue a Federal Implementation Plan (FIP) to satisfy the unmet air-quality-planning obligations. As part of this process, states must impose controls on existing sources to the extent necessary to meet the federal standards and require state construction permits for new and modified sources.[91] The EPA can impose severe penalties on states for failing to submit a satisfactory SIP or for failing to properly implement a SIP.[92] This includes, in some instances, the potential to lose federal highway funding.[93] The EPA will step in and issue a FIP if the state has not met its requirements.[94]

When determining state compliance with the NAAQS, the EPA may under certain circumstances disregard air-quality data attributable to "exceptional events" like wildfires and other natural events.[95] For $PM_{2.5}$, the EPA admits that wildland fires (wildfires and prescribed fires) "account for 44 percent of the nation's primary emissions of fine particulate matter."[96] Despite the pervasiveness of exceptional events, the EPA is not automatically required to exclude air quality data when there are exceptional events. There is a high standard that must be met to exclude data, specifically there must be "a clear causal relationship… between the measured exceedances of a national ambient air quality standard and the exceptional event to demonstrate that the exceptional event caused a specific air pollution concentration at a particular air quality monitoring location."[97]

Recommendations for Congress

Set the standards. The decision whether to establish more stringent standards is of such a magnitude that Congress itself should make the decision, not agencies. As has been explained, the setting of the standards is not an objective, purely scientifically informed decision. It is a subjective policy decision that is best left to policymakers, not agency officials. The legislative process helps to ensure the costs and benefits are properly considered and there is wide buy-in from across the country on a policy decision that has national implications.

Further, Congress is perfectly capable of setting specific standards and has done so in the past, as seen when Congress established certain

vehicle emission standards in Section 202(b) of the CAA.[98] It should be noted that states can already choose to set stricter standards for themselves, and nothing would change with this recommendation. The existing standards should act as a fixed floor moving forward, as described earlier, and states would be able to establish more stringent standards than what is required by the national standards if they choose, just as they can now. The agency's main role would be to ensure there is no backsliding.[99]

If the ideal solution is not adopted, then there are other alternatives approaches to developing the standards. Some of the following recommendations could be mixed and matched together:

Require congressional approval. The EPA could go through a NAAQS review process as it does now and make a recommendation regarding a new standard. This would allow the agency to continue its NAAQS work and then for Congress to make the ultimate decision. Such a process should be no more frequent than every 10 years. This in no way means that the agency is unable to review science before the 10-year schedule and communicate any concerns. However, the actual formal process would be based on a 10-year schedule.

Allow states to have a voice regarding more stringent standards. A variation of the petition for rulemaking process that exists under the Administrative Procedure Act could exist just for states and NAAQS.[100] States could be allowed to petition the EPA to initiate a NAAQS review process and if a supermajority of states support the petition, the EPA would be required to undergo the review process. This recommendation would only apply if there were no longer a scheduled review process in place.

Extend the time between reviews. One recommendation that has been included in legislation, such as in the National Ambient Air Quality Standards Implementation Act introduced by Sen. Shelley Moore Capito (R-WV) in 2023, would change the five-year review process to 10 years.[101] The congressional approval recommendation also suggests a 10-year process. This extended time period would be a beneficial change, but by itself would not address many of the problems that exist with the NAAQS process. Capito's legislation though did include other useful provisions, such as those that would "Authorize the EPA

to consider technological feasibility consideration when revising NAAQS" and "Ensure that for certain ozone and particulate matter nonattainment areas, states are not required to include economically infeasible measures in their plans."[102]

The time reform is a change that should be part of other reforms too. The EPA is often trying to set stricter standards even before many states have had a reasonable amount of time to meet existing standards. Another way to establish a time element is to have a minimum 10-year timeline before setting more stringent standards and to prohibit new stringent standards until at least 75 percent of the population is living in areas already meeting the existing standards.

Clarify the role of science in regulatory decisions. If the EPA is going to make decisions on whether to make the standards more stringent, the science regarding criteria pollutants used by the agency should inform both the decision as to what is an adequate margin of safety (the risk element) and the inherent policy choices made in setting a standard. However, there should be no pretense that this science by itself can provide the answers to these questions. For example, science can help provide answers on what health effects to expect at different concentration levels. That is different from and does not answer the regulatory question of whether to maintain or revise a standard.[103]

Require proper consideration of costs and tradeoffs. Congress should be making policy decisions regarding how to set a standard. However, if the EPA is going to make this decision, it should be expected to properly consider the costs and tradeoffs of the regulatory decision based on specific factors that are as objectively drafted in statute as possible. The agency should be prohibited from setting stricter standards if there is a reasonable basis to conclude that there are not readily achievable means for doing so in all states. There should be no expectation that states would have to significantly undermine development, infrastructure, the financial well-being of its residents, or otherwise hurt its residents to achieve the standards.

Give states more flexibility with SIPs. By properly considering the costs and tradeoffs and not being heavy-handed with what states have to do for compliance, this should make the SIP process much

easier. The agency should not set standards that are so stringent that it requires states to impose significant harm on themselves.

Change the exceptional events process. Under the CAA, it is too difficult for states to establish that exceptional events are causing problems with compliance. This needs to change. If a state (or other party) can demonstrate that an event has occurred and it may reasonably be anticipated to have caused or contributed to an exceedance, then the agency should be required to adjust the air quality data accordingly.

Address problems with CASAC. Some specific requirements worth mentioning here include ensuring a proper balance based on viewpoints, staying focused on hard science, prohibiting individuals currently receiving EPA funding from serving, and not considering grant proposals from current advisory board members until one year after their term of service expires. The individuals who are receiving money from the EPA are especially problematic when it comes to conflicts of interest because they easily could act more like an agent of the agency than expressing their own independent views.

KEY ISSUE

Remove language biased in favor of regulation

In many instances, the CAA does not allow the EPA to use its discretion to consider the costs and tradeoffs of regulating, such as with the endangerment finding in Section 202(a)(1),[104] at least as interpreted by the Supreme Court in *Massachusetts v. EPA*.[105] These types of provisions,[106] which require the agency to regulate based on scientific conclusions about a pollutant's[107] health, welfare, or environmental effects, can even have a presumption in favor of regulating such as in Section 112(b)(3) dealing with hazardous air pollutants.[108]

Under Section 112(b)(3), it is easy to get a substance regulated, but difficult to get it deregulated. Consider first the language for adding new hazardous air pollutants (HAPs) to the list. The EPA *shall* add a substance to the list of hazardous air pollutants if it is an air pollutant and "emissions, ambient concentrations, bioaccumulation or deposition of the substance are known to cause or *may reasonably be* anticipated to cause adverse effects to human health or adverse environmental effects."[109] The "shall" and "may reasonably be" language makes the addition of a substance fairly easy.

In contrast, listed HAPs can only be deleted from the list if "there is adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation or deposition of the substance *may not* reasonably be anticipated to cause *any* adverse effects to human health or adverse environmental effects."[110] [Emphasis added]. This language makes removal unlikely.

In both instances under Section 112(b)(3), the agency is instructed to add or delete a listed hazardous air pollutant without allowing the agency to consider whether regulation is warranted based on costs, tradeoffs, the effectiveness of regulating the pollutant, and other non-science factors that should inform whether to promulgate regulations.

Recommendations for Congress

Recognize that scientific conclusions alone should not trigger the decision to regulate. The EPA should not be forced to regulate due to scientific conclusions alone such as those regarding health effects. The decision to regulate is a policy choice,[111] which is subjective in nature. Science on health effects should inform the decision to regulate, not dictate it. Language that says a substance must continue to be regulated if there are *any* adverse health or environmental effects is such a low-risk threshold that it is unclear when it would not be met. There needs to be realistic risk considerations in the statute.

Provide the EPA discretion on whether to regulate, while requiring that it properly consider the effects of regulations. Language that says the agency "shall" regulate if certain scientific conclusions have been reached, such as in Section 202(a)(1) of the CAA,[112] should be changed to "may." Further, the EPA should only be allowed to regulate if it properly considers factors such as price and energy effects, the likely effectiveness of a rule, alternatives to regulation, and other costs and tradeoffs.

KEY ISSUE

Reduce outside influence in setting EPA's air agenda

There are many provisions in the CAA that impose mandatory duties on the agency.[113] When the agency is required to take action without having the discretion on whether it makes sense to do so, it can give undue influence over the agency's work to outside organizations, usually environmental groups. These organizations frequently sue the agency to meet these non-discretionary requirements, often using the citizen suit provision under Section 304 of the CAA.[114] This is a major problem because the environmental groups are in effect setting the agenda for the agency.[115]

Recommendation for Congress

Limit mandatory requirements, especially those triggering regulation. The agency, not outside organizations, should set its agenda. It should also set the agenda in a transparent manner instead of arguably *de facto* relying on lawsuits by outside groups to set its priorities or justify taking actions that it might not otherwise take. Reducing the number of mandatory requirements, from conducting studies to periodically reviewing air quality standards, will minimize the influence of outside groups on priority setting. This is especially important for those mandatory requirements that trigger regulation and as a result mean outside organizations could be helping to establish policy priorities.

KEY ISSUE

Establish boundaries the EPA may not cross in its air regulations

The CAA is a complicated statute. However, sometimes it gets easy to lose the forest for the trees. Often the simplest answer is the right answer. When the agency asserts power that is so beyond what Congress ever would have authorized, Congress should not sit idly by and let the agency just do whatever it wants. It should expressly prohibit such extreme actions. Unlike trying to address abuses across the entire government, it is much easier to prohibit statute-specific abuses without possible concerns for being overbroad.[116]

Nobody, at least with a straight face, can claim that Congress wanted the EPA to use air regulations to stop Americans from driving gas-powered vehicles. Nor can they claim that Congress wanted the EPA to shift the fuel mix used to generate electricity in the United States at the nationwide level, or to override the resource-planning and fuel-mix decisions made by the states. As an objective matter, Congress never told the agency to take such actions or even hinted at it.

Recommendation for Congress

Prohibit shutting down types of businesses, banning or limiting types of goods, and other actions that common sense tells us Congress never authorized. Congress should just say what it does not want the agency to do under the CAA. Specifically, the agency should be expressly prohibited from promulgating the types of rules that common sense tells us the agency was never authorized to promulgate.[117]

The EPA should not treat shutting down businesses as a compliance option that it presents to regulated parties. It should not directly or indirectly ban or severely limit the availability of categories of goods (such as gas-powered vehicles) or reshape or change the nature of an industry or a broader portion of the economy (such as changing how electricity is generated).

The agency should also be prohibited from promulgating rules that are beyond its regulatory expertise, as it did with the Clean Power Plan in its efforts to change how electricity is generated. It is now doing the same thing with the Biden administration's new rule addressing greenhouse gas emissions from power plants. One of the major arguments for the existence of agencies in the first place is their alleged expertise. If the EPA does not have expertise on a certain issue (such as how to ensure that the electrical grid remains stable and reliable) then this is a sure sign that Congress never intended for the agency to address that issue.

It is important to prohibit rules that directly or *indirectly* lead to such outcomes. The EPA will claim that it is merely setting standards and the effect may be, for example, to kill off coal or get people out of gas-powered vehicles, but that is not their intent. However, the effect of a rule matters, in addition to its stated intent.

The examples of prohibitions listed in this recommendation should just be the starting point. In the unlikely event that there are needed exceptions for general prohibitions, then this is something that can easily be addressed. The purpose of this recommendation is for Congress to make it clear that there are lines that the EPA shall not cross.

KEY ISSUE

Repeal or limit California waivers and authorizations under Section 209

Section 209(a) of the CAA preempts states from establishing emissions standards for new motor vehicles or new motor vehicle engines.[118] However, there is a provision, Section 209(b), under which California, and only California, may apply to EPA for a waiver of this preemption. The provision does not explicitly name California, but instead imposes conditions on seeking a waiver which only California could ever have met; namely, that the state has certain standards in place before a certain date, which only California did. The state's standards, as determined by California, have to be "in the aggregate, at least as protective of public health and welfare as applicable Federal standards."[119] The EPA shall not grant the waiver if, among other things, "such State does not need such State standards to meet compelling and extraordinary conditions."[120]

Even though only California may apply to EPA for a preemption waiver, once EPA grants the waiver for a set of California regulations, pursuant to CAA Section 177,[121] other states are allowed to adopt California's emissions standards in lieu of the corresponding federal ones. The main requirement is having standards that are identical to California.[122]

When the CAA was enacted, California had unique air quality problems, particularly on its urban southern coast, that were exacerbated, as the EPA explained in 2019, by the state's "peculiar characteristics" such as wind and ocean currents, and topography.[123] Yet for decades California's air quality has gotten much better.[124] For example, according to the South Coast Air Quality Management District, which regulates air quality covering large areas of Los Angeles and Orange counties, among other areas (the region covers 44 percent of the state's population),[125] the number of days in the air basin that exceeded federal ozone standards dropped significantly between 1980-2020. Based on the 1979 standard, there were 167 days in 1980 that violated this old standard, while in 2020 there were only 27 days.[126] The major improvements in air quality do not justify continuing this special treatment.

Waivers and greenhouse gases

When it comes to greenhouse gas emissions, the waiver makes no sense. There is nothing compelling or extraordinary that makes California especially susceptible to any harm caused by greenhouse gas emissions, nor is there any particular connection between car emissions in California and climate impacts in California (unlike with traditional pollution/"smog," where California's problems have historically been unique and where there is such a particular, direct connection between California emissions and California impacts).[127] In 2007, when the EPA for the first time denied a California waiver request (the first such request for greenhouse-gas regulation), EPA Administrator Stephen L. Johnson wrote:

> EPA has considered and granted previous waivers to California for standards covering pollutants that predominantly affect local and regional air quality. In contrast, the current waiver request for greenhouse gases is far different; it presents numerous issues that are distinguishable from all prior waiver requests. Unlike other air pollutants covered by previous waivers, greenhouse gases are fundamentally global in nature. Greenhouse gases contribute to the problem of global climate change, a problem that poses challenges for the entire nation and indeed the world. Unlike pollutants covered by the other waivers, greenhouse gas emissions harm the environment in California and elsewhere regardless of where the emissions occur. In other words, this challenge is not exclusive or unique to California and differs in a basic way from the previous local and regional air pollution problems addressed in prior waivers.[128]

This accurately captures the problem. There is nothing special about a car emitting greenhouse gases in California compared to a car in Texas. Those greenhouse gas emissions will have the same effect on California.

Nonroad engines or vehicles

Section 209(e) preempts state standards for nonroad engines or vehicles.[129] This provision was added to the CAA in later amendments and, unlike the on-road waiver in Section 209(b) discussed above,

it explicitly names California as the only state privileged to seek a waiver. Under 209(e)(1), there is no waiver available for states to set standards for "new engines which are used in construction equipment or vehicles or used in farm equipment or vehicles and which are smaller than 175 horsepower" or "new locomotives or new engines used in locomotives."[130] For "other nonroad engines or vehicles," which are addressed under 209(e)(2), the waiver process (which is called an authorization) is similar to the waiver process applicable to new motor vehicles. Other states can adopt the California standards for these engines as well.[131]

Recommendations for Congress

Repeal waiver and authorization authority under Section 209. Congress should repeal the waiver authority under Section 209(b) (as well as the related Section 177 for states adopting California's standards since the provision would be moot)[132] and the comparable authorization authority under Section 209(e).[133] The justification for this special treatment for California no longer exists because California's remaining air quality issues do not equate to compelling and extraordinary conditions. In September, 2024, Sen. Mike Lee (R-UT) introduced legislation, the Stop California from Advancing Regulatory Burden Act (STOP CARB Act) that would achieve this objective.[134] Rep. Troy E. Nehls (R-TX) introduced a House companion bill.[135]

If this ideal solution is not adopted, then Congress should:

Clarify that the waiver and authorization authority does not apply to greenhouse gases. As stated, there is nothing unique about California when it comes to greenhouse gases. If such a clarification were made, Congress would need to be clear that in no way is it suggesting that greenhouse gases could otherwise be regulated under the CAA.

Prohibit the EPA from granting a waiver or authorization to California that would exceed the agency's own authority. There is a difference between California going beyond a federal floor established by the EPA and the state taking action that the EPA itself is not authorized to take. For example, if the EPA is not authorized by Congress to use its

power under the CAA to reduce the number of gas-powered vehicles, it should not then be able to give California the authority to take that prohibited action. Notably, California in 2022 adopted regulations (known as Advanced Clean Cars II or ACCII) that feature an escalating "zero-emission vehicle" sales mandate that culminates by 2035 in an outright ban on the sale of new internal-combustion-engine-driven cars in the state.[136] EPA sought comment on this waiver request, as required by statute prior to acting on the request, with comments due in early 2024.[137] In December of 2024, the EPA granted the waiver request.[138]

Require California to consider the same factors as the EPA. Under existing law, the EPA has some factors that it considers when it sets emissions standards for new motor vehicles, such as "appropriate consideration" of compliance costs [139] However, this language should be made much stronger with clear prohibitions on limiting the availability of different types of vehicles and placing high priority on properly considering safety, consumer choice, and all relevant costs, including the costs for car dealers and customers. These same considerations should apply for California when the EPA considers a waiver or authorization request.[140]

KEY ISSUE

Prohibit unreasonable technological requirements

The CAA is filled with numerous provisions that require the agency to set standards that in effect necessitate the application of specific technologies. The agency does not usually *explicitly* require companies to install any particular technology. Rather, by setting an emission standard based on what can be achieved with a particular technology, the agency essentially requires the use of this technology, even though it can often be excessively costly and impractical. In recent years, the requirements too often reflect whatever the agency wants regardless of feasibility. One example is the agency's vehicle tailpipe rule and its unrealistic assumptions regarding electric vehicle adoption.[141]

Another example is Section 111 that addresses standards of performance for stationary sources and informs the new power plant rule regulating greenhouse gases.[142] It highlights many of the problems with how the EPA sets technological requirements.

Under Section 111(a)(1), a standard of performance is defined in the following way:

> The term "standard of performance" means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.[143]

Improper use of subsidies

When determining the best system of emission reduction, the agency must take into account the total cost of achieving such reduction. There is nothing that indicates that this cost only refers to the direct compliance costs to the regulated company. Yet the EPA in its new power plant rule considers only the direct compliance cost to the regulated company and assumes that regulated companies will be able to take advantage of tax subsidies.[144] The agency should be taking

into account the total societal cost. The EPA's refusal to consider the broader societal costs, including the cost to taxpayers of the subsidies themselves, therefore significantly underestimates the cost of regulation.

The EPA uses the mere existence of subsidies to help claim that a technology, like carbon capture and storage (CCS), is a best system of emission reduction that has been adequately demonstrated. In the Inflation Reduction Act, Congress expanded the availability of the 45Q tax credit that incentivizes the use of CCS.[145] This policy, which was supposed to be a "carrot" to help power plants, is being used by the EPA to justify the unreasonable imposition of CCS. This will result in helping to kill off power plants. Legislators, like Sen. Joe Manchin (I-WV), who supported this tax credit were almost certainly not intending to spend billions on the 45Q tax credit to help coal just so the EPA could then use the subsidy to help kill off coal.[146]

The agency's reliance on subsidies is also problematic because their mere existence does not demonstrate anything. Spending money does not mean that a technology is viable, especially on a commercial scale, nor that it will be viable any time in the future. Assuming that subsidies will continue to exist is itself a faulty assumption.

Inadequately demonstrated

The EPA in its new power plant rule makes a mockery of the adequately demonstrated language. For example, the rule establishes a 90 percent carbon capture requirement for new baseload natural gas power plants.[147] There is no utility scale natural gas CCS plant in existence today—anywhere in the world. There has only been one small-scale facility that was ever built—Florida Power & Light's 40 MW CCS gas plant in Bellingham, Massachusetts.[148] It closed in 2005. Yet the EPA claims its CCS requirement for natural gas baseload plants has been adequately demonstrated.[149]

There is also another problem with the agency's analysis of adequately demonstrated in its power plant rule. A central feature in the business plans of almost every utility-scale commercial CCS powerplant ever built or proposed in North America is an arrangement to sell its captured CO2 to companies engaged in enhanced oil recovery (EOR).[150]

Injecting CO2 into older oil fields increases production by increasing field pressure while reducing the oil's viscosity. Thirty-eight states do not have EOR operations.[151] Both natural gas and coal powerplants in those states (more than 75 percent of all states) would have little or no prospect of ever becoming financially viable.

Recommendations for Congress

Clarify that cost means all costs. At a minimum, when the CAA says costs should be considered when ascertaining the imposition of a technological requirement, this should be clarified to mean all costs, including subsidies. The fact that this would even need to be clarified helps to illustrate the problems with the EPA and its efforts to improperly interpret statutes to achieve its agenda.

In places where the language is unclear or mentions compliance costs, this should be changed to clarify that the agency must consider all costs. There are costs to parties well beyond those being regulated, be it taxpayers through subsidies or consumers who may bear the cost of having regulated parties pass on their costs to them.

Prohibit the consideration of subsidies in justifying technological requirements. The EPA should not consider the mere existence of subsidies to support a specific technology. When Congress enacts a subsidy for the adoption of a technology, it should not have to worry that this investment will then be used to impose unrealistic technological requirements on recipients of the subsidy, such as how the 45Q tax credit has been used against coal plants. Further, the continued existence of any subsidies is not something that can just be assumed.

This recommendation is hardly novel. In the past, Congress addressed the EPA's potential abuse of subsidies in setting technological requirements in rules. Section 402 of the Energy Policy Act of 2005,[152] which has since expired, prohibited the EPA from determining CCS to be adequately demonstrated "solely by reason of" the emission reductions achieved by subsidized clean coal demonstration projects.[153] This recommendation is slightly different than Section 402. It is focused on the EPA relying on the mere existence of subsidies to

justify technological requirements, not on whether the agency can look towards subsidized special projects to justify any requirements. Having said this, the EPA should also not be able to use special subsidized projects like the Section 402 clean coal projects to establish technological requirements.

Clarify that technological requirements must be technically and economically feasible. Technological requirements, be it in Section 111 or elsewhere, should be feasible. This means at a minimum that the required technology should be commercially available, reflect current market conditions (e.g., no predicting future consumer demand), and not be cost-prohibitive in the absence of any subsidies. The technology should be available everywhere across the country and its successful adoption should be in the control of regulated parties, both within their physical operations and existing business models. This last point regarding control gets to a problem in the new power plant rule where power plants have no control over enhanced oil recovery that is a prerequisite for CCS.

KEY ISSUE

Address the abuse of co-benefits

The Office of Air and Radiation has regulated air pollutants even when it has identified little to no monetized benefits from regulating these pollutants.[154] When moving forward with these rules, the agency has pointed to the ancillary benefits (sometimes referred to as "co-benefits") of reducing the emissions of pollutants that are not the focus of the statutory sections or the purpose of the rules.[155] The costs of the rules may dramatically outweigh the benefits from reducing the emissions of the pollutants that are the focus of the statutory sections or the purpose of the rules (direct benefits). In fact, there may be no direct benefits.

According to NERA Consulting data, in the two-year period from 2009-2011, the EPA did not quantify any direct benefits for six major CAA rules. $PM_{2.5}$ ancillary benefits accounted for all of the quantified benefits.[156] In 21 of the 26 major non-particulate matter rulemakings analyzed from 1997-2011, the particulate matter ancillary benefits accounted for more than half of the total quantified benefits. The $PM_{2.5}$ ancillary benefits accounted for greater than 99 percent of the total quantified benefits for 10 of the rulemakings.[157]

In 2016, the EPA issued a supplemental finding to justify the MATS rule (dealing with mercury and other hazardous pollutants, or HAPs) that was struck down by the Supreme Court in *Michigan v. EPA* because the agency refused to consider costs when determining whether the regulation was "appropriate and necessary" as required under the applicable statutory provision, 112(n)(1)(A).[158] In the supplemental finding, the agency provided two forms of cost analysis. The primary analysis considered the costs of MATS against a variety of cost metrics for the utility industry. But the alternative analysis, which was based on cost-benefit analysis, explicitly looked to co-benefits, justifying the rule on that basis even though 99.9 percent of the total quantified benefits came from the alleged ancillary benefits of reducing non-HAP emissions.[159] Once again, the monetized ancillary benefits focused on $PM_{2.5}$ ancillary benefits.[160]

The EPA finalized a new MATS rule in 2024,[161] which is currently being challenged in court.[162] The new rule has zero monetized HAP-

related benefits.[163] All of the monetized benefits are ancillary benefits from non-HAP pollutants, including $PM_{2.5}$. The agency again uses the statutory section (Section 112) that exists to regulate HAPs despite being unable to monetize any benefits from regulating HAPs.

In 2020, the EPA itself sought to address the abuse of ancillary benefits in the MATS context,[164] but that rulemaking was rescinded by the Biden administration.[165] The EPA in the 2020 rule explained that ancillary benefits from criteria pollutants could only play a "marginal role" in deciding whether to regulate HAPs from power plants.[166] The agency rightfully pointed to the fact that the CAA already regulates criteria pollutants under the NAAQS program[167]

Legal concerns

The EPA should not be using a statutory section addressing one pollutant to regulate another pollutant—especially when Congress has adopted other programs specifically designed to regulate the latter. This may or may not be the agency's intent, but it certainly is the effect. For example, when the EPA regulates mercury but is unable to show any monetized direct benefits and instead points exclusively to criteria pollutant ancillary benefits, then the rule, for all practical purposes, is not a HAP rule, it is a criteria pollutant rule. The EPA is taking a section that Congress passed to deal with pollutant A and using it to deal with pollutant B (intentionally or in effect). This acts as an end-run around Congress.[168] Using ancillary benefits from criteria pollutants in this manner when it comes to Section 112 is especially egregious because the agency is likely prohibited from regulating criteria pollutants under Section 112.[169]

It is possible that for a rule with a miniscule amount of monetized HAP direct benefits and massive criteria pollutant ancillary benefits, the EPA's primary objective may not be to reduce criteria pollutants. Instead, the primary objective may be to promulgate HAP regulations that would otherwise seem unreasonable to regulate based on the small amount of monetized HAP direct benefits. The 2012 MATS rule could be interpreted that way—claiming huge $PM_{2.5}$ co-benefits was a way to try and make it seem reasonable to promulgate a rule whose costs exceeded direct benefits by as much as 2400 to 1.[170] But whatever the motive,

whether ancillary $PM_{2.5}$ reductions are the primary objective or a means to an end, the agency is improperly using ancillary benefits.

Ignores basic requirements of regulatory analysis

The EPA, like any agency, should first clearly identify the problem that it intends to address through a rule.[171] Another key requirement of regulatory analysis is to identify alternatives. When a rule purporting to address pollutant A (e.g., mercury) is functionally a rule to address pollutant B (e.g. $PM_{2.5}$), the agency has not properly identified the problem (at least not publicly) nor is it likely to properly consider the alternative strategies for addressing pollutant B. By using such indirect means to regulate a pollutant without careful analysis, the agency is unlikely to be making the best decisions regarding how to address the pollutant.[172]

Recommendations for Congress

The overarching recommendation is to give effect to the will of Congress and to ensure that the EPA does not contrive end runs around the law. To inform whether to regulate, the EPA should compare costs to benefits for its air rules. When the EPA is conducting these comparisons, ancillary benefits should not be used to make up for having an insufficient amount of monetized direct benefits to justify a rule. The following are two bright line approaches to achieving this objective:

Allow ancillary benefits to account for at most a marginal amount of the benefits compared to the costs. If ancillary benefits are used when comparing costs to benefits in air rules, they should at most constitute a marginal amount of the monetized benefits used in the comparison. This should mean less than 5 percent of the benefits.

Allow ancillary benefits to account for under 50 percent of the benefits compared to the costs. This is a less desirable option but would still help to achieve the objective. If ancillary benefits are used when comparing costs to benefits in air rules, they should at most constitute under 50 percent of the monetized benefits used in the comparison. This means the monetized direct benefits should constitute at least 50 percents of the benefits.

KEY ISSUE

Repeal or limit the Regional Haze Program

The Regional Haze Program was added as part of the 1977 Amendments to the Clean Air Act.[173] Unlike the primarily health-based measures elsewhere in the CAA, regional haze is purely an aesthetic concern. It largely focuses on emissions from coal-fired power plants that could potentially impair visibility in national parks and other scenic vistas, especially in the Western United States. The statute provides states with wide discretion in determining both the objectives and the compliance strategies to address regional haze, with only minimal EPA oversight.

Federal takeover of the Regional Haze Program

During the Obama administration, however, the EPA devised a strategy to wrest control of the program from states and impose far more stringent and costlier provisions. Specifically, the agency, in conjunction with environmental organization litigants, used "sue and settle" to create a series of consent decrees, and did so with minimal state input.[174] Although the consent decrees on their face merely imposed timing requirements for the EPA to either approve state regulations or issue its own, the agency was then able to bootstrap the deadlines established in these consent decrees to declare state compliance efforts inadequate and impose its own set of Federal Implementation Plans on several states.

Turning Regional Haze into a war on coal

The agency has used this newfound control to take the Regional Haze Program well beyond the original intent. No longer is the focus on improving visibility but rather to mandate the installation of costly control technology on industrial facilities – and especially on coal-fired power plants that are not, in EPA's view, adequately regulated under other programs. This has been part of the agency's sweeping climate change agenda because many plants are not economically viable if they are required to retrofit with costly control technology and will be shut down unless the rules are revoked. The resulting

federal requirements were, in some cases, as much as an order of magnitude costlier on impacted coal-fired facilities than what the states had proposed.[175]

Aggressive actions under the Biden administration

This litigation strategy has been aggressively revived by the Biden administration. Most significantly, a recent draft consent decree between several environmental groups and the EPA would affect 33 states, requiring these states to either produce a regional haze plan acceptable to the agency or submit to a Federal Implementation Plan.[176] The focus is on the dwindling fleet of coal-fired electric-generation still operating in these states, and will likely result in additional measures on top of the many other CAA provisions already applicable to such facilities.

It should be noted that, while these costly provisions have likely contributed to the wave of closures of coal-fired power plants and will continue to do so, it is far from clear that the actual purpose of the program - improved visibility of scenic vistas - has been positively advanced. Little if any evidence has emerged of improvements in visibility significant enough for people to actually notice.[177]

Recommendations for Congress

Repeal the Regional Haze Program. While the visibility benefits of the program are debatable, the EPA has morphed it into another costly assault on coal. The public would be better off without it, and states would remain free to address visibility as they see fit, including working with neighboring states.

Restore state primacy on regional haze. More than most CAA provisions, the Regional Haze Program indisputably placed states in charge, but the EPA has subverted the federalist intent of Congress. Congress should restore that intent by ending or at least limiting the agency's authority to impose FIPs in the place of state-authored strategies to address regional haze.

KEY ISSUE

Repeal or constrain the AIM Act

The EPA's regulation of refrigerants began with Title VI of the 1990 Amendments to the Clean Air Act, under which the agency phased out a class of compounds known as chlorofluorocarbons (CFCs) on the grounds that they were depleting the earth's ozone layer.[178] CFCs were in turn replaced in many air conditioning and refrigeration applications by hydrofluorocarbons (HFCs). However, HFCs later became targets because of their claimed contribution to climate change, culminating in restrictions on them enacted in the 2020 American Innovation and Manufacturing Act (AIM Act).[179] The EPA is in the process of aggressively implementing the AIM Act through an ongoing series of regulations promulgated under Title VI.

While repeal of the ill-advised AIM Act is the ideal solution, Congress should at least place limits on the agency's authority to make the AIM Act even costlier through additional regulatory restrictions.

AIM Act quotas

The core of the AIM Act is its phasedown of HFC production. As of 2024, the quotas require a 40 percent cut from baseline levels, which tightens to 70 percent in 2029 and culminates with an 85 percent cut in 2036 and later years.[180] There is no flexibility in the statute should compliance raise prices more than anticipated.

Note that these targets parallel those of a 2016 United Nations treaty, the Kigali Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer (Kigali Amendment).[181] The US Senate ratified the Kigali Amendment in 2022, two years after passing the AIM Act.[182]

Effects of the AIM Act and related EPA rules

Not surprisingly, the government-mandated quotas on HFC supplies have led to a several-fold increase in their price.[183] This includes the HFCs needed to service most home air conditioning systems, along with many other categories of air conditioning and refrigeration equipment used in millions of businesses as well as schools, hospitals,

and other public buildings. The prices for HFCs will likely continue to rise as the quotas get more stringent in the years ahead.

The AIM Act does not stop with the statutory limits on HFC supplies and in fact gives the EPA wide discretion to promulgate additional restrictions on how these HFCs may be used. The agency is in the process of setting and implementing costly prohibitions on the use of certain HFCs in newly manufactured air conditioning and refrigeration equipment, along with new requirements on the handling of HFCs during the installation and servicing of systems.[184] Both the cost of new equipment as well as repairs of existing units will be adversely affected by these regulations, and more such measures are likely in the years ahead.

Perhaps the worst of the EPA's added requirements under the AIM Act is the one mandating that all new residential central air conditioners manufactured after January 1, 2025 use refrigerants deemed sufficiently climate-friendly by the agency.[185] As it turns out, the only viable refrigerants meeting EPA's stringent new environmental standards are classified as mildly flammable, which introduces safety risks to go along with potentially higher costs.[186] This measure alone is likely to raise residential equipment prices by at least 10 percent and also add to installation costs.[187]

It should be noted that the EPA estimates that HFCs contribute no more than 3.1 percent of the greenhouse gas emissions the agency blames for contributing to anthropogenic climate change.[188] Thus, even assuming that reductions in greenhouse gas emissions are a worthwhile objective, the AIM Act accomplishes very little of it to justify the costs. This is particularly true of the new regulations that make the AIM Act provisions marginally more stringent but can add significantly to burdens on homeowners and businesses.

Recommendations for Congress

Repeal the AIM Act as well as Title VI of the 1990 Amendments and withdraw from the Montreal Protocol. The phaseout of ozone depleting refrigerants is largely complete, thus retaining Title VI serves little purpose. Further, allowing the EPA to expand the

application of these provisions under the AIM Act to target additional refrigerants considered greenhouse gases is resulting in greater-than-expected economic pain for miniscule environmental gain.

Repeal the EPA's authority to add new regulatory restrictions. In other words, limit the AIM Act to the HFC quotas, and nothing else. Targeting the already-dwindling supply of HFCs with additional red tape is not worth the cost to consumers and businesses.

Create regulatory relief specific to homeowners who are being hit very hard under the AIM Act. This could include expanding the supply of the HFCs needed to service existing residential air conditioning systems as well as repealing the costly new requirements affecting new equipment purchases.

Add a safety valve should regulatory costs prove greater than anticipated. The prices for HFCs have already risen and may skyrocket in the future, leaving owners of millions of air conditioning and refrigeration systems with exorbitant maintenance costs. For some applications, it is not clear that substitute refrigerants are up to the task. Unfortunately, there are no effective provisions in the law to provide any relief should trouble arise.

Conclusion

The United States has some of the cleanest air in the world. This does not mean that improvements should not be made. However, it does mean that when analyzing the federal regulatory role in addressing air quality, the state of the air in 2025 should inform decisions, not the air that existed decades ago.

Current EPA regulations and the CAA itself have serious flaws that Congress should address. It is inexcusable for the EPA to promulgate regulations without considering whether those rules do more harm than good. Yet this happens and some of the statutory language requires this flawed approach to regulation. When the EPA decides whether to regulate, it should look to the best available science. Yet this is just one part of the equation. To answer whether to regulate, the EPA must make subjective decisions and examine other critical factors such as costs and tradeoffs.

Air regulations have become incredibly costly and sweeping in nature. Given the sheer magnitude of the rules, Congress should be making many of these decisions that have been passed off to the agency. In many instances, Congress likely did not even authorize such rules. Therefore, it is important for Congress to stop the agency from using air regulations to get into areas that were never authorized or ever envisioned to be a function of the agency.

When thinking of EPA overreach, air regulations rightfully are at the forefront of this concern. The agency has used its power to act more like the "Economic Planning Agency" than the Environmental Protection Agency. Much of this is due to the agency getting into the regulation of greenhouse gases. The ability to regulate greenhouse gases is the ability to try and use regulatory power to reshape the economy.

A modernized EPA would have air regulations that do not focus on greenhouse gases. The air regulations would stay focused on pollutants that actually affect air quality, that is, pollutants that dirty the air or directly harm human health. The EPA's air regulatory work would be narrower in scope and not just because the agency would stop regulating greenhouse gases. States would be taking the lead on

air quality issues. Congress would be reasserting its lawmaking power and making decisions it should be making as opposed to the EPA. Congress would have established clear limits on the agency's power so it does not promulgate air regulations beyond what was intended by legislators.

No political party or ideology has a monopoly on being concerned with air quality. Americans in general want clean air and they should have clean air. Our country can maintain and improve air quality by using the best available science, applying sound regulatory and risk analysis, and recognizing the proper limits of federal regulation.

3 MODERNIZING WATER REGULATION

Tony Francois

Improving and protecting the nation's water quality has been one of the hallmark achievements of the Environmental Protection Agency (EPA) and its Office of Water over the last five decades. The agency implements two significant federal statutes: the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).[1] This chapter focuses on the CWA.

The CWA generally regulates two types of activities: discharges of pollutants from "end of pipe" point sources (such as factories and sewage treatment plants) into navigable waterways, and placement of fill (i.e. soil and similar materials) into those waterways. The statute does this through a general prohibition on discharges without a permit from the EPA (or the US Army in the case of fill), then sets robust standards for those permits and backs them up with powerful enforcement methods based on strict liability (i.e. the government does not need to prove you intended a violation to impose enormous penalties on you).[2] In the past five decades of CWA implementation, America's water quality has seen significant improvements, for which we are rightly the envy of the world.[3]

And yet, these improvements have been accompanied by decades of unnecessary harm to many Americans who have been subjected to improper and unjust permitting and enforcement actions by the EPA

under the CWA, for ordinary activities that few normal people would consider discharges of pollution: growing crops, raising livestock, building homes, and developing water supplies for fire-fighting to protect the treasure of America's National Forest lands. In part, these harms flow from the fact that while the most common kind of CWA regulation deals with point source pollution from industrial sources, the regulation of "fill" extends to many of these ordinary activities simply because they involve moving dirt around.

Mission creep

How has this come about? Mostly as the result of predictable, but unacceptable mission creep at the EPA. This mission creep started, as it naturally does in all regulatory agencies, with the reality that a single purpose mission for a regulator (e.g., keep the water clean) starts to look more and more like the purpose of the entire universe, and certainly the purpose of the EPA's Office of Water. Clean water, as an aspirational goal, starts to feel to the regulator like the overarching purpose of the entire federal government, and not just one aspect of a high quality of life for those pursuing the American dream. There is little to no consideration of costs and tradeoffs. Perversely, to many regulators the American Dream itself looks like a threat to the environment, and - to some - even mankind appears like the ultimate invasive species.

Driven by this misguided vision, agency regulators have "crept their mission" in two ways. First, they have improperly expanded their footprint, i.e., what "waters" are regulated under the CWA and what actions in those "waters" are regulated. Second, they have turned the volume to 11 in the use of their enforcement tools, particularly against unsuspecting landowners who are the opposite of the stereotypical "polluting industrial factory" or sewage plant. In their quest to make the CWA the most important thing in every American's life, EPA staff have tragically turned some of those lives into nightmares.

This is not what Congress established in the CWA. The statute identifies what "waters" are regulated ("navigable waters … of the United States")[4] and specifies a list of common-sense exempt activities that are not subject to EPA regulation, permitting, or enforcement.

These portions of the statute reflect the policy decisions that Congress made when it enacted and amended the CWA, and the balance it struck between the economy and the environment.[5] What the CWA does regulate is regulated very robustly: factories and sewage plants must exclude almost all pollutants from the effluent they release into rivers and lakes and the oceans. What the Act does *not* regulate, as properly interpreted, should simply be left alone: private property remote from rivers and lakes and the oceans; farming, ranching, and forestry; flood control; gravel roads; and the like.

When Congress made these decisions in the 1970s, it left some ambiguities around the edges. In the ensuing years, both the EPA and Army Corps exploited those ambiguities to facilitate their mission creep to pursue maximal environmental protection (and maximal economic disruption) in places and activities that Congress never intended. The agency "reinterpreted" the term "navigable waters" to include millions of acres of features that not only are obviously not navigable but are also not even "water" for more than a few weeks (or even days) a year.

As an example, private citizens paid millions of dollars in penalties and mitigation fees under the CWA for running a plow one time, in the late summer, through this patch of weeds:

Alongside such weed patches, the US Army Corps of Engineers (Army Corps) and EPA regulate drainages if they flow just a few months a year and they have frequently asserted authority over arid desert arroyos.[6] Even stranger, the agencies consider the frozen tundra of Alaska to be "navigable" "waters."[7] Clearly, something has jumped the rails if this is what the federal government is doing under the CWA.

In addition to drawing circles around dry weed patches and sandy arroyos and calling them federal waterways, the EPA has also harshly limited the CWA's exempt activities. For example, the statute exempts normal farming and ranching practices from regulation.[8] This only makes sense: a federal fill permit takes months to years, and tens to hundreds of thousands of dollars, to obtain. A nation that requires its farmers to go through a multi-year permitting process to grow annual food crops will soon starve.

But EPA regulations limit the statute's broad exclusion for farming to very limited circumstances. If a farmer changes operations in any significant way (say, switching from annual to permanent crops, or rotating in and out of conservation programs, or simply plowing the farmland on an irregular schedule) then the EPA sets the exemption aside and brings enforcement actions.[9]

State role

The net result of expanding their power into vast swaths of private property around the nation (including mud puddles of a few weeks duration and the frozen wastes of Alaska), and the narrowing of statutory categories for exempt actions, is that EPA and its sister agency the Army Corps have wrongly taken on the role of local land use bureaucrats throughout the nation – a role that Congress never gave them and which profoundly squanders federal resources that should be focused on truly federal matters.

Local and state governments perform a wide variety of land use regulation activities, and they also generally protect the property rights of their residents, which rights are in many cases defined in state law. States also play a very important role in the management and regulation of water rights and water supply, and this state primacy has been explicitly respected and deferred to by Congress for 160 years,

and this Congressional deference to state water regulation has been repeatedly recognized and enforced by the federal courts. The CWA explicitly preserves this state primacy, and the Supreme Court of the United States has enforced the CWA's preservation of state primacy.[10]

One of the most important areas in which the CWA endangers this state primacy is land use regulation. As noted above, many everyday "dirt moving" activities implicate the CWA's regulation of dredged and fill material, threatening to insert the United States Army into the role of local planning commission and building permit approval board.

Clarity and penalties

These overreaching enforcement actions are harsher and more punitive because of other unclear provisions of the CWA. The Due Process Clause of the United States Constitution's Fourth and Fifth Amendments protect citizens from being penalized without a fair hearing.[11] But these protections are not spelled out in the CWA, and EPA enforcement staff use that silence to issue clean up and abatement orders and cease and desist orders, and threaten penalties, without affording even basic due process rights to the targets of their enforcement actions.

Speaking of penalties, the CWA authorizes daily penalties for violations and sets a very high daily penalty amount (currently $66,713).[12] But the CWA does not clearly specify what sorts of violations are appropriate for a single penalty and which types of events warrant daily penalties. The EPA uses this ambiguity to impose daily penalties where a single fill event takes place: The EPA imposes a penalty for every day the fill remains in place, even though only one event ever happened.

Citizens face enforcement litigation not only from government agencies. The CWA provides broad power for random members of the public to file private enforcement actions against alleged violators and recover attorneys and expert fees as well as impose penalties and injunctive relief on alleged violators. In many parts of the country this has resulted in cottage industries of shake down artists with little or no stake in whether a particular facility is polluting or not, who can

sue over whether a company's paperwork is in order without ever even alleging any harm to the environment.

For those who do seek permits for fill activities, a daunting gauntlet awaits. Twenty years ago, a permit to fill waters regulated by the Clean Water Act took years, and hundreds of thousands of dollars in consulting fees, to obtain.[13] In two decades since, these costs and delays have only escalated. This may seem appropriate for filling part of San Francisco Bay to add a runway at an international airport. But it is not a rational permitting scheme for building a few houses or widening a country road or planting a vineyard. The CWA does allow for simpler and less expensive nationwide permits (i.e. they "only" take months - and tens instead of hundreds of thousands of dollars - to obtain). But agency practice has turned even these tools into regulatory quagmires that are only available in increasingly narrow circumstances.

If the cost and hassle of permitting were not enough, the Act adds an additional permit layer for any Clean Water Act permit: applicants must also get a state "certification" (Section 401 certification) before they can secure a federal permit.[14] The burden of this duplicative process varies from state to state. Many states have begun to use their certification authority to impose significant non-water quality-based limits on projects seeking federal permits under the CWA.

And once a fill permit is issued by the Corps, the EPA can come in later (after the applicant or permit holder has spent considerable resources in reliance on the permit) and veto the permit retroactively.

The next section of this chapter details key issues for Congress to address that will help to modernize water regulations. For each key issue, there are specific recommendations for Congress.

KEY ISSUE

Restrict EPA regulation of non-navigable waters and transitory water features under the CWA

The first improvement Congress[15] can make in the CWA is to take appropriate steps to focus EPA and Army Corps attention on protecting truly federal waterways: those that are in fact navigable and which connect the states and foreign nations in commerce. Congress has two ways to do so: amending the statute itself or using its oversight and appropriations powers to properly control the EPA and Army's mission creep in this area.

Navigable waters

Many of the problems described earlier derive directly from a very odd formulation used in the CWA to define what waters it regulates. For well over 100 years in prior statutes, Congress used the phrase "navigable waters of the United States" to clearly define what waters it was protecting and regulating. This term had a long established and well understood (and appropriately limited) meaning that restricted congressionally authorized action and projects to those rivers and lakes that support interstate commerce,[16] while leaving to states the responsibility and authority to regulate other waters within the states in the manner they best determine.

But when it adopted the Clean Water Act in 1972,[17] Congress made an odd choice. It separated the term "navigable waters of the United States" into two different locations in the statute. One section of the Act refers simply to "navigable waters" while a different definitions list defines "navigable waters" as "waters of the United States, including the territorial seas." This separation of the two parts of the phrase has been taken by the federal courts for decades to mean that Congress means to regulate a broader footprint under the Act than it previously had in the Rivers and Harbors Act and other statutes. But it is not clear that this was Congress's intent, and there is far more evidence in the Congressional Record that Congress had no interest in broadening the scope of federal action on water quality.[18] One possible reason for the unusual structure may have been to include the territorial seas, which

historically were not part of the expression "navigable waters of the United States."

Nevertheless, the Supreme Court has repeatedly observed that the CWA's novel arrangement of the words suggests some intent to regulate more broadly than navigable rivers and lakes and the oceans, but that the statute is close to worthless in informing the courts, the agencies, and the public as to just how much more broadly the construct might apply.

And EPA and the Army Corps have long taken this odd phrasing as a license to issue regulations that broadly include all manner of terrain features as federally regulated "navigable waters" under the CWA that are not only not "navigable" but are rarely even "water." Over time, the agencies have developed some key regulatory concepts as a framework on which to build their empire of mission creep. These include the classification of non-navigable tributaries as perennial, intermittent, and ephemeral,[19] and various types of "adjacency": physically abutting, "across the road," and "in the neighborhood."[20] Agency standards for a water feature to "neighbor" another have been notoriously lax and include efforts to regulate any wet feature within 1000 yards of another regulated feature.[21]

The Supreme Court, for its part, has more recently added an overlay of requirements for the CWA to apply, by interpreting just the word "waters" to include only hydrologic features that are relatively permanent and continuously flowing and that in ordinary English would be referred to as rivers, lakes, or streams.[22]

All of these complex terms derive from Congress's perplexing decision in 1972 to separate the words "navigable waters" from "of the United States" in the CWA. And the complexity of the resulting regulatory and judicial effort to make sense of the separation has meant half a century of litigation, enforcement, prison sentences, obscene permitting costs and restrictions, delay and outright prevention of projects, disruption of prevailing state-federal relations, and on and on, all because nobody can quite sort out what "waters of the United States" means in isolation from the word "navigable."

Congress could remove this confusion with the simple step of reuniting the two parts of the phrase in one place in the statute,

making obvious that the legislature means no more than it ever has as to the scope of federal regulatory activity on waterways. This can be implemented by amending the definition of "navigable waters" to read "means navigable waters of the United States, ~~including~~ and the territorial seas."

"Adjacent"

The CWA's operative jurisdictional provision references only waters. It does not mention wetlands. However, seizing upon a passing reference to adjacent wetlands in an ancillary provision of the CWA, Section 404(g)(1)),[23] agency regulations have for decades regulated "adjacent wetlands."

Courts have long struggled with what "adjacent" means in this context, although the Supreme Court's 2023 *Sackett v. EPA*[24] *(Sackett II)* decision limits regulation of wetlands only to those that are *as a practical matter* indistinguishable from, other regulated waters. While the decision unanimously rejected the long-standing agency interpretation that "adjacent wetlands" include anything with a "significant nexus" to rivers, lakes, and the oceans, a four- justice concurrence in *Sackett II* wrote that adjacent should include wetlands that are "across the road" from other regulated waters, and many legal scholars have long argued that adjacent should include wetlands even farther afield.

EPA argued at the *Sackett II* hearing that "adjacent" could mean even a mile away. Although that argument was squarely rejected by the *Sackett II* majority, current agency regulations appear to take the position that "adjacent" wetlands include those with occasional water flow through a long series of "daisy chained" non-regulated features like culverts, ditches, drains, and the like, which may take miles to connect the wetland (however infrequently) to some other regulated water. Indeed, in litigation over their current regulations, the agencies have argued expressly that notwithstanding the decision's clear language, *Sackett II* does not limit their authority to wetlands that are "indistinguishable" from covered waters (rather relying upon a bare surface *physical* connection, however remote from other regulated waters).[25] And the agencies have continued to pursue landowners for

filling even wetlands with no water connection to covered waters, whatsoever.[26]

This follows a familiar pattern, observed by the Supreme Court and other courts: After every loss sustained by the agencies, instead of executing the clear directions set forth by the Supreme Court, the agencies have sought to preserve and even expand their own authority in spite of the court rulings, and when challenged, have attempted to relitigate issues definitively resolved against them.[27]

Recommendations for Congress

Restore the traditional and clear definition of "navigable waters." Congress should clarify the confusion described earlier (i.e. the standard term of art "navigable waters of the United States" is separated into two different sections of the CWA) with the simple step of reuniting the two parts of the phrase in one place in the statute, making obvious that the legislature means no more than it ever has as to the scope of federal regulatory activity on waterways. This can be implemented by amending the definition of "navigable waters" to read "means navigable waters of the United States, ~~including~~ and the territorial seas."

Properly define adjacent. Congress could put a stop to the confusion surrounding the term "adjacent" by defining adjacent in the statute to cover only wetlands "(i) with a continuous surface water connection to covered waters and (ii) that are as a practical matter indistinguishable from such waters," so that it has the same meaning as the *Sackett II* majority, and put to rest the long running back and forth over how far afield from actual boat-floating navigable water the EPA and Army can go, with the agencies claiming authority to tell landowners and private citizens what they can do with their mud puddles.

Pursue other options to clarify the statute. Barring these two amendments, Congress has additional approaches to amending the CWA that may result in similar improvements in clarity. These include adding a provision to the definition of "navigable water" that limits its applicability to hydrologic features where standing or flowing water is ordinarily present on the surface for more than 270 days annually.[28] A second alternative is to limit the application of the definition in the

statute to waterways that are used or capable of use for transporting goods in interstate or international commerce.

Use oversight and appropriations. Absent amendments to the statute (which do admittedly face cloture hurdles in the Senate), Congress can also restrict the worst of the EPA and the Army Corps' geographic overreach through oversight hearings and appropriations bills focused on wetland regulation. A primary focus should be on ensuring that the agencies are writing and implementing rules that are consistent with *Sackett II*. This oversight is necessary since the agencies continue to interpret "adjacent" very broadly, well beyond that allowed by *Sackett II*. In a 2023 regulation, issued just a few months before *the Sackett II* decision, the EPA and the Army Corps interpreted "adjacent" to include wetlands connected by "daisy chains" of ditches, swales, pipes, culverts and the like to rivers and lakes even miles away.[29] The agencies then endorsed this "daisy chain" approach as *implementing* the *Sackett II* holding that only physically abutting wetlands are regulated by the CWA.[30]

Oversight hearings should focus on how the agencies are interpreting "navigable waters … of the United States" and highlight the absurdity of the worst abuses in this area, using concrete examples of ordinary citizens who have been forced to pay large penalties to resolve alleged violations that have nothing to do with any navigable water body.

These oversight hearings can then inform the appropriations process,[31] in which Congress can restrict the use of enforcement funds to situations in which alleged violators have discharged to or filled waterways that are in fact navigable and relevant to movement of goods in interstate commerce.

In favorable circumstances, the Congressional Review Act could also be used to overturn new agency regulations that continue to interpret "navigable waters" overbroadly.

KEY ISSUE

Put the exemptions back in the exemptions

Section 404(f) of the CWA lists several ordinary activities which Congress exempted from Section 404 regulation, permitting, and enforcement. They include normal farming, ranching, and forestry practices, flood control structure repair and maintenance, construction and maintenance of farm and stock ponds and irrigation and drainage ditches, and construction and maintenance of farm and forestry roads and temporary mining roads.[32]

Agency regulations, however, limit the applicability of the exemption for farming practices to a narrow range of cases, by reading "normal" to mean, in effect , "routinely done on this farm."[33] This limitation subjects many farmers and ranchers to crippling penalties for unwitting violations of the regulations.

The exemptions are also limited in the statute by subdivision 404(f)(2), which is known as the recapture provision.[34] This provision nullifies the exemption for actions whose purpose is to convert regulated waters to a new use under certain conditions. This provision is not a model of clarity, and Agency regulations and enforcement practice, along with judicial decisions, have taken the view that most of the exempt normal farming practices like plowing nonetheless are not exempt because of subdivision 404(f)(2).[35]

Recommendations for Congress

Make the exemptions more robust. Congress can improve the farming exemption by defining "normal" to include:

> Customary, standard, or frequent, on either a particular farm as established by the property owner, or in a farming region as determined by the applicable county farm advisor.

Congress should clarify (f)(2) to make clearer that it only applies where traditional navigable waters are put to a use to which they have never been put before, that any farming use is a "use to which they

have been put before," and that merely changing the hydrology of soil (i.e. rates of run off and absorption) does not trigger (f)(2).

Congress should also use its oversight and appropriations authority in a similar way, to bring to light agency abuses of the statutory exemptions and restrict appropriated funds for being used for enforcement actions on exempt activities or implementation of regulations that improperly narrow the exemptions.

KEY ISSUE

Require compliance with due process norms

The CWA allows EPA and the Army Corps to issue cease and desist orders and clean up and abatement orders. These orders have significant real-world consequences, because a citizen is liable for additional penalties for refusing to comply with an order under the Act. The result of this is that an enforcement target will frequently learn for the first time through either a cease and desist or clean up and abatement order from EPA or the Army that they may have violated the CWA.

These orders routinely threaten massive civil penalties and criminal penalties including multi-year prison terms for refusing to comply with the order. The alleged violator is then faced with the perhaps impossible choice of challenging the decision in court, if they have the resources to do so, or knuckling under and complying with the order to avoid further liability. This dilemma exists because the agencies have no statutory duty to provide targets with any due process before issuing administrative orders.

Fixing this problem should be a particular priority of Congress because of how court review of administrative orders works. In any legal action to challenge an agency decision under the Administrative Procedure Act, courts are generally required to defer to agency fact-finding. This means that if there is anything in the record of the agency decision that supports the facts that the agency determined to be true, the court is required to rule for the agency on that point. But the lack of due process protections for enforcement targets means that the agency can control the entire development of the record and make its factual determinations and issue an order before the target even knows that there are any factual disputes on which he or she may submit evidence – before the target even knows of the need to defend him or herself.

This process violates fundamental concepts of fairness and opportunity to defend oneself that are enshrined in the Due Process clauses of the US Constitution's Fourth and Fifth Amendments.

Recommendations for Congress

Provide Americans with the due process protections they deserve. Congress can restore these Due Process Protections in a very simple way, by amending the CWA's authorization to issue such orders in 33 U.S.C. sections 1319(g)(1) and 1344(s)(1) (compliance orders from the Army for violations of fill permits)[36] to include the three words "after a hearing:"

> Section 1319(g)(1): "Whenever ~~on the basis of any information available~~ after a hearing …
>
> Section 1344(s)(1): "Whenever ~~on the basis of any information available to him~~ after a hearing the Secretary finds that any person is in violation …"

The invocation in the statute of the right to a hearing before EPA or the Army may issue an administrative order then invokes other provisions of the United States Code that provide the details for how such hearings are to be conducted.[37]

KEY ISSUE

Make penalties rational and proportionate

CWA penalties are too high, too cumulative, and too disproportionate for many alleged fill violations. The maximum *daily* penalty as of 2024 is $66,713.[38] Penalty levels increase annually based on inflation levels. And they apply "per day for each violation."[39] EPA and the Army take the position that a daily penalty is appropriate for alleged fill violations for each day that the fill remains in place, as though each day is itself a new discharge of fill. This can result in maximum daily fines in the tens of millions of dollars if the agency takes a mere five months to investigate and issue a remedial order, before the enforcement target even knows that there might be a need to remove the fill. And removal of fill without agency permission may result in *further* violations. If the agency initiates civil enforcement action in federal court, it can take years for the matter to be resolved, all the while the target is limited in the ability to remove the fill, but potential fines are accruing at more than $66,000 daily. If the alleged violation is based on something innocuous like a farming practice that EPA claims is not "normal" or the construction of a single-family home, the maximum daily fines are almost immediately out of all proportion to any harm done to the environment.

Recommendations for Congress

Congress can significantly improve this state of affairs with four actions.

Eliminate annual inflation increases for daily penalties. Inflation is harming American families in many ways every day. It is particularly perverse for the government to benefit from inflation in food, gas, housing, and tuition prices when it enforces environmental laws that have nothing to do with those markets.

Limit fill violations to one and done. Congress can amend the statute to make clearer that penalties for alleged fill violations apply only to the fill event, and do not accrue daily merely because the fill remains in place.

Reduce penalties for non-polluting activities. Congress would do well to set out lower penalty rates for activities within the categories for which the statute provides exemptions, even if they do not qualify for the exemption. This would restore a level of proportionality to the penalty regime.

Protect innocent landowners. Congress should amend the CWA to provide that no cease and desist order, clean up and abatement order, or penalty may issue to a private landowner for alleged discharge of dredged and fill material on that person's private property before the agency has provided the landowner with a final delineation of regulated water features on the property and allowed the landowner to challenge that delineation administratively and in court.[40]

KEY ISSUE

Improve liability standards and citizen suit provisions

Enforcement targets face significant liability for alleged violations of the CWA. This is made more challenging by the fact that especially for non-criminal violations, the government does not need to prove that the alleged violator even knew that the Act exists, or any regulatory or permit restrictions on their activity. For commonplace activities like farming, homebuilding, road development, and the like, the result can be enormous liability for everyday activities that no normal person thinks of as "pollution," and that comes as a complete and unfair surprise to the alleged violator. The ambiguities that the agencies continue to foster over what water features are regulated, and how the exemptions work, adds further surprise and unfairness to the enforcement of the Act – enormous penalties can be imposed on people with no notice that they may be breaking the law. It is the archetypal trap for the unwary.

This state of affairs is amplified by the CWA's wide allowance for citizen suits, under which anybody can file an action in federal court against any person over ongoing alleged violations of the Act.[41] In a citizen suit, the successful plaintiff can force the target to pay significant fines to the government, remove fill and demolish a project, make mitigation payments, and pay for the successful plaintiff's lawyers and experts. Citizen suit plaintiffs do not have to demonstrate any personal harm to them from the violations they allege, only a generalized interest in the environment in which the defendant operates. And citizen suits do not need to even be about illegal discharges to the environment. Courts allow citizen suit plaintiffs to sue ordinary citizens and businesses over "paperwork violations" in which the plaintiffs allege that the defendant failed to properly complete forms or submit them on time, even without any harm to the environment.[42] This statutory regime has encouraged the development of local cottage industries of professional citizen suit plaintiffs.

Congress can address both of these problems with targeted amendments to the statute.

Provide clear notice to landowners before citizen suits may be filed. First, the liability standard can be improved to ensure adequate notice to landowners and operators of their responsibilities under the law. If someone already has a CWA permit, that permit process should put them on notice of any future event that might violate the permit. But for alleged unpermitted violations, the statute should (1) require the agency to notify the target of CWA requirements, (2) allow an opportunity for the target to contest agency authority over the feature in question and whether the activity is exempt or not, and (3) then, if the final determination of authority and exemption are resolved in favor of the Agency, only impose liability for alleged violations going forward from that determination. This would allow ample power for the agencies to impose clean up and abatement requirements for illegal fill once the determinations are made but would prevent the imposition of penalties for actions taken before the alleged violator was on notice that their action was illegal.

Improve the citizen suit provisions of the CWA. Second, Congress can improve the citizen suit provision of the CWA by adding four requirements. First, to file a citizen suit the plaintiff must allege some personal injury recognized by common law, such as trespass or nuisance to private property owned by or personal injury to the plaintiff. Second, citizen suits may not be brought over mere "paperwork violations." Third, citizen suits may not be brought for the alleged violation of fill permit requirements if the Agencies have not determined their authority over the water feature and potentially exempt activity at issue, with the target defendant having been afforded notice of such determination beforehand and an opportunity to be heard on the matter (see the earlier discussion regarding due process standards). Finally, successful defendants should be able to recover their own attorneys' fees and expert costs from professional CWA citizen suit plaintiffs (e.g., any CWA citizen suit plaintiff who, either individually or through related parties, had filed more than two CWA citizen suits in the prior five years).

KEY ISSUE

Reform nationwide permits

As mentioned earlier, the permitting process is extremely onerous. It requires significant consulting support, takes months to years to complete, and requires compliance with the National Environmental Policy Act (NEPA) requirement for an environmental impact report and can fall under the Army's duty to consult with the Fish and Wildlife Service under the Endangered Species Act (ESA). All of this bureaucracy adds time and cost to the process and imposes limits on the applicant's ability to carry out the intended project. The permit process requires consideration of alternatives to the desired project that avoid, minimize, and/or mitigate the impacts that the project would have on regulated water features. As of two decades ago, such an individual permit took years to complete and required over $250,000 in consulting costs.[43]

One of the ways that the CWA allows for streamlining this burdensome process is through the issuance of nationwide permits.[44] These are "off the shelf" permits for many routine activities that include common sense environmental protections for the activities while also recognizing the importance and frequency of these activities for everyday life and the economy. But NEPA and ESA bureaucracy has hampered the Army's ability to renew these nationwide permits on a timely basis and has gradually eroded their utility as other concerns result in reduced scope of the permits and reduced ability for projects to enroll in them. The nationwide permits for homebuilding and non-exempt farming activities in particular are of very little value because of the small acreage they apply to.

Given the importance of food and housing to any people, Congress should especially improve the CWA's provisions for nationwide permits that allow more streamlined regulation of food and housing production. For example, many areas of the country are currently experiencing housing shortages that have made housing costs unbearable. They need to be able to build more housing. But the nationwide permit for homebuilding is limited to half-acre projects. This may allow individual property owners (usually the more affluent,

building custom homes) to move through permitting more easily, but is completely inadequate for the production of commodity multi-family and single-family housing where it is needed.

Recommendations for Congress

Remove bureaucratic limitations from nationwide permits. Congress can and should amend the CWA's allowance for nationwide permits by expressly exempting such permits from NEPA and the ESA. This exemption could, for policy preferences, be limited to specific categories of nationwide permits such as food, housing, and energy production and transportation infrastructure. But for nationwide permits to be of more than trivial value, the Army needs to be able to make them available for larger acreage and a wider range of projects, and NEPA and the ESA stand strongly in the way of that reform.

Extend the availability of nationwide permits. Congress should also require that nationwide permits be made available for food and housing production without regard to acreage, or within certain acreage limits that are much higher than are currently allowed. Further, Congress should make nationwide permits available for a broader range of activities than currently covered by nationwide permits.

KEY ISSUE

Reform the Section 401 certification process

If the Corps' fill permitting scheme, described above, were not enough, the Act also imposes a parallel state permit, what is known as a "401 Certification."[45] The CWA requires applicants for a federal permit to obtain this parallel sign off from their state as a way of making sure that uniform federal standards do not undermine stricter local standards in a very few states. This advances important federalism objectives, and the burden of parallel state permitting varies around the country depending on state level priorities and policy preferences. In an important general sense, state level decisions about whether to demand more than uniform federal standards in a wide variety of areas, not just the environment, is a way that states compete with each other for residents and businesses.

However, states should not be able to leverage federal permit processes to pursue state policy goals *unrelated* to the federal permit, especially if those state policy goals are informal (i.e. are not required by existing state law). Instead of being a basis for fair interstate competition, this practice uses federal law to pursue "informal" agendas that may not even be required by state law. One example of how states have misused their Section 401 Certification authority is how the State of Washington has impeded the federal permitting of an energy export terminal on the Peugeot Sound by loading its 401 certification for the federal water quality permit with several state conditions that are not related to state water quality law,[46] some or all of which are not required or even possible under state law. This includes the state considering factors like vehicle traffic, train noise, and rail safety to block the project.[47]

Other examples include California state regulators including multi-million-dollar environmental restoration projects as conditions in Section 401 certifications where the restoration project is not related to the ongoing operations that are being federally permitted, but instead is motivated by long past perceived misdeeds (in this case dam construction and water diversion) that the state had previously allowed.[48]

Congress should not let its federal permitting processes be repurposed by states to achieve goals that state law does not sanction and should not allow states to expand the Section 401 certification process beyond what the statute envisions: confirmation or not that the federal permit meets existing state water quality standards.

The Biden administration finalized a Section 401 certification rule[49] that would allow states to block projects through the Section 401 process even for reasons that have nothing to do with discharges, point sources, or navigable waters.[50] The CWA is focused on discharges from point sources into navigable waters, yet there are efforts to allow state certification to go beyond even these foundational requirements of the CWA permitting process.[51]

Recommendations for Congress

Clarify the limits of state 401 certification authority. This can be accomplished by amending the statute to clarify that the state certification may only state whether the federal permit would comply with existing state water quality law. The amendment would consist of the following new sentence at the end of existing Section 401:"A proposed state certification that, in the determination of the Administrator and which determination shall constitute final agency action on the subject, includes provisions unrelated to state water quality standards in effect at the time of the application for the federal permit, shall be deemed a waiver of the certification required by this section."

Further, the language should make it clear that Section 401 certification does not give states the power to review matters that exceed what the federal government itself may review in terms of permitting. Specifically, Congress should make it clear that certification applies to discharges only, from point sources only, and only those point source discharges that go into navigable waters. The House of Representatives passed H.R. 1, the Lower Energy Costs Act, in March of 2023,[52] which amends Section 401 in a manner to address many of these concerns.[53]

KEY ISSUE

Eliminate the EPA's veto of Army permits

A final priority for Congressional reform of CWA permitting includes making sure that permit applicants who have run the gauntlet of fill permitting with the United States Army and the applicable state certification for that federal permit, are in fact done with CWA permitting. But the same Act that requires applicants for fill permits to apply for and get that permit from the United States Army, Section 404(b),[54] allows the EPA to then veto that permit, Section 404(c).[55] EPA can even preemptively close off certain areas to any future permitted fill activity under the same statute.

There is no policy justification for this additional layer of bureaucracy. If the Army is the right federal agency to decide on and issue fill permits, then one federal agency should be enough for applicants to deal with. The addition of the EPA veto adds uncertainty to important projects and introduces an additional element of political gamesmanship for the government that is easily abused by EPA officials who may have personal and policy reasons to reject projects that meet all legal requirements and are fully permitted by the Army.

Recommendations for Congress

Eliminate the EPA permit veto. Congress should amend the Clean Water Act by eliminating the EPA veto for Army fill permits, by deleting 404(c).

Conclusion

The Clean Water Act is one of the fundamental pillars of federal environmental law and has done much good for Americans and their environment. But nothing is perfect; all good laws can and should be improved in the light of experience. Some of the assumptions about how EPA and the Army Corps would use (or misuse) the authority entrusted to them by Congress have proven ill founded. And some of the tools in the Clean Water Act have proven ill-suited to Congress's purposes. Congress should be mindful that EPA and the Army Corps may exercise only that authority granted to them by Congress. And the federal government must exercise its powers with due regard for the rights of all citizens.

The recommendations to improve the Clean Water Act flow from these principles. Congress can and should improve the Act in light of five decades of improving water quality and administrative experience. Congress should take seriously that agencies have their own purposes and agendas generally (the EPA and Army Corps are not extraordinary in that regard), and that it is Congress's role to keep agencies in their proper lane through statutory limits and active oversight. And the civil rights of American citizens must always be protected and respected. Nobody faces a dilemma between clean water and American values – adopting these recommendations will advance both causes.

4 MODERNIZING CHEMICAL REGULATIONS AND OTHER CRITICAL REGULATORY ISSUES

Multiple Contributors[1]

This chapter examines the Environmental Protection Agency (EPA) regulations that implement several environmental statutes:

- The Toxic Substances Control Act (TSCA), which regulates the production, importation, use, and disposal of new and existing chemicals.
- The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which governs pesticide distribution, use, sales, and labeling.
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, which regulates the cleanup of sites contaminated by releases of hazardous substances; and
- The Resource Conservation and Recovery Act (RCRA), which regulates the generation, transportation, treatment, storage, and disposal of hazardous and solid waste.

It also discusses a controversial program that has a cross-cutting effect on EPA regulations: the Integrated Risk Information System (IRIS), a program that identifies and characterizes the health hazards of chemicals in the environment.

An entire chapter (or book) could be written on each of those programs. For reasons of space, and because all the programs address health risks associated with chemicals in the environment, we examine them here in a single chapter.

The chapter begins, however, with two methodological orientations that foster regulatory activism in all EPA regulatory programs including the five covered in this chapter. Those orientations are the precautionary principle, which counsels policymakers to err on the side of caution, and the linear no-threshold model, which assumes hazardous substances can pose serious health risks at any level of exposure above zero.

There are some common themes that run throughout the seven key issues that follow, from the need to properly assess risk and utilize sound science, to recognizing the importance of costs and tradeoffs when promulgating regulations. The EPA has long been characterized by unreasonable risk assumptions and counterproductive rules in areas such as pesticides and hazardous waste, but modernized regulations would avoid such problems. The regulations would effectively protect the health and welfare of Americans without hindering the innovation that improve the lives of Americans.

KEY ISSUE

Require the EPA to abandon the precautionary principle

The precautionary principle is a regulatory strategy designed to minimize potential harms to human health and the environment when scientific uncertainty exists.[2] The principle operates on the assumption that it is better to overestimate risk and err on the side of caution rather than wait for scientific certainty before implementing regulations. The precautionary principle sounds reasonable at first blush, as it conforms with a "better safe than sorry" approach to risk management. However, adhering to the precautionary principle often leads to overly stringent regulations that impose significant economic costs for few if any corresponding benefits. Moreover, the precautionary principle is tailor-made for expanding bureaucracy and regulatory agency power without any scientific basis.

The EPA employs a number of conservative assumptions in its risk assessments that are grounded in precautionary principle logic. These assumptions lead to overestimation of risk, resulting in tougher-than-necessary regulatory standards.

One conservative assumption employed in EPA risk assessments is the concept of the maximally exposed individual (MEI).[3] This approach estimates exposures by assuming a hypothetical person who experiences the highest possible exposure to a pollutant or toxin. For instance, in air quality regulations, the EPA might model exposure based on someone who lives and works at the point of maximum pollution concentration and assumes that this individual spends his entire life in that environment. Or the agency might assume a person eats locally grown food that has absorbed the highest level of contamination in an area, or drinks contaminated water directly from a nearby stream, ignoring the availability of clean water sources or bottled water. The MEI typically does not account for factors such as time spent indoors or away from polluted areas, nor does it consider mitigating actions, such as using water filters or switching to cleaner sources of food or water.

Relatedly, the EPA often introduces conservatism in its risk assessments by assuming 95th percentile exposure levels. For example, in estimating dietary exposure to pesticides, the EPA may

assume an upper bound on pesticide residues left on food.[4] This can make sense when the agency is calculating a range of uncertainty, with upper and lower bounds. It can also make sense when setting a standard if a statute requires a particular margin of safety. But using upper bounds is inappropriate in other instances, such as when attempting to characterize risks objectively or when incorporating risk estimates into a benefit-cost analysis, where the use of upper bounds will tend to exaggerate regulatory benefits.

The linear no-threshold (LNT) dose-response model is another source of conservatism built into EPA risk assessments. This model assumes that any level of exposure to a hazard carries some risk of harm, with no threshold below which exposure is free of risk. However, in cases where there is a threshold exposure level below which risk is undetectable, the LNT model can overestimate the risk of harm. A detailed discussion on LNT is included elsewhere in this chapter.

The EPA also commonly employs safety factors in its risk assessments to account for uncertainties in data, such as when translating findings from animal studies to potential human health risks or from adults to children. These safety factors are often applied in increments of 10, leading to cumulative reductions in allowable exposure levels by orders of magnitude. For example, a 10-fold factor may be applied to account for differences between animals and humans, another for variability among human populations, and further factors if there is uncertainty in the data or incomplete studies.[5]

While these safety factors are intended to provide an extra margin of safety,[6] they frequently result in exposure limits that are far more conservative than necessary, often by factors of 100 to 3,000 times.[7] This overly precautionary approach contributes to a culture of fear surrounding any hazard (chemical or radiological), and leads to unnecessarily stringent regulations, thereby preventing the beneficial uses of substances where the actual risk to human health is minimal or negligible. Overly conservative safety factors also push industries toward substitutes that have not been as thoroughly evaluated, potentially posing greater risks to public health or the environment.

Each of these risk assessment practices is consistent with the precautionary principle. In each case, assumptions shape risk

assessments to reflect worst-case scenarios rather than typical human conditions. These conservative strategies are not harmless, as they can introduce additional countervailing risks in the following ways:

Diverting resources from other public health priorities

Billions of dollars are spent on radiation and other cleanup efforts to meet strict regulatory standards, even when the health benefits are undetectable. These are funds that could be better used for more cost-effective health interventions, such as breast cancer screening programs, which have the potential to save thousands of lives.[8] By diverting limited public and private resources toward activities with little measurable benefit, the opportunity to fund health strategies that can achieve tangible, life-saving outcomes is lost, leading to a net harm to public health. This inefficient allocation of resources ultimately reduces society's ability to address the most pressing health needs and diminishes overall public welfare.

Ignoring substitutes

A problem with conservative risk assessments is that they often fail to account for the risks posed by substitute products or activities. For instance, the EPA's regulation of phthalates,[9] a group of chemicals used to make plastics more flexible, is grounded in concerns over potential health risks, such as reproductive toxicity, based on high-dose animal studies.[10] However, the risks posed by phthalates to humans, particularly at typical exposure levels, remain highly uncertain.[11] Stringent regulations on phthalates can lead to the adoption of substitute chemicals that may not be as thoroughly studied or could pose greater risks. Another common chemical found in plastics is bisphenol A (BPA), which has raised concerns about endocrine disruption. Yet the science surrounding these concerns is hotly debated,[12] and common substitutes for BPA have also raised concerns.[13]

Ignoring beneficial effects

Another problem with the EPA's conservative approach is its failure to consider hormetic effects or other ancillary health benefits stemming from exposure to certain agents. The EPA's long-standing debate

with the FDA over methylmercury in fish is one example. While the EPA has focused on the risks posed by mercury, the Food and Drug Administration (FDA) has emphasized the health benefits of consuming fish, particularly for pregnant women.[14] The EPA's work has likely discouraged fish consumption by those who stand to see significant health benefits from it. This debate highlights the potential for overly cautious regulations to increase rather than decrease risk.

Raising costs for consumers

The economic costs associated with conservative risk assessments translate into higher prices for goods and services. These higher prices reduce disposable income, limiting consumers' ability to mitigate risks privately.[15] For example, stringent regulations on chemicals or pesticides increase the cost of food production, driving up prices for consumers.[16] This, in turn, reduces consumers' ability to allocate their own resources toward health-protective measures, such as safer housing or healthcare.

Finally, the EPA's conservative estimates of risk feed into benefit-cost analysis,[17] and inflated risk estimates will lead to inflated estimates of the benefits of regulations. This can distort the analysis, making it appear that the benefits of regulation outweigh the costs, when the actual benefits may be much lower than estimated. In some cases, such as with a safety analysis that estimates a reference value[18] or identifies a no observed adverse effect level, the outputs of risk assessment are incompatible with benefit-cost analysis.[19]

Recommendations for Congress

Review and revise environmental statutes to avoid precautionary logic. Congress should engage in a comprehensive review of environmental statutes and reform language that is based on precautionary principle rationales. The review should focus on ensuring that any identified potential harms are accurately characterized (in the sense that the EPA reports the expected level of risk) and that regulatory standards are not set so low that their benefits cannot be measured. Additionally, Congress should require that EPA

provide data used to estimate risks and should clarify that finding evidence of harm can inform the decision to regulate but should not automatically trigger regulation. This approach will allow the separation of scientific assessments of harm from the policy decision of whether promulgating a rule is reasonable, thus ensuring a more balanced and rational regulatory process.

Require comprehensive and transparent presentation of risk data. Congress should codify in statute principles for risk analysis developed by the Office of Management and Budget.[20] This includes requirements to clearly identify the relevant populations associated with risk estimates, the expected central risk estimates, upper- and lower-bound estimates of risk, and any significant uncertainties associated with the data. The EPA should be required to report risk estimates that are consistent with and can be incorporated into a benefit-cost analysis.

Require consideration of substitutes. Congress should require the EPA to assess the risks posed by substitute products before setting regulatory standards on chemicals, pesticides, and similar products. This would help prevent unintended consequences from bans or restrictions and ensure that regulations promote overall public health.

These reforms would help ensure that the EPA's risk assessments are scientifically grounded, consistent with benefit-cost analysis, and reflective of actual public health risks rather than precautionary assumptions.

KEY ISSUE

Limit the EPA's use of the linear no-threshold model

Risk assessment is a systematic process used by regulatory agencies to evaluate potential hazards to human health and the environment. It typically involves several steps, including identifying hazards, assessing exposure levels to humans, animals or wildlife, and then characterizing risks. Regulatory agencies like the EPA use risk assessments to inform policy decisions and set safety standards.

The linear no-threshold (LNT) model is a key concept in human health risk assessment. It assumes that any level of exposure results in risk increasing in a linear fashion. Regulatory agencies have traditionally used the LNT model as a default assumption when setting radiation protection standards, considering it a conservative approach to ensure public safety.[21] However, the model has spread beyond radiation to chemical carcinogens, as well as to some non-carcinogens. Yet the scientific basis and appropriateness of the LNT model, especially for low-dose exposure, has been debated for years,[22] and has become particularly controversial as new evidence has emerged about cellular repair mechanisms (which are the body's natural ways of fixing damaged DNA and removing potentially harmful cells).

The LNT concept is fundamentally at odds with the traditional toxicological principle that "the dose makes the poison," which is a principle that has guided society's understanding of toxicity for centuries. According to this historical view, a substance is only poisonous at a certain dose, suggesting that low levels of exposure could be harmless. In contrast, the LNT model asserts that there is no level of exposure that is free of risk, no matter how minute. This approach serves the interests of regulatory agencies by providing an enduring rationale for their oversight and intervention. By adopting the LNT model, the EPA can justify the need for continuous monitoring, regulation, and control of substances, effectively ensuring that its programs remain necessary indefinitely.

The use of the LNT model across government agencies has had practical implications that affect the lives of all Americans. In the field of medical imaging, the LNT model has led to concerns about

radiation exposure, particularly in diagnostic procedures such as X-rays, CT scans, and mammography.[23] In some cases, physicians avoid ordering potentially lifesaving imaging scans due to fears of radiation exposure, even though the actual risks at low doses are minimal, zero, or perhaps even modestly beneficial. Likewise, the application of the LNT model to radiation regulation has led to extremely stringent safety standards that increase the costs of nuclear power plant construction.[24] This has undoubtedly hindered investment in advanced nuclear technologies, such as small modular reactors, which are seen as providing reliable energy while reducing greenhouse gas emissions.

EPA's reliance on the LNT model has had a profound effect on regulatory practices in areas such as radiation exposure, chemical regulation, hazardous waste management under the Superfund program, and air pollution. The extensive application of LNT leads to analysts reporting worst-case scenarios that are unlikely to play out in reality. The result is overly conservative policies that impose substantial costs on industry, delay development, and create unintended social and economic harms.

Formaldehyde

One application of the LNT model in chemical regulation can be seen in the EPA's handling of formaldehyde, a common chemical found in building materials and household products. The EPA considers formaldehyde a carcinogen. Relying on the LNT framework, the agency imposes strict regulations limiting formaldehyde in products such as plywood, particleboard, and insulation materials.

According to EPA estimates, annual compliance with its formaldehyde standards imposes compliance costs of about $121 million annually.[25] The residential construction sector in the U.S. is especially affected by the costs of compliance with EPA formaldehyde regulations. Industry costs are passed on to consumers, contributing to higher prices for housing materials and construction, which exacerbates housing affordability challenges.

Even as the EPA doubles down on its standards, recent studies question the application of the LNT model to formaldehyde.[26] Research published by the National Academy of Sciences has shown that

the body can detoxify small amounts of formaldehyde,[27] possibly rendering low-level exposures harmless. Indeed, formaldehyde is a naturally occurring substance in the human body that is rapidly metabolized and detoxified through normal physiological processes. Yet in spite of those findings, the EPA continues to regulate formaldehyde using the LNT model,[28] reflecting a case where regulatory frameworks may lag behind current scientific understanding.

Radon

The regulation of radon also highlights the challenges and shortcomings of the LNT model. Radon is a naturally occurring radioactive gas. The EPA, using the LNT model, has established an action level of 4 picocuries per liter (pCi/L),[29] below which mitigation is still recommended.[30] This has led to stringent mitigation measures for homes and commercial buildings, costing millions annually in testing and remediation, even though emerging evidence questions the appropriateness of this action level. Some studies suggest a higher threshold may exist than the EPA's action level suggests, potentially between 8 and 27 pCi/L.[31] Other research has found that lung cancer mortality rates may actually decrease with low-level radon exposure,[32] suggesting that current regulations might not be aligned with beneficial health outcomes. The application of the LNT model to radon regulation thus results in policies that impose significant economic burdens, potentially for little to no public health benefit.

Superfund

The EPA's use of the LNT model also affects Superfund cleanups, where the agency oversees the remediation of contaminated land and water. Superfund sites, which number over 1,300 in the United States,[33] often involve contaminants like heavy metals, chemicals, and radioactive materials. The EPA applies the LNT model to assess a number of the risks posed by this contamination,[34] leading to stringent cleanup standards.

One notable problem with this approach is the excessive costs and delays that result from using the LNT model to regulate low-level

contamination. In Fiscal Year 2022, committed cleanup costs were estimated at $1.1 billion, with a total of $50 billion since the inception of the Superfund program.[35] Cleanup efforts at sites like the Hudson River have dragged on for more than two decades and cost more than a billion dollars.[36] The EPA's assumption that even small amounts of residual contamination could increase cancer risks means that cleanup efforts like this often stretch out over years, causing delays in redevelopment and contributing to economic stagnation in affected areas. Former Supreme Court Justice Stephen Breyer referred to this as "the problem of the last 10%,"[37] namely that even when a clear environmental harm is present, the marginal benefits of addressing the final residual elements of the harm after substantial cleanup efforts have been undertaken are often dwarfed by the marginal costs.

If the EPA reconsidered its reliance on the LNT model and adopted a more biology-based approach to risk assessment, Superfund cleanups could be completed more quickly and cost-effectively and regulations could be relaxed, freeing up resources for other environmental programs or other priorities.

Particulate matter

The EPA's use of LNT also extends to the regulation of particulate matter. Particulate matter, specifically fine particles known as PM2.5 (particles with a diameter of 2.5 micrometers or smaller), has been a central focus of the EPA's air quality standards for years, often forming the largest share of regulatory benefits in EPA economic analysis.[38] The agency has applied the LNT model in the context of PM2.5 since the inception of the PM2.5 standards in 1997; however, it ceased doing so in 2006.[39] That change came in response to a statement in support of a threshold from the agency's Clean Air Science Advisory Committee,[40] along with a corresponding staff report that offered mixed, inconclusive evidence with regard to both linear and threshold concentration-response functions for PM2.5 and associated health effects.[41]

Then, in 2009, the EPA made a significant and formal shift back to embracing the LNT model in its Integrated Science Assessment for PM2.5.[42] Returning to past practices was a convenient change for the agency, as it allows the EPA to set PM2.5 standards to levels at

which the epidemiological evidence is highly uncertain, due to the diversity of findings across a body of research that spans multiple health endpoints and employs a variety of statistical methods.[43] The EPA acknowledges uncertainty surrounding the shape of the concentration-response function for PM2.5,[44] and this issue continues to be studied.

There have been substantial successes in U.S. air quality since the Clean Air Act was passed.[45] However, as air quality continues to improve and PM2.5 concentrations fall, the incremental health benefits of further reductions may diminish or be eliminated entirely, even while the costs of achieving stricter standards will continue to rise. The debate surrounding PM2.5 pollution will continue and highlights the ongoing challenge involved with balancing a precautionary public health framework with cost-effective and efficient regulatory policy.

Recommendations for Congress

Require a comprehensive review of the scientific evidence supporting the LNT model. Congress should mandate that the EPA conduct a comprehensive review of the scientific evidence underpinning the LNT model, particularly focusing on recent advances in molecular biology, radiation biology, and cellular repair mechanisms. Since the EPA has historically resisted such reviews,[46] Congressional action is necessary to ensure that this review occurs.

Shift the burden of proof to the agency to demonstrate significant health risks from low-dose exposures. Congress should require that the burden of proof be placed on the EPA to demonstrate that a particular hazard or stressor poses significant threats to human health. By setting a null hypothesis as the standard, the default assumption would be that low doses of exposure are not harmful unless the body of scientific evidence convincingly shows otherwise. One way to advance this requirement is to mandate that studies finding a null result are not ignored by the EPA when it reviews relevant literature or commissions studies. This approach would promote a more balanced

regulatory framework, ensuring that regulations are based on clear evidence of harm rather than precautionary assumptions.

Establish a "de minimis" dose below which regulation and safety measures can stop. *De minimis non curat lex* is Latin for "the law does not concern itself with trifles." In cases where health benefits of regulatory standards are either trivial in nature or too uncertain to be distinguished from zero, Congress should require regulators to establish stopping points, or a "de minimis" dose, below which further regulation and safety measures are no longer necessary. Such standards should be tailored to specific hazards and should be updated as scientific understanding advances. By setting clear finish lines for policy programs, regulatory efforts can avoid some of the problem of the "last 10%," where increasingly burdensome costs are imposed to achieve ever-more trivial health improvements.

Adopt a mixed dose-response model for more tailored risk assessments or use alternatives to LNT to reflect the state of scientific uncertainty. Congress should require that the EPA rely on more than one dose-response model in cases where this is scientifically supported. For example, different ranges of exposure levels might be represented with different models, or different models might be weighted based on their biological plausibility.[47] This approach would allow for more tailored analysis that does not conflict with known scientific facts, such as superior or indistinguishable health outcomes in countries where pollution levels are high relative to the US, or in areas with relatively high background radiation.[48] Even when biological plausibility is not established,[49] say because the mechanism underlying a relationship is not fully understood, alternatives to LNT may still be useful for characterizing model uncertainty.[50]

Taken together, these reforms would go a long way toward grounding US environmental policy in science and evidence rather than fear.

KEY ISSUE

Eliminate the EPA's IRIS program

The Integrated Risk Information System (IRIS) program at the EPA has long been a focus of debates over scientific standards within environmental risk assessment.[51] Established in 1985,[52] IRIS was intended as a repository for hazard identification and dose-response information on chemicals.[53] Having been created administratively, IRIS has never been authorized by Congress.[54] Nevertheless, its analyses serve as critical inputs supporting EPA's decision-making under numerous environmental statutes, including the Clean Air Act, the Safe Drinking Water Act, and the Superfund program. IRIS analyses and values are also used by regional EPA offices, states, other agencies, and by international organizations and governmental bodies.

Over the years, criticisms of IRIS have abounded, with voices as varied as the Government Accountability Office (GAO), the National Academy of Sciences (NAS), Congress, and industry groups all questioning the program's scientific rigor and transparency. While a recent 2022 IRIS Handbook[55] shows modest improvements, the program remains deeply flawed and appears incapable of meeting the evolving demands of chemical safety assessment.

Checkered history

Chief among the criticisms of IRIS has been the tendency of its assessments to employ overly conservative assumptions,[56] leading to hazard assessments that exaggerate health threats. For example, IRIS's 2010 draft assessment value for formaldehyde was set lower than the amount humans naturally exhale with each breath.[57] The draft assessment faced widespread criticism, including from the NAS, for its lack of transparency and "recurring methodologic problems."[58]

NAS, in its 2011 review of the IRIS assessment for formaldehyde, criticized the program's lack of standardized criteria for data selection and evidence integration.[59] NAS found that IRIS's practices were not transparent and lacked a clear underlying conceptual framework. In the 2011 report, as well as 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.[60]

In spite of these criticisms, the formaldehyde value was finalized in 2024,[61] highlighting how a myopic focus on hazards, absent any context related to real-world exposure data, can result in an absurdly low health value.[62] Similarly, the EPA's IRIS program established a risk value of 100 parts per quadrillion for the sterilizing agent ethylene oxide (EtO), a level that is 19,000 times lower than naturally occurring levels in the human body.[63] IRIS's EtO value came under scrutiny when it contributed to sterilization plant closures and worsened critical shortages of medical equipment during the COVID-19 pandemic.[64]

GAO has been an especially vocal critic, placing IRIS on its High-Risk List since 2009.[65] The purpose of this list is to identify federal "programs and operations that are particularly vulnerable to waste, fraud, abuse, or mismanagement, or in need of transformation."[66] GAO reports highlight IRIS's chronic delays and recurring methodological problems.[67] These reports find that, as a result of failing to implement recommendations from NAS and other parties, the IRIS program struggles to produce accurate, scientifically sound toxicity values, undermining its role in public health protection and creating regulatory uncertainty for industry. A 2023 GAO report recommends that the EPA establish clear and predictable timeframes for completing assessments to reduce stakeholder uncertainty, and to align IRIS's resources with strategic goals to effectively balance workload demands with available resources.[68]

Failed modernization

The IRIS program has responded to these criticisms with a series of reforms, the most notable being the creation of the IRIS Handbook in 2022.[69] This handbook introduces systematic review methods intended to standardize the program's approach to issues related to literature review, evidence synthesis, and risk modeling, among others. A central feature is the attempt to ensure consistent application of principles across evaluations. The Handbook also includes more rigorous protocols for study evaluation and evidence integration,

establishing risk of bias frameworks that aim to address NAS's call for transparency and reliability in scientific evaluation.

The IRIS Handbook represents a significant procedural update, but this document on its own is unlikely to be sufficient given the longstanding nature of IRIS's problems. For one thing, the NAS has questioned the reasonableness of some of its contents.[70] Additionally, the IRIS Handbook's support of the LNT model, especially in cancer assessments, remains a contentious issue.[71] The handbook's endorsement of uncertainty factors will encourage agency policy decisions to be hidden behind a veneer of science.[72] In short, EPA continues to default to conservative methods without sufficiently considering alternative approaches. As a result, we can expect IRIS will continue to produce risk assessments that remain out of step with current scientific understanding.

IRIS's final formaldehyde assessment also provides reason to doubt the program's ability to make meaningful improvements. One industry group argued the assessment ignored peer review feedback, failed to use the best available science, and deviated from international standards.[73] Others argued the EPA failed to establish the biological mechanism linking formaldehyde with cancer.[74] In other words, in spite of having years to finalize the formaldehyde report, IRIS failed to adequately respond to the concerns surrounding its earlier, much criticized, drafts.

The path forward

IRIS hazard values are developed without considering real-world exposure scenarios. As a result, these values often include extremely conservative assumptions that make them impractical to implement. The problems with these overly cautious values typically only become apparent once the EPA attempts to use them in actual regulations and stakeholders see their practical implications.

Despite the procedural improvements in the IRIS Handbook, the program's continued reliance on a hazard-only framework for many chemicals remains a critical weakness. This limitation not only leads to inflated risk estimates but also misleads regulatory decisions by leaving out critical information related to context. The result is

too often undue economic burdens on industries without any clear public health benefits. Moreover, the redundancy between IRIS and the Toxics Substances Control Act's (TSCA) chemical risk evaluation process has become more apparent as TSCA's program has evolved in recent years.[75] Unlike IRIS, the TSCA program operates under statutory authority and has clear guidelines to use the "best available science." This has allowed that program to develop assessments with greater authority and practical relevance for regulatory decision-making.[76]

Disbanding IRIS and moving assessors into respective program offices, such as EPA's Office of Chemical Safety and Pollution Prevention tasked with managing programs under TSCA,[77] would provide EPA risk assessments with the legal mandate and established procedures necessary for more effective chemical risk assessment. By consolidating these responsibilities, the EPA could eliminate the redundancies that contribute to IRIS's low scientific standards. Once disbanded, IRIS's overly conservative values should not be used by EPA regulatory programs without re-evaluation.

Recommendations to Congress

Wind down the IRIS Program. The IRIS program has demonstrated an inability to consistently produce timely, scientifically robust assessments. Congress should initiate a phased wind-down of IRIS, transferring resources, including human capital, to the Office of Chemical Safety and Pollution Prevention and other regulatory program offices, which should develop their own hazard assessments in line with statutory requirements. By leveraging TSCA's legislative requirements for science-based evaluations, the EPA can improve the reliability and credibility of its hazard evaluations.

Prohibit the use of legacy IRIS values. Congress should mandate that EPA regulations may not use existing IRIS values after the IRIS program is wound down, unless those values have been re-evaluated using updated scientific methods that incorporate real-world exposure data and avoid overly conservative assumptions. This will prevent outdated and overly conservative IRIS values from continuing to

influence regulatory decisions through citation in future rulemakings or risk assessments.

Mandate that evaluations consider real-world context. Congress should require that all EPA chemical assessments integrate real-world exposure data that consider naturally occurring levels of chemicals in the human body and environment. Moving away from hazard-only frameworks would help address critiques of IRIS's reliance on conservative models that ignore these baseline exposure contexts. This adjustment could help prevent assessments from overestimating risk, producing regulatory standards that reflect actual health impacts rather than theoretical worst-case scenarios.

Make hazard assessments legally accountable. IRIS's history of disregarding peer review feedback demonstrates the weakness of the current peer review process. Congress should make the Information Quality Act judicially reviewable to enable stakeholders to challenge flawed hazard assessments in court.[78] Enabling judicial review would create accountability and ensure the EPA properly addresses scientific criticisms of its hazard assessments.

Prioritize central risk estimates while accounting for uncertainty. Congress should mandate that EPA assessments present a range of values based on uncertainty but prioritize central estimates of risk rather than defaulting to overly conservative assumptions or relying on concepts such as reference values. By focusing on central estimates—those representing the most probable risk level—the EPA can provide a more balanced and realistic portrayal of chemical risks. Meanwhile, a range allows analysts to select alternative values when appropriate based on the unique circumstances of the situation they are assessing (e.g. exposure to children). Publishing the point of departure value before uncertainty factors are applied should also be required.[79]

KEY ISSUE

Reform TSCA

The Toxic Substances Control Act (TSCA), originally enacted in 1976, provides the EPA with the authority to regulate all production, importation, use, and disposal of new and existing chemicals. Under TSCA, the EPA must review and approve all new chemicals before they can be manufactured domestically or imported from abroad. TSCA also authorizes the EPA to place use restrictions, including bans, on existing chemicals currently utilized in commerce. Companies regulated under TSCA are subject to extensive reporting, record keeping, and testing requirements.[80]

2016 Lautenberg Amendments

In 2016, with bipartisan support, including support from industrial and environmental stakeholders, the Frank R. Lautenberg Chemical Safety for the 21st Century Act (Lautenberg Amendments) amended TSCA.[81] The Lautenberg Amendments did not change the EPA's obligation to regulate chemical substances or mixtures that present an unreasonable risk of injury to health or the environment, and consider the environmental, economic, and social impact of any action proposed or taken under the statute.

However, the Lautenberg Amendments did significantly change the EPA's authority to ensure the safety of chemicals. The amendments included:

- Mandatory requirements for the EPA to evaluate existing chemicals with clear and enforceable deadlines.
- A new requirement that the EPA make an affirmative finding on the safety of new chemicals or significant new uses of chemicals before they are allowed to enter the marketplace.
- New and more frequent substantiation requirements for certain confidentiality claims.
- A provision that allows EPA to collect up to $25 million annually in user fees from chemical manufacturers and processors.[82]

Importantly, the Lautenberg Amendments also added new scientific quality standards that must be met when EPA evaluates chemicals. The new standards include requiring the EPA to rely on the best available science and the weight of scientific evidence.[83]

To carry out the Lautenberg Amendments' numerous requirements, the EPA adopted four important framework rules:

1. The July 2017 Risk Prioritization Process Rule,[84] which established a framework and criteria for identifying high-priority chemicals for EPA risk evaluations.
2. The July 2017 Risk Evaluation Procedures Rule,[85] updated in May 2024,[86] which established a framework for evaluating high priority chemicals to determine whether they present an unreasonable risk to health and/or the environment.
3. The August 2017 Inventory Update Rule,[87] which required industry reporting of chemicals manufactured, imported, or processed in the US over the past 10 years to identify which chemical substances on the TSCA Inventory are active in US commerce.
4. The October 2018 Fees Rule,[88] updated in February 2024,[89] that established the structure and approach the EPA will follow to collect user fees to defray the cost of TSCA implementation.

Importance of chemicals

Chemicals are the backbone of so many elements of modern life. Without chemical manufacturing and processing, many important products and technologies such as computers, batteries, cell phones, solar panels, and motor vehicles would not be possible.[90] In addition to supporting innovative technologies, chemicals are also indispensable to the manufacture of, among other things:

- Cleaning and disinfection products that enable us to quickly and effectively remove bacteria and dirt from our clothing, homes, and workspaces.
- Pharmaceuticals such as vaccines, antibiotics, and painkillers that prevent and cure disease and avoid or reduce suffering from illness, injury, or surgery.

- Fertilizers that enhance agricultural yields and thereby enable farmers to feed a planet of eight billion people without further encroaching on wildlife habitat.[91]
- Construction materials essential for building homes and critical infrastructure, such as bridges, roads, and tunnels.

Although some chemicals may pose risks under certain exposure scenarios, it is important to assess chemicals in a thoughtful manner that does not discount the myriad benefits they provide to modern life. Indeed, in a world without industrial chemistry, human life would be poor, brutal, and short.

Overly burdensome and untargeted regulations, even if well meaning, can undermine progress and make it much more difficult for American companies to produce the chemicals that Americans rely on in everyday life. This can make products more expensive, lower quality, or make them unavailable entirely. Ensuring that regulations are prudent and protect public health while still allowing access to goods Americans rely upon is essential.

Recommendations for Congress

There are numerous issues that Congress needs to address to improve TSCA, from improper consideration of risk, failure to consider costs and tradeoffs, to unreasonable delays in the review of new chemicals. Specifically, Congress should:

Ensure that TSCA is implemented consistent with a risk-based approach. TSCA provides for a robust risk-based approach for the evaluation and management of chemicals. Congress must ensure that the EPA is evaluating and regulating based on risk, not hazard. Even if a chemical poses a hazard, this is a woefully incomplete picture of whether it could pose harm to people or the environment. In a formula, risk = exposure x hazard. For example, chemicals that may be harmful at high exposure levels can carry little risk if workers using them wear proper personal protective equipment, and if downstream users and consumers are only exposed at low levels below which the

chemical may cause harm.[92] Precautionary hazard-based decisions, which do not consider exposure, should be avoided.

Consistent with this approach, Congress should clarify that determinations of unreasonable risk should be made on a use-by-use basis rather than for the chemical as such. Determinations of risk based on the chemical, independent of specific uses, take exposure out of the risk equation and are not consistent with the intent of TSCA. Currently, if the EPA finds that even one condition of use presents an unreasonable risk, the agency determines that the entire chemical presents an unreasonable risk, even if there are conditions of use that present no risk at all. Determinations of whether a chemical presents an unreasonable risk should be tied to specific uses.

Clarify the conditions for mitigating unreasonable risk. The EPA's risk evaluation procedures rule mentions several considerations likely to inform unreasonable risk determinations. Currently, the EPA does not consider any costs or non-risk factors when evaluating whether a chemical, under a condition of use, presents an unreasonable risk. When evaluating restrictions to mitigate unreasonable risks, Congress should ensure that the EPA considers the harm any regulation would place on society, including through lost benefits or the creation of indirect or additional risks to health, the environment, and the economy.

Improve the new chemicals evaluation process. TSCA requires that the EPA review and approve chemicals within a 90-day window. However, the EPA's current practices, such as reviewing all reasonably foreseen uses of a chemical rather than just the chemical's intended use, are stifling the innovation pipeline. The EPA routinely misses the 90-day deadline,[93] and a recent survey shows that the agency is taking more than 365 days to review 81 percent of individual chemical applications.[94] This is harming the competitiveness of the US manufacturing sector. Congress should ensure that the EPA puts in place the policies and procedures needed to meet its statutory mandate of completing reviews of new chemicals in 90 days. Congress should:

- Clarify that for new chemical reviews, the term "under the conditions of use" means the circumstances under which a

chemical is known or intended to be used.[95] New chemicals should not be reviewed for uses that are neither intended nor expected by the manufacturer.

- Ensure that the EPA's assessment is based on the actual conditions of use, including personal protective equipment and engineering controls, that the manufacturer has in place and intends to put in place. This would allow the EPA's evaluation to be based on real-world exposure scenarios.
- Ensure that the EPA is conducting risk-based reviews, rather than precautionary hazard-based reviews for new chemicals.
- Ensure that the EPA is relying on the best available science, including information provided by manufacturers, sometimes at the EPA's request.

Improve the existing chemicals risk evaluation process. Through the Lautenberg Amendments, Congress gave the EPA three years to conduct risk evaluations for existing chemicals.[96] Due to the EPA's ever-expanding scope of risk evaluations, the EPA has been unable to meet this deadline. Congress should ensure the timely review of existing chemicals while ensuring that the agency focuses on the most significant potential risk, not chasing miniscule risks. Congress should also ensure that the EPA is relying on the best available science, the weight of the scientific evidence, and all reasonably available information when conducting risk evaluations.[97] In addition, Congress should:

- Ensure that the EPA's risk evaluations are focused on pathways of exposure that are expected to lead to significant risks and are not covered by other EPA program offices or other statutes. Congress should clarify that TSCA is a gap filler. For example, there is no reason for TSCA to look at chemicals in drinking water. Eliminating TSCA scope creep in risk evaluations will make EPA's workload more manageable.
- Ensure that the EPA is focusing on the potential risks of greatest concern, and not seeking to evaluate risks that are due to *de minimis* exposures and unintentional minor uses. If the EPA were to evaluate all conditions of use of a chemical, the agency

would not be able to complete risk evaluations consistent with the congressionally mandated timeline.

- Ensure that TSCA risk evaluations focus on chemicals currently in commerce, not on chemicals that have already been phased out or discontinued uses.
- Prohibit the EPA from regulating chemical risk exposures in the workplace. After the EPA completes a risk evaluation, it may then refer the results to the Occupational Safety and Health Administration (OSHA). However, Congress should clarify that OSHA is the agency that sets workplace health and safety standards.
- If the EPA is to retain authority to regulate workers, the EPA should not set existing chemical exposure limits (ECELs) unless it determines that current practices, including current occupational exposure limits and current personal protective equipment (PPE) requirements and practices are not sufficiently health protective. Congress should ensure that ECELs are reasonable and achievable, and that if an ECEL is set, compliance with the ECEL is performance-based.
- Ensure that when establishing a baseline for existing exposures to chemicals, EPA risk evaluations take account of existing regulatory requirements, including requirements from other EPA program offices and other agencies, such as OSHA. In particular, the EPA should assume that facilities regulated by OSHA comply with all OSHA requirements, including the requirements to use PPE.
- Clarify that conditions of use include all practices that impact an evaluation of risk, including existing regulations and actual practices. For instance, OSHA general industry standards, including requirements for PPE and existing workplace practices regarding use of PPE, should be considered as 'reasonably available information' that impacts the risk of a chemical under a particular condition of use.
- Ensure that TSCA's scientific standards for best available science, weight of the scientific evidence, and reasonably available

information are clearly defined by the EPA within each risk evaluation. Approaches to risk that do not meet TSCA standards for best available science, such as the use of Integrated Risk Information System (IRIS) hazard values and developing methods for cumulative and aggregate assessment, may not be used.[98] If a TSCA risk evaluation does rely on an IRIS value, Congress must ensure that the IRIS value is subject to peer review by the Science Advisory Committee on Chemicals.

- Congress should also require the EPA to base its decisions on the weight of scientific evidence. That means the agency must not only assess the strengths, limitations, and relevance of multiple lines of evidence, but also give the most weight to the highest quality and most relevant information.
- Due to their importance, all risk evaluations and risk management rules should be subject to Executive Order 12866 review, at the proposed and final stages, as is done for rulemakings.

Eliminate non-mandated EPA programs that take resources away from TSCA implementation. There are two programs that should be eliminated:

- **Safer Choice program.** The Safer Choice program is a voluntary program implemented by the EPA. Under Safer Choice, the EPA certifies products that are considered to be "safer" for people and the environment.[99] There is no statutory authority for this program and in fact the program's designation of chemicals as "safer" is not consistent with TSCA.[100] Congress should mandate the EPA stop certifying chemicals under Safer Choice and current resources for this program should be used to implement TSCA instead. If the public deems such information to be valuable, then the private sector is more than capable of meeting this need.
- **EPA's Environmentally Preferable Purchasing Program and Procurement Recommendations.** The EPA provides recommendations to other federal agencies with respect to how they can comply with purchasing under their own statutory mandates. It recommends purchasers look for various ecolabels, standards, and seals.[101] Congress should eliminate this non-

authorized program, which meddles in the procurement policies of other agencies that have their own priorities, picks winners and losers, and diverts resources from statutory priorities.

Require implementation guidance for risk management. While the EPA developed framework rules for the fees program, chemical prioritization, and risk evaluation, the EPA has not provided any frameworks for the risk management of chemicals under TSCA Section 6 (15 U.S.C. § 2605).[102] Congress should require that the EPA develop a framework rule for risk management. Congress should also require the EPA to ensure that its restrictions on chemicals are technically and economically feasible, cost-effective, and do not result in the creation of greater risks for health or the environment.

Strengthen the Section 21 petition process. Congress should ensure that Section 21 petitions and other TSCA provisions (Section 20, Section 4(f), Section 7) that address chemical risks flagged by citizens or the EPA on a case-by-case basis[103] do not undermine the design and function of the TSCA Section 6, comprehensive, multi-year risk evaluation and risk management process. For example, Congress should prohibit the EPA from making a determination of unreasonable risk on a Section 21 petition that would bypass performing a section 6 risk evaluation. Congress should also clarify that any unreasonable risk determination by the agency should be subject to notice and comment.

Improve the approach to test orders. Congress should ensure that the EPA follows TSCA's tiered approach to data gathering[104] and does not order new testing until it has demonstrated the necessity for the information. All testing requirements must be narrow, reasonable, technically feasible, and not imposed on companies manufacturing chemicals for uses and purposes for which the chemistries are not intended.

KEY ISSUE

Reform FIFRA

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs pesticide distribution, use, sales, and labeling.[105] As the Environmental Protection Agency (EPA) explains, the agency must register (license) all pesticides distributed or sold in the United States, and before the agency may register a pesticide under FIFRA, "the applicant must show, among other things, that using the pesticide according to specifications 'will not generally cause unreasonable adverse effects on the environment.'"[106]

Overview of requirements

FIFRA requires the EPA to evaluate human health, ecological risks, and safety before any pesticide can be registered. As a part of that evaluation, the EPA undertakes a thorough scientific review, including a review of carcinogenicity and non-cancer effects, including endocrine effects, as well as effects on sensitive subpopulations including children and pregnant women and agricultural workers who may be exposed to pesticides. The EPA may not lawfully approve a pesticide unless the agency confirms the product does not cause unreasonable adverse effects to the environment or humans.[107] The EPA also regularly evaluates all new information to guarantee the safety of existing products.[108]

FIFRA defines the term "unreasonable adverse effects on the environment" to mean: "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the Federal Food, Drug, and Cosmetic Act."[109]

Amendments to FIFRA

In 1996, Congress unanimously passed the Food Quality Protection Act (FQPA) that amended FIFRA and the Federal Food, Drug, and Cosmetic Act (FFDCA).[110] Most importantly, FQPA requires that the EPA

consider the special susceptibility of children to pesticides by using an additional tenfold (10X) safety factor[111] when setting and reassessing tolerances[112] unless adequate data are available to support a different factor; consider aggregate risk from exposure to a pesticide from multiple sources (food, water, residential and other non-occupational sources) when assessing tolerances; and consider cumulative exposure to pesticides that have common mechanisms of toxicity.

In 2004, FIFRA was amended further by the passage of the Pesticide Registration Improvement Act of 2003 (PRIA).[113] PRIA created a registration service fee system for applications for specific pesticide registration, amended registration, and associated tolerance actions. According to the EPA, the goals of PRIA were to create a more predictable evaluation process for affected pesticide decisions, and to couple the collection of individual fees with specific decision review periods.[114] PRIA fees have been reauthorized four times, most recently by PRIA 5 (a fifth update to the legislation) which was passed in December 2022.[115] Registration service fees authorized by PRIA fund approximately one third of EPA's pesticide program activities.[116]

Benefits of pesticides

As a preliminary matter, it is important to understand the importance of pesticides. Pesticides are necessary for the effective protection of our food supply, public health, homes and structures, infrastructure, our natural resources, and environment. Pesticides protect people, pets, companion animals, and wildlife from diseases transmitted by mosquitoes, ticks, and rodents. Our homes, businesses and other structures are protected by pesticides against pests such as cockroaches, bedbugs, mice and rats, termites, flies, and moths. The judicious use of pesticides helps maintain safe, beautiful, and functional outdoor spaces such as home lawns, gardens, public parks, athletic fields, and golf courses. Furthermore, pesticides are vital to our nation's production of food and fiber.

Today, up to 40 percent of global crop production is lost to pests, weeds, and disease.[117] Without the use of pesticides, crop yields could decrease by more than 70 percent and additional land would need to be removed from natural habitat and converted for food production.[118]

Annually, plant diseases cost the global economy over $220 billion, and invasive pests at least $70 billion.[119] Without pesticides, a greater reduction in yields would mean less food and, as a result, higher prices. All food prices would increase as costs for products, such as animal feed and ingredients in processed food, would be passed on to consumers in some fashion. For instance, without pesticides, the yields of corn, cotton, and soybeans show declines of up to 70 percent,[120] underscoring the indispensable role of pesticides in agriculture and ensuring food security. And cultivating corn, cotton, and soybeans without pesticides, results in upwards of three times more land, water, energy use, and greenhouse gas emissions.[121] Crucially, pesticides are not only enhancers of productivity but significantly mitigate the environmental impact of agricultural crops.

Problems with FIFRA

Today, the EPA's implementation of FIFRA is broken in many ways. EPA's risk evaluations of pesticides are overly precautionary and not consistent with the agency's own science, leading to unnecessary restrictions on important crop protection tools. And the EPA is implementing Endangered Species Act (ESA) requirements in a manner that will significantly curb growers' abilities to effectively use pesticides. These concerns are further compounded by the EPA's inability to meet the statutory timeframes mandated in PRIA. Approximately 60 percent of all pesticide registration actions are not completed until after their statutory decision review times and many are still incomplete 18 to 24 months later, leaving farmers and ranchers without the up-to-date tools they need.[122] This is just the tip of the iceberg. Significant reform is necessary as described in the recommendations below.

Further, the EPA, along with other agencies such as the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), too often undertake efforts to undermine the existing risk- and science-based regulatory frameworks for these tools, making the US more reliant on foreign competitors for food and agricultural goods. Agency pesticide decisions should not be politicized, but rather should be based on sound science and Congress should hold the agencies accountable for such decisions.

Recommendations for Congress

Require the EPA to pay for fee program delays. To incentivize the timely review of pesticide applications and to provide certainty to innovators, Congress should ensure that PRIA fees are refunded to applicants when PRIA deadlines are exceeded. If a deadline is exceeded by more than 10 percent of the time originally allotted, the EPA should refund the fee to the applicant at a level commensurate with EPA's delay. For instance, if the PRIA timeline is 100 days and it takes EPA 151 days to review the action, the EPA should refund 51 percent of the fees to the applicant. Congress may want to consider setting an appropriate cap or additionally considering changes to the collection of maintenance fees to incentivize increased efficiencies.

Improve the oversight of important registration decisions. Individual pesticide registrations are considered adjudications and not reviewed by the Office of Management and Budget (OMB).[123] However, when pesticide tolerances and registrations are withdrawn by the EPA (as opposed to being withdrawn voluntarily by registrants), Congress should ensure that these actions undergo coordinated interagency review managed by OMB. In addition, when a pesticide is necessary for a particular crop, if the EPA is proposing modifications to the registration to limit use or make a tolerance more restrictive, Congress should also ensure that there is an interagency review coordinated and managed by OMB. Moreover, that procedure should be followed even if the crop's market share is not economically significant.

Ensure the robustness of evaluations. Before manufacturers can sell pesticides in the United States, the EPA must evaluate the pesticides thoroughly to ensure that they meet federal safety standards to protect human health and the environment. In evaluating a pesticide registration application, the EPA assesses a wide variety of potential human health and environmental effects associated with use of the product.

Potential registrants must generate scientific data pertaining to the identity, composition, potential adverse effects, and environmental fate of each pesticide. The EPA establishes robust guidelines that provide the necessary predictability and rigor for scientific

decisions. However, during registration review, the EPA considers all available information, including non-guideline-compliant studies. Consequently, although the EPA has a framework for considering epidemiologic studies of health and disease in human populations, the agency does not always rely on high quality data, and sometimes fails to adequately control for confounders and uncertainties.

Using epidemiologic findings simply because they are more recent, and because they rely on human data rather than other scientific information, does not necessarily make the findings sufficiently robust for informing regulatory decision making. Congress should ensure the EPA is appropriately considering the quality of the epidemiologic information. At a minimum, the EPA should evaluate the statistical significance, or lack thereof, of research findings when evaluating causality.

Congress should also ensure that the EPA relies on U.S. Department of Agriculture (USDA) and state usage data that reflect actual pesticide use in registration reviews and ESA analyses. The FWS and NMFS should rely on similar data in their ESA analyses. Such data represent the best available information to describe how pesticides are used.

Finally, the EPA develops guidance documents, frameworks, white papers, strategies, public relations notices and other documents (under many different names) that shape the pesticide programs' approach to individual registrations and reregistration review decisions but are subject to little scrutiny by OMB or Congress. Any document of this type, which informs the EPA's general approach to evaluating human and/or ecological risk, should be treated as an economically significant guidance document. Congress should ensure that these documents go through a robust peer review process which is consistent with the Federal Advisory Committee Act (FACA) and allows for public comment, such as the EPA's Office of Chemical Safety and Pollution Prevention Science Advisory Panel. After peer review and notice and comment, Congress should ensure that each of these documents goes to OMB for coordinated interagency review.

Improve Endangered Species Act (ESA) implementation. Congress mandated, through FIFRA, that the review of pesticides take their benefits into account.[124] However, the ESA does not allow for risk and

benefit balancing, according to the Supreme Court's ruling in *Tennessee Valley Authority v. Hill* (1978).[125] Current implementation of the ESA by the EPA essentially ignores the necessary risk benefit balancing required by FIFRA. Congress should enact an exemption to the Supreme Court's ruling to ensure the continued use of pesticides that are important for public health and food security.

Recognizing the important benefits of pesticides to public health protection and food security, Congress must ensure that EPA pesticide decisions (including registrations and reregistration decisions) are exempt from the provisions of the ESA except in cases where an ecological assessment, conducted by the EPA, makes a preliminary determination that the use of the product is likely to adversely affect a species or critical habitat. Only if a "likely to adversely affect" (LAA) determination is made, should the EPA move forward with informal or formal consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service.

Congress should additionally ensure that emergency exemptions for unregistered uses of pesticides, including under Section 18 of FIFRA, are fully exempt from ESA requirements and are reviewed within 90 days or are automatically granted by default.

Ensure uniform pesticide labeling. Congress should ensure that pesticide labels are uniform and do not create confusion for users based on their location. This means that individual states and localities should not be able to require additional warnings on labels and packaging. Uniformity is particularly important for labeling related to human health assessments, including carcinogenicity and for pesticide use requirements. Congress must reaffirm that the EPA is the sole authority for making safety findings related to pesticides while retaining the states' ability to further regulate the use of these tools.

Reaffirm the importance of state lead agencies. Congress should reaffirm that state lead agencies charged with implementing EPA regulations under FIFRA are the agencies in that state with the authority to regulate the use of crop protection and pest control tools, providing regulatory certainty for farmers, commercial applicators, and small businesses who rely on these tools. A patchwork of localities dictating the use of these tools makes compliance difficult for the

regulated community, and localities often do not have the budgets and resources necessary to ensure adequate pesticide enforcement.

Remove barriers to biotechnology. Plant-incorporated protectants (PIPs) are pesticidal substances produced by plants and the genetic material necessary for the plants to produce these substances. While some PIPs are achieved through conventional breeding and have not been subject to federal regulation, PIPs created using genetic engineering are still subject to regulation under FIFRA. Congress should remove excessive regulatory burdens for plant breeders by exempting from regulation PIPs that are identical to those found in nature.

Recognize the importance of plant biostimulants. Plant biostimulants are substances that support a plant's natural nutrition processes and can thereby improve the efficiency of a plant. Congress should provide a clear definition for plant biostimulants. Developing this definition is a first step towards creating a pathway to avoid an inefficient patchwork of differing laws and regulations at the state level that make innovation and interstate commerce exceedingly difficult.

Create certainty for registration review. The EPA must review each pesticide at least every 15 years to ensure that the pesticide can carry out its intended function(s) without creating unreasonable adverse effects to human health and the environment.[126] To ensure certainty for the marketplace and growers, if this review is not completed on time, an automatic 2-year extension should be provided to allow certainty for the marketplace and growers.

Give some more flexibility for state registrations. Under section 24(c) of FIFRA, states may register an additional use of a federally registered pesticide product, or a new end-use product, to meet special local needs.[127] The EPA has concluded that state registrations that limit or restrict use of pesticides registered by the EPA are beyond the scope of FIFRA section 24(c), and that such registrations should be disapproved.[128] Congress should revise this section of FIFRA to allow state registrations to be more restrictive, as appropriately determined by the state.

Increase coordination between the EPA and USDA. The USDA often provides feedback to the EPA on pesticide registration and

reregistration decisions during a public comment period. While USDA career scientists frequently submit comments that include recommendations on how these actions can reduce the impact on agriculture, while simultaneously protecting human health and the environment, the EPA frequently ignores these recommendations. As such, Congress should amend FIFRA to require further coordination between the EPA and USDA during the pesticide registration and registration review processes.

Provide advanced notification and account for existing stocks. Farmers make decisions related to their input costs, including chemicals and seed varieties to use alongside those chemicals, months before the start of the growing season. When the EPA completes registration review decisions prior to or during the growing season that either restrict the use of a pesticide or requires the implementation of costly and burdensome mitigation measures, it causes additional uncertainty for producers. To prevent any restrictive actions being taken prior to or during the growing season, Congress should amend FIFRA to ensure an advance notification of at least 9 months is required prior to implementing these restrictions.

Additionally, some courts frequently vacate pesticide registrations or tolerances, creating uncertainty for growers who rely on these tools to protect their crops from damaging pests, weeds, and diseases. To minimize the economic impacts when courts vacate registrations or tolerances, Congress should amend FIFRA to provide for a mandatory existing stocks order that allows farmers to continue using pesticides already in the chain of commerce for a specified period of time.

Eliminate duplicative permitting. In some instances, the EPA requires a permit under the Clean Water Act's National Pollutant Discharge Elimination System to use a pesticide that has already been approved for use under FIFRA. Since all pesticides undergo both a human health and an ecological risk assessment before being registered under FIFRA to ensure the use of the pesticide does not cause unreasonable adverse effects to the environment or humans, Congress should remove this duplicative step in the regulatory process.

KEY ISSUE

Reform CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, addresses the cleanup of sites contaminated by releases of hazardous substances.[129] It was signed into law in 1980[130] following public outcry over toxic waste contamination of groundwater, soil, and surface water at several residential communities.[131] One of the most notorious toxic waste sites was Love Canal, a former dumping ground for industrial waste at Niagara Falls in New York that eventually became home to a neighborhood and elementary school.[132]

CERCLA works in combination with another statute, the Resource Conservation and Recovery Act (RCRA), enacted in 1976. Typically, Superfund authority is used to cleanup previously contaminated sites no longer in productive use while RCRA covers the management of contaminants through their lifecycle and regulates releases at currently operating sites.[133]

In 1986, Congress amended CERCLA through the Superfund Amendments and Reauthorization Act (SARA). SARA gave the EPA wider enforcement authority under CERCLA, increased state involvement in Superfund activities, and increased the size of the Hazardous Substance Superfund Trust Fund.[134]

Superfund is implemented by the 10 EPA regional offices and overseen by the Office of Superfund Remediation and Technology Innovation (OSRTI) within the Office of Land and Emergency Management (OLEM).[135]

Potentially responsible parties

CERCLA is intended to ensure that "potentially responsible parties" (PRPs) are held responsible for the remediation of releases hazardous substances on a site. A PRP can be any owner or operator of a site, both past and present, as well as a party who generated, transported, or arranged the transport of waste.[136] PRPs are potentially liable for various cleanup costs and natural resource damages associated with

the site. Courts have interpreted Superfund as imposing strict liability that is retroactive, joint and several. In other words, a PRP can be compelled to cleanup sites based on actions that happened before CERCLA was enacted and can be held liable for the whole cleanup even if other parties were involved and even if all the actions taken were legal at the time.[137]

Hazardous Substance Superfund Trust Fund

To fund cleanups when PRPs cannot be located or no longer exist, CERCLA established the Hazardous Substance Superfund Trust Fund. Originally, the Trust Fund obtained its revenues from a Superfund tax on industries using specific chemicals and appropriations from the Treasury's general fund.[138] The Superfund tax expired in 1995,[139] but was reinstated in 2022 for many chemicals.[140] Recent EPA estimates indicate that approximately $1.2 billion will be collected for FY2024—less than half of the agency's original projection.[141]

National Priorities List

Under the law, the EPA maintains a National Priorities List (NPL) of contaminated sites in need of remediation. These are intended to be the most significantly contaminated sites in the country. New sites are added to the list annually. Many sites remain on the list for a long period of time without action being taken to remediate them.

Recommendations for Congress

Controversies over CERCLA typically concern when and how sites will be cleaned up and then reused, and who will pay for it. Many of the law's provisions cause sites to languish rather than be redeveloped as intended. The transaction costs associated with Superfund sites related to PRP litigation and consulting costs add considerably to the overall time and expense of remediation. While efforts have been made to allow for redevelopment of brownfields[142] (sites that are potentially contaminated or less contaminated than a Superfund site, but for which potential liabilities hinder redevelopment), expeditious redevelopment will require further reforms to the law. The following

are some specific recommendations to modernize CERCLA so that it best achieves the statute's objectives:

Prune the National Priorities List to focus resources on the most important sites. The NPL should be reserved for the sites that are most severely contaminated and would not otherwise be remediated by state or private action. The NPL is meant to prioritize cleanup of the most hazardous sites.[143] However, the current list does not reflect that objective. As of December 2024, there were 1,340 sites on the NPL.[144] Placing too many sites on the list undermines the NPL by diffusing resources and focus. Additionally, once on the list, a site must go through a rigorous planning process under complex National Contingency Plan regulations[145] before remediation can occur. In numerous cases, many years will pass between listing a site and the actual start of remediation.

In short, the current NPL is too inclusive and as a result too little gets done as resources are spread across too many sites. Better gatekeeping by the EPA and more effort focused on alternative cleanup paths can get contaminated properties back on the tax rolls quicker.

One way to keep the list focused on the worst sites would be to eliminate the requirement that the list be updated annually.[146] The worst sites, those that truly belong on the list, will be immediately apparent. The requirement to update the list only causes lower priority sites to be added to the pile during each cycle.

Alternatively, Congress could direct the EPA to raise the Hazard Ranking System (HRS) score required for a site to be eligible for placement on the NPL.[147] Congress also could ensure that the HRS score be a more meaningful measurement of actual risk.[148] Concentrating Superfund activities on fewer sites will result in the most severely contaminated sites receiving the necessary remediation rather than expending the same money and effort across a broader array of partially completed, lower-priority cleanups.

Allow states to assume the responsibility for long term monitoring of sites. The NPL would be more manageable if states were given access to Superfund money by Congress to address sites before placement on the NPL, typically considered the last option. States should also have

more latitude to manage Superfund sites over the long term once the most severe contamination has been remediated and the site is subject to long term monitoring. This begins with allowing sites to be removed from the list if they are under state management. States should also be able to use Superfund money to conduct and oversee cleanups under state law.

The EPA and states should be given the authority to delegate the long-term stewardship of sites subject to monitoring to land trusts, similarly motivated non-profits, or other organizations qualified to manage the site both for beneficial use of the land and environmental monitoring. Use of such organizations will help stretch Superfund dollars while also putting land back into use, either for recreation, wildlife conservation, or other uses of benefit to the local community.

Currently, taking on this responsibility comes with legal liabilities under CERCLA.[149] Creating an arrangement where those attempting to use or improve the land do not become PRPs and are shielded from future liability is essential to allowing land to be put back into use.

RACER Trust is a great example of how an entity can successfully manage a portfolio of contaminated properties to the benefit of many communities.[150] During the 2008-09 financial crisis, General Motors went through chapter 11 bankruptcy. As part of the GM reorganization plan, RACER Trust was established. Funded at nearly $500 million, RACER managed a portfolio of 336 tax parcels (closed plant sites and other unwanted real estate), many of which were contaminated (approximately 60 locations). Its mission was to prepare the properties for redevelopment to help the local economies. It has been a great success story.[151]

One critical key to RACER's success is its ability to manage funds across multiple sites so that cost savings at one site can free up funds for the more difficult sites. That is in contrast to the NPL, where all funds for a site must be used on that site, resulting in delays and limiting the ability to maximize cleanup dollars. Allowing the pooling of monies over a portfolio of sites creates efficiencies in both costs and time. When Congress created Superfund it anticipated sites being cleaned up over a relatively short timeframe. It did not intend the

current situation in which many sites are managed and monitored in virtual perpetuity.

Specify that federal funds are only to be used to meet federal standards. States can use federal funds to meet state cleanup standards that go beyond the federal standards. This should be prohibited. States that want to exceed federal standards are free to do so, however they should use their own funds to meet this objective. Specifying that federal funds are solely for the purpose of attaining federal standards would help ensure that the worst sites are ameliorated first as cleanup standards under CERCLA are already considered protective.[152]

Transfer large river and harbor sites to the Army Corps of Engineers. The Army Corps of Engineers already provides significant assistance on a variety of Superfund programs, but there are some sites, typically large river segments and ports, which would be best served by being transferred fully to the responsibility of the Corps. When control over an issue is divided among several government agencies, progress can often be slowed considerably. Multiple versions of similar paperwork, poor communication between agencies, and the ability to obfuscate ultimate responsibility behind the layers of bureaucracy all come into play.

Harbor sites frequently require significant dredging activities. A prime example is the Portland Harbor site, a 10-mile stretch of the lower Willamette River, added to the NPL in 2000. Nearly a quarter century later, the main in-river remediation remains in the planning stages.[153] Another example is the New Bedford Harbor cleanup, which the EPA presents as a series of successful milestones. Nonetheless, the project began before 2000 and remains a work in progress in December 2024.[154] This cross-agency model is simply not working. These projects would be best managed by the Corps, which has the more relevant skill set suited to the sites' dredging requirements and scale.

Eliminate the Superfund tax. The Superfund tax, which initially expired in 1995, was reinstated as part of the 2021 Infrastructure, Investment, and Jobs Act, and came back into force on July 1st, 2022.[155] This tax should be eliminated. It is a tax "imposed on any *taxable chemical* sold or used by a manufacturer, producer, or importer."[156] Companies that still exist and are responsible for historical releases already bear financial responsibility for their contaminated sites—

this is the crux of the "polluter pays" principle.[157] At the same time, those companies as well as new chemical and refining companies are subject to the Superfund tax. The latter are paying a tax for being in the business of making gasoline and chemicals--not for any connection to actual releases that caused a site to be on the NPL. They are paying for cleanups for which they bear no responsibility.

Worse, many companies that contaminated sites neither pay to remediate nor pay the tax because they no longer exist. Under this tax scheme, the best-behaved companies are forced to bear the costs of the worst-behaved companies. That is not a prudent incentive structure, nor a fair one. The Superfund tax also disadvantages US manufacturers compared to their international rivals and worsens supply shortages for needed chemicals.[158]

Allow simple Good Samaritan projects without triggering CERCLA liability. As it currently stands, CERCLA punishes "Good Samaritans" for trying to improve conditions at a contaminated site. Once a Good Samaritan "touches" a site, it becomes a PRP. That is particularly problematic for the thousands of abandoned hard rock mining sites across the West. Many nonprofit organizations have approached the EPA with proposals to clean up segments of a contaminated stream. Their desire to clean up abandoned hard rock mining sites they did not create is laudable. But they face legal liability for the entire scope of contamination even if all they did was improve conditions at one portion of the site. Additionally, the work they do will likely not be sufficient to meet all the requirements of a CERCLA cleanup. Consequently, to avoid potential liability to clean up the entire site, some potential "Good Samaritans" decline to proceed with any improvement works at all—a classic example of the "perfect" being the enemy of the "good."[159]

This prevents reasonable improvement efforts, such as moving overburden (waste from surface mining such as slag leftover from mineral extraction) from a stream bed or covering an area to prevent rainwater from leaching metals out of waste rock piles. Organizations that would otherwise like to clean up and make improvements are unwilling to do so in the face of the legal threat. This is the sort of project that would help ameliorate the conditions that CERCLA exists

to improve. Unfortunately, the law often unintentionally deters efforts to improve such sites.

In January 2024, Senator Martin Heinreich (D-NM) introduced legislation to create a permit system for Good Samaritans to remediate mine residue without threat of liability, S.2781 the Good Samaritan Remediation of Abandoned Hardrock Mines Act of 2024.[160] A House version, H.R. 7779, was introduced by Rep. Celeste Maloy (R-UT).[161] The bill passed the Senate in August.[162] Similar legislation has been introduced several times.[163]

Create a separate program for uranium mines on tribal lands. During the early days of nuclear weapons development and during the Cold War, miners extracted a large amount of uranium from tribal lands, especially within the Navajo nation. Miners produced almost 30 million tons of ore from Navajo lands over a 32-year period beginning in the 1940s.[164] Uranium mines on tribal lands pose unique challenges under CERCLA. Due to the slow rate of decay for uranium radiation and the stringent CERCLA guidelines established by the National Oil and Hazardous Substances Pollution Contingency Plan, it will take hundreds to thousands of years to achieve near-zero radiation at those sites.

Because of this, it is often difficult for any progress at all to be made. More than a billion dollars is already set aside to clean up these sites.[165] For many sites, the federal government is the responsible party, and the burden from its poor management has fallen on the tribes that own and live on the land. The EPA has been slow to move on those cleanups. A separate program within CERCLA and the NCP to acknowledge the unique nature of this problem would help people living in those areas gain access to quality drinking water.

Allow buyout of "reopeners" for cleaned up sites. Once remediation is complete, a site can be considered closed (although there may still be long-term monitoring in place) meaning that no further cleanup is required. However, CERCLA judicial consent decrees often contain provisions authorizing the EPA to "reopen" a Superfund site and require additional remediation well after cleanup has been completed, leaving PRPs subject to a lingering long-term liability risk that EPA will require more work to be done at a "closed" site at some point in

the future.[166] That may happen, for example, if the EPA obtains new information about the presence or health risks of certain chemicals at the site. Reopeners are not common but occur often enough to create business risk. With the recent designation of Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) as CERCLA hazardous substances,[167] reopeners could happen more frequently.[168]

Compounding PRPs' financial risk from reopeners, the EPA interprets CERCLA §122(b)(3) to require that any money collected at a site must only be used for the purpose of cleaning up that site.[169] Consequently, the EPA is not allowed to use money left over from one site to clean up another site. That inflexibility creates an additional future contingent liability for PRPs as the threat of a reopener looms that is very difficult to resolve.

One possible solution to this issue, one that would likely require an amendment to CERCLA §122(b), would be to allow the EPA to accept a buy-out of those reopener provisions and allow the money to go into a pool for use at any site that is brought into the buy-out program rather than limiting the use of the money to a specific site. Over the Superfund program history, only a limited number of sites have been reopened, so the pooling of the monies from multiple sites will provide a cushion, or a form of insurance, as cash collected from sites that are not reopened is available for the handful that are reopened and may have additional costs above the amount collected and contributed to the pool.

Forty years of cleanup efforts should be sufficient data to determine a viable buy-out number. These buy-outs could go into a general fund that would function like insurance. Essentially, responsible parties would buy out their reopeners and the few sites that are eventually reopened are remediated using the pooled reopener money.

Eliminate the PFOA and PFOS designation. In May of 2024, the EPA finalized a rule that designated PFOA and PFOS as hazardous substances under CERCLA.[170] The rule was unprecedented—the first time the EPA used CERCLA §102 to designate a substance as hazardous. The rulemaking failed to consider several factors.[171] For example, the rule did not properly account for cost or provide

adequate scientific support that the regulations were "appropriate," which is a requirement under §102(a).[172]

The biggest problem with the rule though is that CERCLA is simply not the right tool to regulate PFOA and PFOS. CERCLA's liability regime, which is strict, and joint and several, will pull far more PRPs into the mix than necessary or even useful, subjecting multitudes of sites, both new and reopened, to an avalanche of contribution and cost recovery actions.[173] Moreover, an adequate treatment or destruction method for those substances has not been properly established. Consequently, designation under CERCLA will create an endless legal quagmire without ameliorating this issue.[174] The EPA possesses, and has used, other legal tools, such as the Safe Drinking Water Act, to address PFAS impacts on drinking water aquifers. The EPA should address PFOA and PFOS risks without designating those substances as hazardous under an untested CERCLA provision.

KEY ISSUE

Reform RCRA

The Resource Conservation and Recovery Act (RCRA) enacted in 1976 established the federal program that regulates the management of solid and hazardous waste. It amended the Solid Waste Disposal Act of 1965 to create a much larger and more specific role for the federal government in handling waste.[175] Specifically, RCRA provides the Environmental Protection Agency (EPA) with authority over hazardous waste, "from cradle to grave," meaning the generation, transportation, treatment, storage, and disposal of waste are all under the purview of the statute. RCRA also established a high-level framework[176] for the regulation of non-hazardous wastes, including municipal solid wastes.[177] Subsequent amendments expanded RCRA's scope, stringency, and requirements.

Hazardous and Solid Waste Amendments

The Hazardous and Solid Waste Amendments of 1984[178] effectively required the EPA to phase out the disposal of untreated hazardous wastes in impoundments and landfills. The amendments also created a "corrective action" requirement for facilities that initially filed for a RCRA permit and received interim status, and for RCRA permitted facilities. Corrective action requires facilities to investigate and remediate contamination caused by solid and hazardous waste management activity. In addition, the amendments increased the agency's enforcement authority, imposed more stringent standards for the management of hazardous waste, and created an underground storage tank program.[179]

Superfund Amendments and Reauthorization Act

The Superfund Amendments and Reauthorization Act of 1986, also known as SARA, made further changes to the treatment of underground storage tanks to address leaching from underground storage tanks that hold petroleum and other substances classified as hazardous.[180]

E-Manifest program

In 2012, the Hazardous Waste Electronic Manifest Establishment Act authorized the establishment of the e-Manifest program to track the shipment of hazardous waste electronically. The program launched in 2018 and was intended to save money and man-hours compared to the previously paper-intensive process while making information available in a central hub.[181] Despite the long wait between authorization and rollout and five additional years of implementation, user errors occur so frequently that the EPA issued a compliance advisory in 2023.[182]

Reuse challenges

Presently under RCRA, it is difficult to reuse many waste substances once they have been discarded. This is especially true for coal ash and other substances with reasonable and well documented reuse cases. It is also an issue for pharmaceutical products that may be able to be either reused or reprocessed.

Although the goal of the law is to encourage resource reuse and recycling and thereby reduce waste, the complicated way the law has been implemented and interpreted frequently makes it difficult to achieve Congress' goal of resource reuse. The following recommendations seek to ease and eliminate those unnecessary complexities and complications.

Recommendations for Congress

Clarify the definition of solid waste. RCRA focuses too much on where material comes from rather than focusing on where it is headed. The current definition of solid waste under RCRA as interpreted by the EPA is subjective and reliant upon assessing the state of mind of the disposer. Material qualifies as "solid waste" if it is discarded by being "abandoned" or "inherently waste-like."[183] These concepts are nebulous and leave room for different interpretations that depend to some extent on the disposer's intentions especially as regards to abandonment.[184] Once something is deemed to be a waste, RCRA requirements take hold and seemingly never let go. This is turn makes it unnecessarily complex to productively use material once the RCRA "solid waste" tag has been affixed to it.

"Sham" recycling,[185] where recycled material is ineffective or only marginally effective for its claimed use, is a legitimate concern. However, current restrictions inhibit many legitimate uses, particularly in a world moving towards a "circular economy" where material is constantly reused and regenerated rather than discarded as waste.[186] The "waste" from one process is the feedstock for another manufacturing process.[187] Manufacturers can be discouraged from reusing "waste" instead of a virgin material as a feedstock if that material is subjected to regulatory requirements or designations that do not apply to the virgin feedstock.

Additionally, the law needs to incorporate the ability to "undispose" material. Disposed materials are currently considered to be waste, in perpetuity. RCRA regulations technically do not regulate the actual act of recycling but regulate the material before it is recycled. Designating the material as waste frequently discourages recycling due to the burdensome regulations that follow the material considered a waste.

The law should be based on objective factors about how material is handled and not rely on an evaluation of intention. For example, if the receiver of the material plans to use it as a raw material in its manufacturing process, then the material should now be regulated as a raw material as it is no longer a waste. Factors to look at could include:

- The material is stored in a manner similar to other raw materials.
- The material receives the same accounting treatment as other raw materials.
- The material, like virgin materials of similar kind, is now subject to other environmental regulations.

Flue gas desulfurization (FGD) gypsum provides an example of a product that, although derived from waste, should not be regulated as waste. As part of the effort to control toxic emissions from coal-fired power plants, Clean Air Act (CAA) regulations required the installation of FGD scrubbers to reduce sulfur dioxide emissions. During this process a sludge is created. Utilities quickly found that with some additional oxidation the sludge could be turned into gypsum of a purity superior to that of mined gypsum. However, since the gypsum

came from a treatment process, the EPA considers this material subject to its waste rules for coal ash, or combustible coal residuals (CCR). Consequently, the RCRA rules follow the material all the way through until it becomes wallboard. In contrast, newly mined gypsum, although inferior in purity, moves through the supply chain with no RCRA waste rules attached.[188]

Require regulation of air emissions related to waste management to be addressed under the Clean Air Act. Currently, the EPA has CAA rules that govern solid waste incinerators and RCRA rules that establish control requirements for air emissions associated with waste handling.[189] RCRA should be focused on solid waste management exclusively. The CAA is structured to address air-related emissions from all types of processes including waste handling processes. Rather than covering air emissions under both laws, the CAA—without any RCRA strings—should be the vehicle for governing the emissions from waste management units. That would streamline the regulatory process and consolidate it into one authority. Quite simply, there is nothing unique about air emissions from waste management that the CAA could not handle.

Require all regulation of wastewater discharges to be regulated under the Clean Water Act. Just as the CAA should be the sole source of regulatory controls on air emissions from solid waste landfills and incinerators, so the Clean Water Act (CWA) alone should cover wastewater discharges. To classify them under RCRA is both repetitive, unnecessary, and confusing. Transferring this authority to the CWA exclusively would reduce repetition and ease communication burdens between offices while simplifying the regulatory process.

Allow coal ash reuse as an alternative to current regulation and enforcement. The EPA for many years resisted regulating coal ash under RCRA. In Kingston, Tennessee in 2008 the dike of a large surface impoundment filled with coal ash mixed with water failed sending over 5 million cubic yards of ash into the nearby water system and ultimately to the Emory River channel.[190] The Kingston coal ash pond failure in 2008 eventually culminated in the 2015 coal ash rules. In these rules, the EPA determined to not regulate coal ash as a RCRA hazardous waste under subtitle C, but the final regulations are so

stringent that some requirements as implemented by the EPA exceed the hazardous waste handling requirements.

Recognize benefits of coal ash. There are many useful applications for coal ash, as the EPA acknowledges.[191] For example, fly ash from coal combustion may be used to strengthen concrete, and FGD gypsum may substitute for mined gypsum to make wallboard (sometimes also referred to as gypsum board). About 12.6 million tons of the concrete and 7.6 million tons of the wallboard products are made in this fashion each year, making up a small, but not insignificant portion of the market for these products.[192]

However, when EPA finalized its RCRA rules in 2015, it placed restrictions on some beneficial reuses of coal ash thus creating a barrier to the potential re-use of coal ash in certain circumstances and casting a cloud of regulatory uncertainty over other reuses. RCRA rules should be limited to regulating wastes not beneficial uses. Were a simpler regulatory regime for coal ash reuse established, those uses could be expanded, and others could be added in a manner that both protects the environment and conserves resources. Without clear statutory protection for all beneficial uses, coal ash will end up in long-term storage in a landfill or closed impoundment rather than in productive use.

Make it easier to reuse coal ash. The challenges with coal ash epitomize the inability of RCRA, as administered by the EPA, to effectively create a regulatory regime for material reuse and recycling. For the most part, under RCRA as implemented, certain reuse and recycling activities are permitted by way of exempting those activities. An alternative approach would be, for example, if the EPA, the Department of Transportation and the Department of Energy could coordinate in rulemaking as they do on other rules to certify coal ash management standards that states could implement for reuse in applications such as road material, building material, and a source of critical minerals. Once a coal ash source is designated for reuse, it can be removed from RCRA regulation, and the regulation can be left to the states. State regulation would still cover failure to reuse the ash as promised and other possible misuse situations. This would both lower

the burden of RCRA enforcement and allow the material to go to a useful purpose.

Remove reverse distribution from RCRA and support the circular economy. Pharmacies use the services of reverse distributors to return unsold or non-saleable pharmaceutical products to the manufacturer, wholesaler, or waste disposal facility.[193] Some products that are beyond their expiration date and can no longer be sold in the US can still legally be sold in other markets. Since the product still has economic value in another market, it should be treated the same as any other pharmaceutical in international trade rather than as a waste requiring disposal under RCRA rules.

Moreover, the Food and Drug Administration (FDA) also regulates reverse distributors and can handle redistribution to foreign markets, because pharmaceuticals are not industrial process wastes. Allowing such products to move to those markets reduces waste disposal and benefits consumers. If there are no other markets available for the expired products, then pharmacies and other drug sellers would need to discard the material per applicable RCRA rules. But RCRA need not be applied to both situations.

Eliminate land disposal restrictions. Land disposal restrictions impose technology-based, not health-based, standards on the disposal of RCRA hazardous waste, including the residues from the treatment of hazardous waste; they effectively ban the disposal of untreated RCRA wastes on land.[194] Although in theory intended to prevent additional releases of hazardous materials, land disposal restrictions often result in less optimal modes of disposal that can appear to be treatment for the sake of treatment and not for any measurable environmental benefit. Such restrictions implicitly favor incineration as a disposal method, even when wastes already meet health-based exposure limits and toxic air emissions from incineration could cause harm to health or the environment. Disposal restrictions can also impede recycling, making it more difficult to dispose of incinerator wastes, such as ash containing toxic metals.

Another element of the land disposal restriction that often poses problems is the dilution prohibition that forbids waste handlers from diluting wastes to meet treatment standards.[195] That is, simply

adding water or another material to a waste to make it less toxic is not considered to be a treatment under the law. But in many cases, dilution is a cost-effective way to reduce toxicity to below hazardous levels. Forbidding this option in all cases is unwise.

Repeal and replace the e-Manifest law with a real electronic manifest system and not allow the EPA to create it. When Congress passed the Hazardous Waste Electronic Manifest System law in 2012, it surely did not envision years of inefficiency. To comply, users continue to submit paper manifests produced only by EPA-approved printers, and manually enter data on PDFs prior to submitting to the database.

Rather than use a system of their own creation, the EPA should defer to a more well-developed technology to allow speed, accuracy, and ease of use. Many companies in the technology space could create a system that would be both more user-friendly and more secure than the system currently used by the EPA. Many shipping companies including UPS and FedEx use such systems. FedEx in particular uses location tracking chips for its most sensitive packages. The technology, called SenseAware, provides specific information about the package's location, temperature, and other metrics.[196] Utilizing a system of this kind, providing some additional features and security measures, would better fulfill the aims of the eManifest program.

Conclusion

Americans should rightfully expect to live their lives without having to worry about genuine threats to their well-being from chemicals and hazardous substances. The EPA helps to address these threats. However, the agency also has a history of overstating risk and not using the best science to make decisions. Being too risk-averse can itself cause major harm, such as by limiting the use of chemicals that would improve the overall well-being of the public or that would result in industry using alternative products that are more problematic than what they replace.

A modernized EPA would properly assess risk and science. It would recognize that there are costs and tradeoffs that must inform its regulatory decision-making. Americans should expect thoughtful regulation and to be protected from genuine harms. At the same time, they should also expect that the agency will not promulgate regulations that are far broader and sweeping than what is necessary. The latter of which itself can also create genuine harms. The EPA faces a challenge in identifying when regulation is appropriate and the proper scope of regulation for issues like chemicals and hazardous substances. However, by being committed to careful and thoughtful consideration of risk and costs as well as the objective review of the best available science, the EPA will go a long way to meeting this challenge.

5 BEYOND REGULATION PROGRAM AND ORGANIZATIONAL CHANGES

Daren Bakst

The Environmental Protection Agency's (EPA) regulatory power warrants most of the attention when it comes to modernizing the agency. However, there are numerous non-regulatory programs that should be eliminated or reformed. The spending for many of these programs can help achieve objectives similar to those of unnecessary EPA regulations by getting the private sector, states, and local actors to help meet the goals of the agency.

There are some common problems with many of these programs that are not always the fault of the EPA. Congress too often gives the EPA wide discretion to spend money with insufficient guardrails, effectively creating what amounts to massive slush funds for the agency. A prime example discussed in this chapter is the EPA's Greenhouse Gas Reduction Fund, which is a $27 billion program created through the Inflation Reduction Act (IRA).[1] When Congress gives the EPA (or any agency) too much discretion over how to spend money, it arguably is improperly delegating its spending power to the agency.

The non-regulatory programs of concern that are discussed in this chapter also require the EPA to intrude into issues that are inherently state and local matters, such as education, or are properly addressed by the private sector, such as disseminating information to consumers. Some of these programs do not just entail routine meddling but can also influence how students think about environmental issues and how individuals meet their basic needs such as the food they eat, the places they live, and the transportation choices they make.

Beyond addressing these programs, this chapter recommends three important organizational changes at the EPA that should help reduce waste and duplication as well as help facilitate transparency, fairness, and better communication across the agency.

KEY ISSUE

Eliminate the Greenhouse Gas Reduction Fund

The Inflation Reduction Act (IRA) amended the Clean Air Act (CAA) to create a program requiring the EPA to distribute $27 billion for "green" projects.[2] The agency was required to hand out the money by September 30, 2024.[3] Given that the EPA will have distributed this money before the 119th Congress is able to get it back,[4] the elimination of the program may seem unnecessary. However, Congress amended the CAA for this program and more money could easily be appropriated again for the agency's use.

Under the statutory language,[5] the money is supposed to be spent for zero emission technologies ($7 billion), general assistance ($12 billion), and low-income and disadvantaged communities ($8 billion). In implementing the program, the EPA has developed three different programs, but they do not neatly mirror this statutory language.[6]

For example, one of the three EPA-created programs is the Solar for All program. The agency is going to spend $7 billion to provide solar panels on homes in low-income and disadvantaged communities. Yet, the underlying IRA provision appropriating the $7 billion is supposed to be used on more than just solar. It states that the money should be spent on zero emission technologies, "including distributed technologies and residential rooftops." While the agency can spend on solar, the coverage of the provision is broader in scope, with solar being a subset of what the money can be spent on. If it were supposed to be solar only, Congress would have said this.

Additionally, the EPA has created the National Clean Investment Fund ($14 billion) and the Clean Communities Investment Accelerator program ($6 billion). These two programs authorize the EPA to distribute money to nonprofits that can then distribute money to eligible recipients.

The Greenhouse Gas Reduction Fund provides significant discretion to the EPA as to how to spend the money. It acts like an EPA slush fund. However, it is even worse. It authorizes the EPA to use its slush fund to, in effect, help create slush funds for favored nonprofit

organizations. In implementing the National Clean Investment Fund and the Clean Communities Investment Accelerator program, the EPA exacerbated problems by distributing money to a small number of nonprofit organizations. As a result, the selected nonprofits have billions of dollars to use with limited oversight. Five of the eight selected nonprofits will have about $2 billion or more to distribute.[7] One organization has $7 billion and another $5 billion.[8]

The entire program, which is implemented by the EPA's Office of the Greenhouse Gas Reduction Fund,[9] is rife for abuse and cronyism, especially since so much money will be disbursed by nonprofits that will be very difficult to hold accountable. During a 2024 House Committee of Energy and Commerce oversight hearing, Chair Cathy McMorris Rodgers (R-WA) stated the following regarding the National Clean Investment Fund and the Clean Communities Accelerator program:

> Even more concerning, two of the fund's programs were designed so that the EPA can funnel billions of taxpayer dollars to non-profits who happen to be their political allies that can then fund green projects of their choosing. This is the perfect scenario for cronyism to take hold.[10]

The federal government should not be picking energy winners and losers or subsidizing projects that should be able to secure private capital on their own if they are worthy investments. Further, even for legislators who do not object to the purpose of the program, the way the program operates should be a concern for them and all legislators. The Greenhouse Gas Reduction Fund ignores the fact that Congress and not the EPA has the spending power under the US Constitution. This EPA slush fund to help create nonprofit slush funds disregards basic principles of separation of powers.

Recommendation for Congress

Congress should eliminate the Greenhouse Gas Reduction Fund.

KEY ISSUE

Eliminate environmental education programs

The EPA should focus on improving the environment and not using taxpayer dollars to help indoctrinate students or intrude into areas that states and local communities can address on their own, if they so choose. The EPA claims that environmental education "does not advocate a particular viewpoint."[11] Yet the choices it makes when it selects grant recipients, the issues it chooses to emphasize, and the way it evaluates award recipients tell another story.

In fairness, there is arguably no way for the agency, regardless of administration, to avoid subjective policy and ideological preferences from influencing their choices. In addition, these choices will likely be consistent with the preferences of an administration. These are additional reasons why the EPA's environmental education programs should be eliminated.[12] Specifically, the following should be eliminated:

- Environmental Educational Grants program. According to the EPA, "Since 1992, a total of 3,960 environmental education (EE) grants have been awarded by EPA nationwide for a cumulative total of $95,104,287."[13] The total per year has generally been in the $2 million to $3.5 million range.[14] The money has often gone to educate students or those serving students. Recent projects include engaging schools in climate "action" within an urban area "suffering from the ravages of climate change,"[15] "diversifying the environmental movement,"[16] and "empowering" people to take "environmental action."[17] There is also money for projects "using urban greening initiatives (e.g., tree planting, nature-based solutions, and urban gardening) to help address the impacts of climate change…" and "transforming a state-of-the-art electric bus into a roving electric classroom…"[18]
- Some of these projects reflect not just biases, but apparent efforts to build up environmental activism. This is bad enough. In addition, the hard-earned tax dollars of Americans should not be used for the EPA to fund activities like tree planting or electric bus classrooms. Some people may find such projects to be useful to students, but

if they do, they should contribute their own money to make this happen. It is not something that should be the role of government, and especially not the role of the federal government.

- Presidential Innovation Award for Environmental Educators. The program "recognizes outstanding kindergarten through grade 12 teachers who employ innovative approaches to environmental education and use the environment as a context for learning for their students."[19] This language regarding environment as a context for learning suggests incorporating the environment through a "whole-of-education" approach integrating the environment to unrelated subjects. In fact, one of the selection criteria is "How does the teacher help to integrate environmental education into the broader school curriculum or coordinate environmental education with other teachers and academic subjects?"[20]

  Teachers are evaluated in part by looking at how they use topics like "climate change," "reducing food waste in school cafeterias," "school gardens," and "environmental justice" to teach about environmental sustainability.[21] The agency can use this program as a way to push its own agenda and cover issues that hardly constitute core federal environmental concerns, such as school gardens and food waste in school cafeterias.

Additional programs that should be eliminated are the National Environmental Education Training Program,[22] President's Environmental Youth Award,[23] and National Environmental Education Advisory Council.[24]

There is no reason for the federal government to be involved in any of these educational programs. It is especially troubling when an agency, in this case the EPA, has little oversight and significant discretion to hand out money to shape the views of Americans, starting when they are young children. It could also use the money to help get them in line with the regulatory agenda of the agency.

Recommendation for Congress

Congress should eliminate the EPA's environmental education work.[25]

KEY ISSUE

Eliminate the Office of Community Revitalization and all of its programs

The Office of Community Revitalization runs numerous programs that seek to plan everything from land use decisions to transportation choices to "equitable economic revitalization."[26] These programs, which have little to do with the EPA's statutory objectives and are state and local matters, also overlap in many ways. They reflect heavy-handed federal central planning of basic aspects of the lives of Americans, which is way off mission for the EPA. Even if they were not federal programs, they would be extreme efforts by the government (federal, state, or local), to involve itself in issues should be left to individuals and the private sector. The programs are:

- Local Foods, Local Places. This program has enabled the EPA to partner with communities to do such things as "Making it easier for people to walk or bicycle to farmers markets, food cooperatives, and local restaurants" and "Developing community gardens in walkable, transit-accessible places."[27] The EPA's role is to help protect the environment and these efforts to stretch its role well beyond this core work is another example of it going beyond its mission. As it is, the federal government should not be meddling in local matters such as how people transport themselves to certain food locations. This program also inappropriately picks food and transportation winners and losers.
- Health Places for Healthy People. The program, according to the EPA, "engages with community leaders and health care partners to create walkable, healthy, economically vibrant downtowns and neighborhoods that can improve health, protect the environment, and support economic growth."[28] This initiative has similar problems to Local Foods, Local Places. It puts the EPA into the role of local zoning board and local transportation planner.
- Recreation Economy for Rural Communities. This program "helps communities identify strategies to grow their outdoor recreation economy and revitalize their main streets."[29] Federal taxpayers should not be having their hard-earned dollars going to help build

a recreation economy. The free market should be playing such a role, and to the extent there is any government involvement, it should be states and local government. This program is a prime example of federal waste and the heavy-handed role the federal government plays in even the most basic aspects of our lives.

- Building Blocks for Sustainable Communities. The EPA makes clear that this program is about local land use decisions. EPA staff and agency consultants provide technical assistance on issues such as transportation options and "housing type and location." The program's work has included strategies to support local culture and "successful parking management."[30] Local land use issues should be just that, local. The federal government, and certainly the EPA, should not be working on local parking and helping to advance local culture. In some ways, it is hard to think of more ridiculous federal meddling.
- Smart Growth Network. This appears to cover the agency's smart growth work in general,[31] and it includes programs previously mentioned such as Local Foods, Local Places and Recreation Economy for Rural Communities. "Smart growth" is a pleasant name given to a planning philosophy that is anything but pleasant. It seeks to promote high-density living and limit development.[32] The EPA should not be involved in urban planning in the first place, but advancing policies that aim to influence how and where people live is especially egregious.

Recommendation for Congress

Congress should eliminate the EPA's so-called community revitalization work.

KEY ISSUE

Eliminate EPA's green purchasing programs

The EPA disseminates a significant amount of information about "greener purchasing"[33] in a program[34] it refers to as the Sustainable Marketplace.[35] This does not appear to be a formal program but instead the agency packaging together in one place its green purchasing work.[36]

Some of the EPA's green purchasing work includes running two IRA programs dealing with the embodied carbon of construction materials.[37] According to the agency, embodied carbon "refers to the amount of [greenhouse gas] emissions associated with upstream—extraction, production, transport, and manufacturing—stages of a product's life."[38] The agency's two programs include grants to help measure embodied carbon and to label construction materials with low embodied carbon.

Another aspect of the agency's green purchasing work are ecolabel programs. The EPA has ecolabels that "address energy efficiency, water efficiency, products safer for human and environmental health, refrigerant emissions, vehicles emissions, and recycled materials."[39] These labels are EnergyStar, Safer Choice, SmartWay, Significant New Alternatives Policy (SNAP), Comprehensive Procurement Guideline (CPG), and WaterSense. The agency also manages a list of recommended ecolabels and standards.[40]

These green purchasing programs assume the federal government needs to meddle in the marketplace by providing its seal of approval on what it deems to be environmentally satisfactory products. If consumers demand certain information, then businesses will respond by disseminating this information to them. If there is a need to create a labeling program to ensure credibility and consumer confidence, then private certification organizations should play such a role.

Recommendation for Congress

Congress should eliminate the EPA's green purchasing programs and related work.

KEY ISSUE

Eliminate the Office of Climate Adaptation and Sustainability

The Office of Climate Adaptation and Sustainability is a new office within the EPA's Office of Policy. It "focuses broadly on the impacts of climate change on the environment and the sustainability of communities and businesses and leads ongoing efforts to coordinate across EPA and the federal government on these issues." Regardless of the climate angle, this is yet another example of the EPA getting involved in issues that should be left to local communities, and for this program, businesses.[41]

Recommendation for Congress

Congress should eliminate this office and its work.

KEY ISSUE

Eliminate EPA programs to electrify vehicles and equipment

The EPA is not just using regulation to help eliminate gas-powered vehicles and equipment. It also has spent billions of dollars to lead a shift towards electric vehicles and equipment. This includes:

- Clean Heavy-Duty Vehicles Program. This program, created through the IRA, provides the EPA $1 billion to fund zero-emission heavy-duty vehicles and charging infrastructure, and training for drivers and mechanics on electric vehicles,[42] among other things.[43]
- Clean School Bus Program. The Infrastructure Investment and Jobs Act[44] provides the EPA a total of $5 billion for the adoption of "clean" school buses and zero-emission (i.e., electric) school buses.[45] Electric school buses cost about three to four times more than diesel-powered school buses.[46] The money for this program must be expended from fiscal years 2022 through 2026.
- Clean Ports Program. The IRA amended the CAA to create a new program[47] to fund zero-emission port equipment or technology.[48] The provision appropriates $3 billion to be spent by September 30, 2027.[49] The EPA though is already planning to award the $3 billion by the end of 2024.[50] Regardless, this program amends the CAA and should be eliminated so the program will not be replenished with even more money.
- Deisel Emissions Reduction Act. Congress passed the Deisel Emission Reduction Act in 2005, giving the EPA authority, as the agency states, "to accelerate the upgrade, retrofit, and turnover of the legacy diesel fleet."[51] Some of this money has gone to the push for electrification, such as electrifying parking spaces[52] and buying electric tractors.[53] This program[54] is broad in scope and covers everything from ports equipment, school buses, to locomotives.[55]

These programs fail to properly consider costs, the unreliability of electric vehicles,[56] and infrastructure obstacles.[57] They do not respect the decisions made by local governments, businesses, or other buyers to make the best vehicle and equipment choices to meet their needs.

Further, the buyers of the vehicles and equipment should not be subsidized in these purchases.

Recommendation for Congress

Congress should eliminate all EPA programs to fund the electrification of goods, including vehicles and equipment, and other programs to upgrade vehicle fleets.

KEY ISSUE

Reform environmental justice programs

There are numerous concerns regarding the EPA's environmental justice programs and how the agency applies this nebulous and ever-expanding concept.[58] The Biden administration has taken to a new level the conflation of environmental justice with civil rights issues. It has also made equity a central component of the EPA's environmental justice work, and its work in general, including featuring it prominently in its FY 2022-2026 strategic plan.[59]

The administration took the unprecedented step of creating a new office combining the agency's existing environmental justice work with much of its civil rights work. The EPA explained that the new Office of Environmental Justice and External Civil rights "is the latest significant action under President Biden's aggressive approach to embed environmental justice, civil rights, and equity across the government."[60]

Congress, through the partisan-enacted IRA, has also exacerbated problems. The IRA amended the CAA to create the Environmental and Climate Justice Program. The funds for this $3 billion program must be awarded to nonprofits, local governments, and other eligible parties by September 30, 2026.[61] Some of this money is going to help local activists and community organizers to push their agendas.[62] Examples include money for communities to have "meaningful involvement in the offshore wind (OSW) development process in the Gulf of Maine" and to "engage New Haven high school students in at least 200 paid jobs as environmental justice problem-solvers."[63] Another example includes giving money to educate residents "on how to advocate for their community's best interest in dialogue with government and private entities over siting, permitting and other decisions affecting their environment."[64] The federal government in general[65] should not be funding activism and community organizing, and in this case likely helping to advance the ideological objectives of the EPA and certain special interests.[66]

The EPA is also using IRA money for the Environmental Justice Thriving Communities Grantmaking Program. According to the

agency, it has selected 11 nonprofits to "serve as pass-through entities nationwide" in allocating $600 million.[67] This is yet another EPA slush fund for nonprofit slush funds.

Recommendations for Congress

Return the agency's environmental justice and civil rights work to where it was before. A new administration could do this on its own, but Congress should ensure that these two issues are not centralized into one office, as it is now. This would include sending the work back to the Office of the Administrator and Office of General Counsel, where it was before the Biden administration.[68]

Eliminate the Environmental and Climate Justice Program and any related programs. Congress should repeal this IRA program that is using money to help activists and to create nonprofit slush funds. The federal government does not need to be intruding into areas that should be left to private organizations and local communities.

Clarify the concept of environmental justice. The EPA's work should help *all* Americans and if it does its job properly, then it will do just that.[69] If there is the continued use of "environmental justice," the concern should focus on all communities, including low-income communities.[70] When distributing assistance, such as drinking water grants,[71] the agency should prioritize communities at greatest risk of suffering direct environmental harms. More important, the concept of environmental justice should first and foremost focus on how the agency itself is taking actions that have a disproportionate effect on communities, especially low-income communities, such as through driving up prices, reducing housing options, and limiting mobility.

Eliminate the use of "equity" throughout the agency's environmental justice work and across the agency. This is yet another issue easily addressed by a new administration. However, Congress should clarify that equity (as opposed to equality)[72] is not part of any valid conception of environmental justice and prohibit the agency from embedding the use of equity throughout its work.

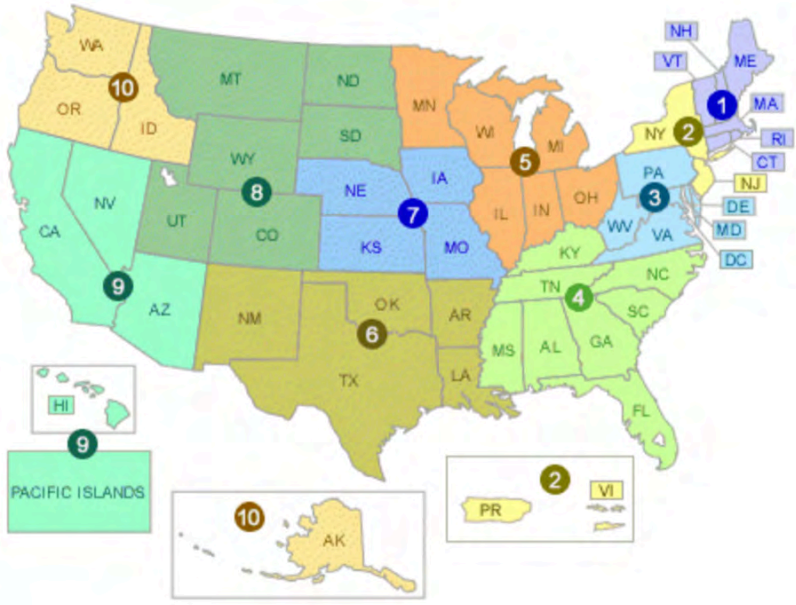
KEY ISSUE

Reform the regional offices

The EPA has 10 regional offices throughout the United States that help to execute the agency's work (see the map below).[73] These offices were created to help the EPA better address and understand the specific environmental needs and concerns of different areas of the country.[74] They are also supposed to effectively coordinate with the state governments in their region that are implementing federally delegated programs. The regulated community and states tend to see this as a vital function. Recognizing the differences between states and regions consistent with the goals of cooperative federalism is something that the EPA should make a leading objective. Further, by being closer to the those affected by the EPA's work, agency officials can be more responsive and develop a better understanding of the challenges on the front lines instead of all work being managed from the Washington, DC headquarters office.

One risk of this approach is that different regional offices can interpret laws and regulations differently, leading to inconsistency across the regions. While one-size-fits all approaches can be problematic, consistency in the application of the law is important. Furthermore, the organization of the regions and their general approaches to enforcement should be similar, so that regulated industry is able to navigate without idiosyncratic differences. For example, the Trump administration's EPA helped to ensure that the organizational structure of EPA regional offices generally aligned with each other and the structure of the EPA headquarters office. At the time, each regional office had a different structure. This structural change should help the agency facilitate communication, increase consistency, and make it easier for interested and affected parties to better understand the workings of the regional offices.[75]

EPA's Regional Offices



Source: EPA.

Recommendations for Congress

Regularly review whether regional offices are serving their purpose. Congress should regularly use the oversight process to evaluate whether the regional offices are properly respecting the lead role that state environmental agencies have in implementing our nation's environmental laws, facilitating better environmental outcomes, helping to develop more timely and flexible processes, such as with permitting and compliance, respecting due process and treating regulated parties fairly, and working well with all interested parties. In addition, Congress should ensure that there are not glaring inconsistencies in the application of federal environmental laws across the Regions that undermine the mission of the agency.

Move or consolidate offices. Some of the regional offices are in very expensive cities, such as San Francisco, New York, and Chicago.

Congress should direct the Government Accountability Office (GAO), in consultation with the EPA, to explore the savings and effects of moving regional offices to less expensive cites. One likely positive outcome would be to make it easier to attract and retain employees. Any new locations should certainly be easily accessible and appealing to potential employees. As part of this analysis, GAO should also examine the potential of consolidating regional offices (or reducing their size) and whether it can be done without sacrificing any benefits of the agency being closer to the people affected by its work.

Create more political appointee positions. To help develop consistency and for the agency to fulfill the objectives of an administration, whatever the party, Congress should add some more political appointee positions in the regional offices. Currently, only the regional administrator who oversees each region is consistently a political appointee.

KEY ISSUE

Eliminate OECA and shift its work to other offices

The EPA has a stand-alone office called the Office of Enforcement and Compliance Assurance (OECA) to enforce the statutes administered and implemented by the agency.[76] This office is comprised not only of inspectors and investigators but also lawyers that report to the Assistant Administrator for OECA.

There are various problems with this structure. It can lead to miscommunication between OECA, the program offices (e.g. Office of Water, Office of Air and Radiation), and the Office of General Counsel on important legal and regulatory matters. OECA can even take legal positions that are inconsistent with the program offices, the General Counsel, and an administration.[77]

Enforcement decisions should not be made within a vacuum independent of broader agency and regulatory objectives. A stand-alone office with enforcement as its primary mission can result in a singular short-term mindset of winning big cases and big settlements that can work at cross-purposes with other agency officials who are seeking to best protect the environment.

This does not mean that the EPA should not make enforcement a top priority. The opposite is true. The best way to have strong and effective enforcement is to have good communication, consistent positions, and recognition of the many factors that need to inform enforcement decisions, from agency and administration priorities, the objectives of the regulatory programs, respect for the rule of law, and fairness.

Recommendations for Congress

Eliminate the Office of Enforcement and Compliance Assurance and move existing OECA attorneys to the Office of General Counsel and OECA non-attorneys to the program offices. The enforcement and compliance work should be shared between the program offices and the Office of General Counsel, with both playing a lead role but the

latter having final say on legal interpretation in consultation with the Administrator.

Place greater emphasis on compliance assistance. Without losing the objective of strong and reasonable enforcement, Congress should place greater emphasis on compliance assistance so that fewer enforcement actions are necessary in the first place. After all, the goal is for regulated parties to meet their legal obligations. If they are doing so without having to take enforcement actions, then this is beneficial for the environment and the agency.

KEY ISSUE

Require transparency in the EPA budget

It is very difficult to ascertain how the EPA spends its money. The agency's own budget documents do not help matters. The most obvious way to organize the budget that best informs the public and policymakers about agency spending would be by showing the amount of funding each office receives, how they spend these funds, and the underlying statutory authority for the spending.[78]

Yet the EPA budget summary is not organized in this common-sense manner. The latest budget summary, the EPA's "FY 2025 Budget in Brief," is indicative of how the agency has regularly developed its budget summaries in an opaque manner.[79] It is organized by cross agency strategies and agency goals, making it unhelpful to figure out what the agency is doing. To provide some context as to how unhelpful this document is, the office that generates the agency's greatest regulatory costs, the Office of Air and Radiation, is not mentioned once in the document.[80]

The agency's "justification of appropriation" documents to Congress do provide some spending figures by major office in a useful chart "EPA Budget by National Program Manager and Major Office," but this by itself does not provide further details on what these offices are doing.[81] Readers are required to go through the extensive justification document to try and piece together the specific work these offices are doing and how money is being spent to accomplish this work. This is not just difficult, but it also appears to be impossible to get anything close to a complete picture given the lack of information.

In fairness to the EPA, Congressional appropriations legislation[82] for the EPA does not follow the office-by-office organization either. Whether the lack of transparency is caused by the appropriations process for the EPA, the agency's own opaque budget information, or both is unclear. Regardless, the lack of transparency is a problem that needs to be addressed.[83] If Congress is going to provide the necessary oversight for the EPA, it needs better information regarding how the agency is conducting its business, including how it is spending money.

This is not an impossible task. Other agencies disseminate budget information in a useful and logically structured manner. In a 2017 report, Myron Ebell, then-Director of the Competitive Enterprise Institute's Center for Energy and Environment wrote about the EPA budget:

> In submitting its annual budget justification, the EPA should use the same rational format employed by other agencies, which clearly identifies the spender, how much they spend, and the legal basis for the spending. Only when Congress can follow the money can it exercise its power of the purse to effectively oversee agency policy making.[84]

This recommendation remains just as important today.

Recommendation for Congress

Require the EPA to provide a transparent budget. Congress should require that EPA budget information be presented in "the same rational format employed by other agencies," as Ebell stated. To clarify, this is not simply a question of disseminating the necessary information, but also a question of presenting information in a useable manner for both the public and policymakers.

Conclusion

Congress should ensure that the EPA is focused on protecting Americans from genuine environmental harms. This is not merely about limiting the agency's regulatory abuses. It is also about ensuring that the agency is not using funding in a manner not intended by Congress.

However, it is not always about agency abuse. Congress has too often created slush funds for the agency, giving far too much discretion to how the agency spends money. It has also created programs that divert the agency's focus into areas that it should not be involved in, such as environmental education.

Legislators should look beyond regulation and carefully review the non-regulatory programs it has created and the broad spending authority it has provided the EPA. For those advocating a heavy-handed federal role dealing with the environment, regulation is just one tool to achieve their objectives. Spending is another tool, one playing a far more prominent role, as seen with the Inflation Reduction Act.

To properly modernize the EPA, Congress must be willing to address spending and make organizational changes to the agency, including the elimination of non-regulatory programs.

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 καλά.

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 Krimsky. 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 McKitrick, *Check the Numbers: The Case for Due Diligence in Policy Formation*, Fraser Institute, February 2009, pp. 3-4, https://www.rossmckitrick.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 McKitrick, 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 McKitrick, *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 ($\mu g/m^3$). Animal studies may use concentrations up to 1,000 $\mu g/m.^3$ 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 $PM_{2.5}$ level in Washington,

D.C. during 2020-2022 was 8.6 μg/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/MarloLewisCompetititiveEnterpriseInstituteSupplementalnotice.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 McKitrick (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.200503-443OC.

- 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.org/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. Xinhaunet, "Beijing life expectancy hits 82.2 years," February 21, 2019, http://www.xinhuanet.com/english/2019-02/21/c_137840135.htm#:%7E: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/recipients.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 McKitrick, "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 Stands: 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 McKitrick (2012), *Check the Numbers,* p. 28.

129. McCullough and McKitrick (2012), *Check the Numbers,* p. 29.

130. McCullough and McKitrick (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.

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. McKitrick 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. McKitrick 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.bigdataelearning.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/m^2), 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/m^2 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. USGRCP, *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 ±0.04°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 CO_2 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. CEI Senior Fellow Ben Lieberman worked on the Regional Haze Program and AIM Act sections.

2. 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.

3. Clean Air Amendments of 1970, Public Law No. 91-604, December 31, 1970. https://www.congress.gov/bill/91st-congress/house-bill/17255/text.

4. 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.

5. 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. 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.

6. 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.

7. 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/.

8. 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.

9. 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.

10. 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.

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

12. "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 (NO_2), ground-level ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2).

13. 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.

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

15. 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.

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

17. The PM2.5 (24-hour) standard did increase by 1 percent from 2010-2023, but the PM2.5 (annual) standard declined by 15 percent, and direct PM2.5 emissions declined by 11 percent in that same time period.

18. What is Ozone, Environmental Protection Agency, accessed October 24, 2024, https://www.epa.gov/ozone-pollution-and-your-patients-health/what-ozone.

19. 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.

20. "EPA Finalizes NAAQS for Particulate Matter," Environmental Protection Agency, accessed October 24, 2024, https://www.epa.gov/newsreleases/epa-finalizes-naaqs-particulate-matter.

21. "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).

22. "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.

23. "Easy to read-The European Union," The European Union, accessed October 24, 2024, https://european-union.europa.eu/easy-read_en.

24. 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.

25. 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.

26. "What are Hazardous Air Pollutants," Environmental Protection Agency, accessed October 24, 2024, https://www.epa.gov/haps/what-are-hazardous-air-pollutants.

27. "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.

28. "What are Hazardous Air Pollutants," Environmental Protection Agency, accessed October 24, 2024, https://www.epa.gov/haps/what-are-hazardous-air-pollutants.

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

30. 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 Breath 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/.

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, https://trumpwhitehouse.archives.gov/wp-content/uploads/2019/12/2019-CATS-5885-REV_DOC-2017Cost_BenefitReport11_18_2019.docx.pdf.

32. 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.

33. 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.

34. 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, https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/2015_cb/2015-cost-benefit-report.pdf. There was no final 2016 report and more recent reports do not appear to have the same 10-year analysis.

35. 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 . f. 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.

36. 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."

37. "Regulation Rodeo," American Action Forum, accessed October 24, 2024, https://regrodeo.com/.

38. 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/.

39. 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/.

40. 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.

41. 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.

42. 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/.

43. 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.

44. 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/.

45. 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.

46. "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.

47. 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.

48. 42 U.S. Code § 7604, accessed October 24, 2024, https://www.law.cornell.edu/uscode/text/42/7604.

49. 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.

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

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

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

53. 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 Russellyn 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.

54. 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.

55. 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).

56. 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/.

57. 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.

58. 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.

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

60. 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.

61. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

62. 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.

63. 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.

64. "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.

65. 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.

66. 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.

67. "Greenhouse Gas Reduction Fund," Environmental Protection Agency, accessed October 25, 2025, https://www.epa.gov/greenhouse-gas-reduction-fund.

68. 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.

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

70. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

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.

72. 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.

73. 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.

74. See Chapter 1.

75. 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.

76. "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.

77. 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.

78. 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/.

79. 42 U.S. Code § 7416, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7416.

80. 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.

81. "NAAQS Table," Environmental Protection Agency, accessed October 25, 2024, https://www.epa.gov/criteria-air-pollutants/naaqs-table.

82. 42 U.S. Code § 7409, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7409.

83. 42 U.S. Code § 7409, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7409.

84. 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.

85. *Mississippi v. EPA*, 744 F.3d 1334 (D.C. Cir. 2013), https://caselaw.findlaw.com/court/us-dc-circuit/1652053.html.

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

87. 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/.

88. 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.

89. Congressional Research Service, *Background Ozone: Challenges in Science and Policy*, January 31, 2019, https://crsreports.congress.gov/product/pdf/R/R45482/1.

90. 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.globalenergyinstitute.org/sites/default/files/2023-11/Air-Quality-Fact-Sheet_%20US%20Chamber%20GEI%20Final%2011.3.23.pdf.

91. "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.

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. 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. "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.

95. 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#/.

96. 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.

97. 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.

98. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

99. 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.

100. "Petitions for Rulemaking," Environmental Protection Agency, accessed October 25, 2024, https://19january2017snapshot.epa.gov/aboutepa/petitions-rulemaking_.html.

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. 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.

103. 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.

104. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

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

106. There may be risk considerations as well, such as with NAAQS, which inform whether to regulate.

107. This is in no way suggesting greenhouse gases are a pollutant.

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.

110. 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.

111. 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.

112. 42 U.S.C. § 7521(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

113. 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-%200803.pdf.

114. 42 U.S. Code § 7604, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7604.

115. 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.

116. 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.

117. 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.

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

121. 42 U.S. Code § 7507, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7507.

122. "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.

123. 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.

124. "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.

125. "About South Coast AQMD," South Coast Air Quality Management District, https://www.aqmd.gov/nav/about, accessed October 28, 2024.

126. "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.

127. 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.

128. "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.

129. 42 U.S.C. § 7543(e), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7543.

130. 42 U.S.C. § 7543(e)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7543.

131. 42 U.S.C. § 7543(e)(2), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7543.

132. 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.

133. Nonroad engines or vehicles subject to the current authorization process should instead be preempted under 209(e)(1).

134. "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.

135. "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.

136. "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.

137. 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.

138. 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.

139. 42 U.S. Code § 7521, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7521.

140. 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).

141. 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/.

142. 42 U.S. Code § 7411, accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7411.

143. 42 U.S.C. § 7411(a)(1), accessed October 25, 2024, https://www.law.cornell.edu/uscode/text/42/7411.

144. 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.

145. 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/.

146. 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/.

147. 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.

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

149. 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/.

150. 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.

151. 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.

152. "Energy Policy Act of 2005," H.R. 6, 109th Congress, https://www.govinfo.gov/content/pkg/PLAW-109publ58/pdf/PLAW-109publ58.pdf.

153. 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.

154. 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."

155. 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.

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.

157. 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.

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

159. 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.

160. 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.

161. 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.

162. 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/.

163. 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.

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 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.

165. 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.

166. 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.

167. 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.

168. 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.

169. *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.

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

171. *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.

172. 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.

173. 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-subchapI-partC-subpartii-sec7491.htm.

174. 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.

175. Id.

176. 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.

177. 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.

178. 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.

179. 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-section7675(a)&num=0&edition=prelim.

180. Id., §7675(e).

181. 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.

182. 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.

183. 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.

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

185. 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.

186. 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.

187. 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/.

188. 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 (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 | 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 Enviros Decide to Sue Poultry Farmer over His Birds." *Pacific Legal Foundation*, October 14, 2014, accessed October 17, 2024, https://pacificlegal.org/epa-enviros-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; and Angela Logomasini, "CPSC's Scientific Shenanigans on Phthalates," Competitive Enterprise Institute OpenMarket Blog, March 18, 2015, https://cei.org/blog/cpscs-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; Laura N. Vandenberg, Maricel V. Maffini, Carlos Sonnenschein, Beverly S. Rubin, Ana M. Soto, "Bisphenol-A and the Great Divide: A Review of Controversies in the Field of Endocrine Disruption," *Endocrine Reviews*, 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.

23. Jeffry 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%2FL.

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=CjwKCAjwyfe4BhAWEiwAkIL8sG3dgba1VLIvmnKA7tSJOY3hRr4PnQJPy-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=CjwKCAjwyfe4BhAWEiwAkIL8sG3dgba1VLIvmnKA7tSJOY3hRr4PnQJPy-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/inforeg/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 Managemen*t, 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 Quinoñes, "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 hazard 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. "Greenhousee 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. "Greenhousee 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 Busses 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?Dockey=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?Dockey=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 (EJCPS) 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?Dockey=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. Lauretta 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.

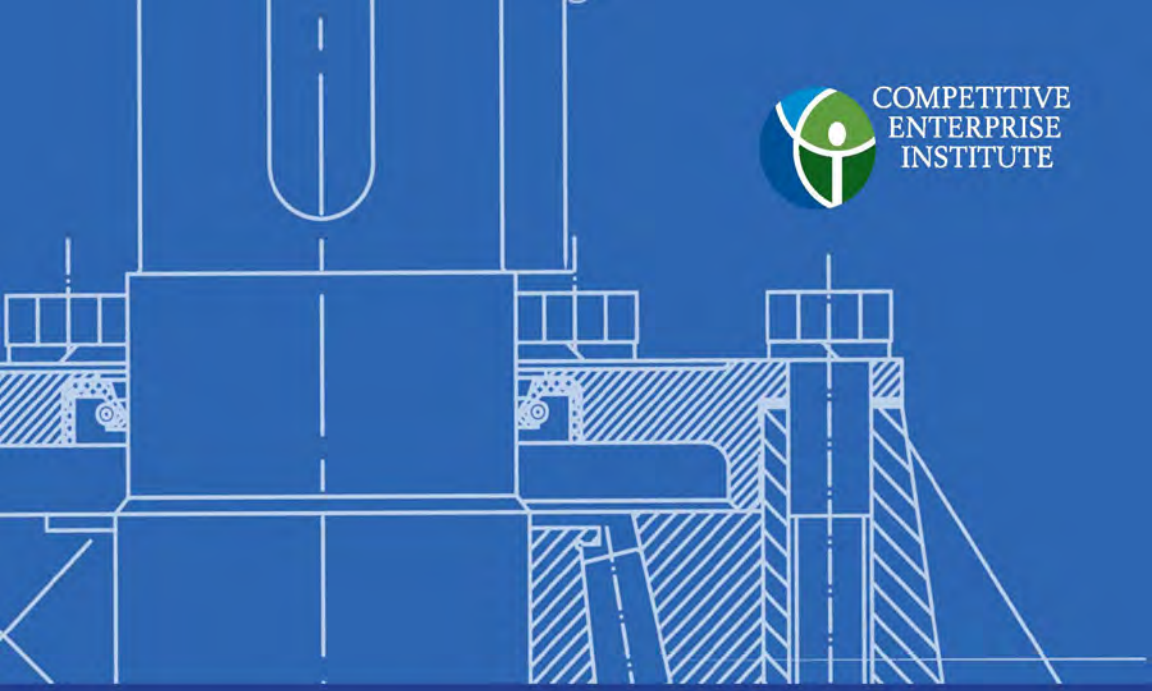
80. Environmental Protection Agency, "FY 2025: EPA Budget in Brief," https://www.epa.gov/system/files/documents/2024-03/fy-2025-epa-bib.pdf.

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.



COMPETITIVE ENTERPRISE INSTITUTE

The Competitive Enterprise Institute promotes the institutions of liberty and works to remove government-created barriers to economic freedom, innovation, and prosperity through timely analysis, effective advocacy, inclusive coalition building, and strategic litigation.

COMPETITIVE ENTERPRISE INSTITUTE
1310 L Street NW, 7th Floor
Washington, DC 20005
202-331-1010