Ignoring Implementation Costs of the Clean Air Act: A Costly Mistake

Patrick A. McLaughlin

1. Introduction

The Clean Air Act (CAA) in its present form is a complex and opaque[1] 465-page document. Inside this document is one of the CAA's primary goals—to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population."[2] Congress mandated that the Environmental Protection Agency (EPA) must establish ambient air quality standards for each air pollutant that "cause[s] or contribute[s] to air pollution which may reasonably be anticipated to endanger public health or welfare."[3] Some CAA titles give an express grant of authority to the EPA to consider implementation costs in considering its regulatory actions.[4] There is no such express grant for National Ambient Air Quality Standards (NAAQS), and the Supreme Court interpreted the CAA to prohibit the EPA Administrator from considering implementation costs.[5] Rather, the EPA's primary guideline in setting NAAQS is that it must set a standard that protects human health and allows "an adequate margin of safety."[6]

Some have cited the EPA's inability to consider costs as a victory for human health and welfare.[7] Reality is quite the opposite—setting NAAQS without considering costs could eventually lead to scenarios where EPA policies actually reduce human health

[1] Andrew P. Morriss, *The Politics of the Clean Air Act*, *in* POLITICAL ENVIRONMENTALISM: GOING BEHIND THE GREEN CURTAIN 263, 264-65 (Terry L. Anderson ed., 2000).
[2] Clean Air Act, 42 U.S.C. § 7401(b)(1) (West 2010).
[3] *Id.* at §§ 7409(b)(1), 7408(a)(1)(A).
[4] See *Id.* at §§ 7412(g)(2) (mandating the use of maximum achievable control technology).
[5] Whitman v. Am. Trucking Ass'ns, Inc. 531 U.S. 457, 468 (2001).
[6] Clean Air Act, § 109(b)(1).
[7] Brief for Environmental Defense, American Public Health Association, et. al. as Amici Curiae Supporting Cross-Respondents, Am. Trucking Ass'ns, Inc. v. Browner, (No. 99-1426), 2000 WL 1299554.

and welfare. Every time the EPA sets a new ambient air quality standard, the resources devoted to compliance with the new standard necessarily have an opportunity cost because they take resources away from other uses. As a result, the allocation of scarce resources in the economy is forcefully altered, with more resources devoted to clean air activities at the expense of other investments. While improving air quality can impart health benefits, so can investing in health care research, buying safer cars, paving potholes, or reducing childhood diabetes. When considering new CAA regulations, the EPA should consider the costs of its actions and choose whichever action is most beneficial to society. Sometimes the most beneficial action may be not to create a regulation and instead allow the resources that would have been used for compliance to be used elsewhere. Amending the CAA to state that the EPA Administrator should consider implementation costs in setting NAAQS would allow the Administrator to carefully consider whether the EPA's regulatory actions improve human health and welfare. Tools for economic analysis of regulations such as cost-benefit analysis, cost-effectiveness analysis, and risk-risk analysis would help the EPA in making its regulatory decisions. However, in order to use these tools, the EPA must be empowered to consider costs when setting NAAQS.

2. Background on the CAA

The political process that created the current version of the CAA and other environmental legislation over the past four decades has led one previous EPA Administrator, Alvin Alm, to compare the legislation to an archaeological dig in which "[e]ach layer represents a set of political and technical judgments that do not bear any relationship to other layers."[8] Another former Administrator, William Ruckelshaus, stated that the EPA suffers from "battered agency syndrome" because it is "not sufficiently empowered by Congress to set and pursue meaningful priorities, deluged in paper and lawsuits, and pulled on a dozen different vectors by an ill-assorted and antiquated set of statutes."[9] The sentiments of these former Administrators are regularly echoed by regulators, academics, and environmental practitioners, some of whom have called every incarnation of the CAA since 1967 "overly cumbersome," "peculiarly complex and obscure," and "opaque."[10]

Despite the CAA's complexity and obscurity and the EPA's difficulty administering it, air quality has improved.[11] As of 2007, the concentrations of the six common air pollutants for which the EPA sets national air quality standards (criteria pollutants) had decreased significantly compared to both 1980 and 1990.[12] For example, EPA data, as shown in Figure 1, suggest that in 2007 the amount of carbon monoxide in the air had decreased by 76% since 1980 and by 67% since 1990.[13] Additionally, airborne lead has decreased by 94% since 1980 and by 78% since 1990.[14] In fact, the air

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[8] Alvin Alm. U.S. EPA. 1990. *EPA Journal* 13 (September/October). Washington, DC: U.S. EPA, *in* ECONOMIC ANALYSES AT EPA: ASSESSING REGULATORY IMPACT (Richard D. Morgenstern ed., Resources for the Future 1997).

[9] William D. Ruckleshaus, Speech at the Environmental Law Institute (Oct. 18, 1995), *quoted in* Morgenstern, *supra* note 8, at 56-57.

[10] Morriss, *supra* note 1, at 264-65.

[11] Press Release, National Academies' National Research Council, Clean Air Act Is Working, But Multipollutant, Multistate Approach and Stronger Focus on Results Are Needed to Meet Future Challenges (Jan. 29, 2004), *available at* http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=10728.

[12] Morriss, *supra* note 1, at 264-65.

[13] *See Air Trends: Basic Information*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/air/airtrends/sixpoll.html (last updated Apr. 1, 2010); *infra* Figure 1.

[14] *Id.*; *infra* Figure 2.

concentrations of all criteria pollutants[15] have decreased by more than 20% since 1980 even though the economic activities creating those pollutants have increased.[16]

These statistics raise an important question: if air quality has improved under the CAA, why have so many bemoaned its shortcomings to the point where an EPA Administrator has proposed rewriting the CAA?[17] The answer is simple: The CAA may not be efficient, or even cost-effective, in improving overall human health and welfare. Surely some of the improvement in air quality is due to the CAA. However, other factors, such as technological innovation, the threat of lawsuits, and consumer demand for environmentally friendly goods and services have likely contributed to air quality improvement too. In fact, the downward trend for many pollutants may actually predate federal control of those pollutants, indicating that federal regulations are not the only cause of the reduction.[18] Nevertheless, it is possible that the resources devoted to improving air quality under the CAA could have improved human health and welfare to a greater degree in alternative investments. This possibility is true even if one assumes for the sake of argument that the improvements in air quality are entirely attributable to the CAA. Furthermore, even if the CAA has been relatively efficient and cost-effective so far, future regulation under the CAA may generate scenarios in which society is worse off than it would be without the regulation.

3. Assessing the CAA

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[15] The six criteria pollutants are carbon monoxide, ozone, lead, nitrogen dioxide, particulate matter, and sulfur dioxide, *Air Trends: Basic Information*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/air/airtrends/sixpoll.html (last updated Apr. 1, 2010); *infra* Figure 2.

[16] *Air Trends: Basic Information*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/air/airtrends/sixpoll.html (last updated Apr. 1, 2010); *infra* Figure 2.

[17] Juliet Eilperin, *EPA Tightens Pollution Standards*, WASH. POST, March 13, 2008, at A1.

[18] Morriss, *supra* note 1, at 263, 264, 268; Indur Goklany, *Empirical Evidence Regarding the Role of Federalization in Improving U.S. Air Quality*, *in* THE COMMON LAW AND THE ENVIRONMENT, 27, 39, 48 (Roger Meiners and & Andrew P. Morriss eds., 2000).

Many EPA regulations generate considerable costs and therefore require some portion of society's limited resources.[19] For CAA regulations, the primary reason compliance costs are incurred is ostensibly to promote public health and welfare by, for example, averting adverse health effects of air pollution such as asthma or lung cancer.[20] However, those resources allocated to CAA compliance could be used in other activities that improve human welfare. Therefore, when evaluating the CAA's success, one must ask whether the resources used to comply with the CAA could improve human welfare better if allocated elsewhere.

Many difficulties arise in attempting to determine whether the resources used for CAA compliance could be better used elsewhere in society. First one must define "resources used to comply with the CAA," including all direct and indirect compliance costs arising out of its regulations. Direct compliance costs include research and development expenditures and capital costs, such as operation and maintenance costs. The cost of CAA compliance also includes a host of indirect costs: legal and lobbying actions for and against further regulation; production, trade, and consumption forgone as a result of decreased economic activity in the regulated industries; and decreases in economic activity in seemingly unrelated industries, as the effects of higher costs in one industry ripple through the entire economy. The result of these direct and indirect costs is that total compliance costs are almost always greater than the direct costs to the regulated industry itself.[21]

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[19] W. Kip Viscusi et al., *Economics of Regulation and Antitrust* 741 (4th ed., MIT Press 2005).

[20] Clean Air Act, § 101(b)(1).

[21] It is theoretically possible, although highly unlikely, that the direct costs to the regulated industry equal the total costs for a society. Of course, this is not to say that regulatory intervention necessarily has a negative welfare effect. Indeed, in accordance with the theory of the second best, it may sometimes be socially optimal for policymakers to offset one market failure by creating a second market failure (e.g.,

It seems to be a common misconception that the costs of environmental regulation fall only on polluters. However, while emitters of air pollutants bear some costs, ultimately all of society pays some of the CAA's compliance costs.

The second difficulty in determining the CAA's success is clarifying the CAA's goal in setting NAAQS—to improve human health and welfare.[22] As mentioned previously, the CAA directs the EPA Administrator to set NAAQS at a level that protects human health "allowing an adequate margin of safety."[23] Additionally, the Supreme Court's interpretation of the CAA prohibits the administrator from considering implementation costs when setting NAAQS.[24] Prohibiting cost consideration could lead to the creation of ambient air quality standards that actually harm human health and welfare, rather than enhance them. Thus, failing to consider costs could undermine the CAA's goal of improving human health and welfare. Instead of prohibiting cost consideration, regulators would better serve the public interest by considering as much information as possible about a regulation's effects. The following section details some analyses the EPA Administrator could apply when considering costs.

4. Types of regulatory analysis

Three methodologies could help decide whether a regulation harms or helps human health and welfare: cost-benefit, cost-effectiveness, and risk-risk. Cost-benefit analysis weighs the overall benefits of a variety of policy choices against their overall costs, and most significant federal regulations pertaining to human health and welfare use

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through regulatory action implementing a command-and-control regulation). *See* R.G. Lipsey & Kevin Lancaster, *The General Theory of the Second Best*, 24 REVIEW OF ECONOMIC STUDIES 11-32 (1957).

[22] Clean Air Act, § 108(a)(1)(A), 42 U.S.C. § 7408 (West 2010).

[23] Clean Air Act, § 109(b)(1).

[24] Whitman et. al. v. Am. Trucking Ass'ns, Inc., 531 U.S. 457, 468-70 (2001).

this standard.[25] Cost-effectiveness analysis assesses ways of achieving a fixed goal. Risk-risk analysis recognizes that a regulation that reduces health risk of one sort may increase health risk of another sort and analyzes the tradeoff.

One form of risk-risk analysis is health-health analysis, which highlights the relationship between health and wealth. For example, health-health analysis studies the tradeoffs regulations create when the regulations attempt to decrease health risk yet simultaneously decrease private expenditures on other health risk reducing activities. The sections below use each type of analysis to evaluate the success of the current CAA, given the policy of not considering costs in setting air quality standards.

4.1 Cost-benefit analysis

Cost-benefit analysis attempts to monetize all relevant costs and benefits of a policy. There are necessarily ranges of uncertainty, and sometimes it can be impossible to monetize certain costs or benefits. Nevertheless, applying cost-benefit analysis to regulations informs policymakers, regulators, and the public about their choices. Creating a costly regulation entails sacrificing some other economic activity. In some cases, the benefits of a regulation may be so large that it is worth creating the regulation and sacrificing the benefits of the forgone activities. In other cases, the costs may outweigh the benefits so greatly that regulators decide against creating the regulation.

Cost-benefit analysis tries to determine the value of regulatory outcomes to consumers, typically through revealed preferences or contingent valuation. CAA

[25] Executive Order 12866 directs Federal agencies in the Executive Branch to conduct regulatory analysis of economically significant rulemakings at §6(a)(3)(c). Circular A-4 provides guidance on how to perform regulatory analysis, which is to include "an evaluation of the benefits and costs of the proposed action." See Circular A-4, OFFICE OF MANAGEMENT AND BUDGET, P. 2 (2003).

regulations should attempt to improve human health and welfare as a primary goal.[26] Thus, those regulations' cost-benefit analyses include the monetized value of expected improvements in health as a result of the regulation. For example, the EPA recently conducted a regulatory impact assessment of the revisions to NAAQS for lead. The assessment includes estimates of the adverse health impact of high blood lead levels on the cognitive function of children. In its cost-benefit analysis, the EPA included the calculated monetized benefits of each hypothetically avoided case.[27]

On the other hand, costs of a regulation can include direct costs, such as the engineering, operations, and maintenance costs of adding pollution controls to a factory, as well as indirect costs, such as the opportunity cost of physical and human capital devoted to compliance with the regulation, and general equilibrium costs incurred by the reallocation of resources from some previous set of goods and services to pollution control activity.[28] Cost-benefit analysis helps regulators and policymakers select regulations and policies with positive net social benefits. Furthermore, cost-benefit analysis can identify uncertainties of the costs and benefits of different policies, and it can identify areas where new information may be valuable for evaluating policies.[29]

Economists in the government, academia, and the private sector have applied cost-benefit tests to federal regulations. One relatively recent paper on the costs and benefits of federal regulations estimates that of the seventy-six final regulations the paper

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[26] Clean Air Act, § 101(b)(1).

[27] U.S. ENVTL. PROT. AGENCY, REGULATORY IMPACT ANALYSIS OF THE PROPOSED REVISIONS TO THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR LEAD (2008), *available at* http://www.epa.gov/ttn/ecas/regdata/RIAs/finalpbria.pdf.

[28] *See* Michael Hazilla and Raymond J. Kopp, *Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis*, 98 JOURNAL OF POLITICAL ECONOMY 853-873 (199), (contrasting private costs of environmental regulation with social costs calculated in general equilibrium analysis).

[29] Robert W. Hahn & Patrick Dudley, *How Well Does the Government Do Cost-Benefit Analysis?* (AEI-Brookings Joint Center For Regulatory Studies, Working Paper No. 04-01, 2005).

studied, thirty-two did not pass a cost-benefit test, meaning that nearly half the regulations analyzed cost society more than the benefit conferred.[30] In fact, many regulations are promulgated after they fail to pass cost-benefit tests in the government's own analyses of the regulations' impact on the economy if promulgated. For example, when the EPA revised the NAAQS for ozone in 1997, the EPA published a regulatory impact analysis that estimated the net benefits of full attainment of its proposed ozone standard would produce "net benefits ranging from negative $1.1 billion to negative $8.1 billion" in 1990 dollars.[31] This example is not to suggest that cost-benefit analyses should be the only consideration when creating a new regulation. Instead, cost-benefit analysis can inform all relevant parties about the consequences of taking a certain action and compare that action to its alternatives.

4.2 Cost-effectiveness analysis

An alternative to cost-benefit analysis is cost-effectiveness analysis. To some degree, cost-effectiveness removes some subjective judgment from the analysis because the alternatives that are examined in a cost-effectiveness analysis are limited to a common objective.[32] While results of cost-benefit analysis may vary depending on, for example, beliefs about technological innovation and how to monetize benefits anticipated from a regulation, cost-effectiveness analysis can cirvument such difficulties by simply comparing the costs of different ways of achieving some fixed goal.[33] For EPA

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[30] John F. Morrall, *Saving Lives: A Review of the Record*, 27 J. RISK & UNCERTAINTY 221, 237 (2003).

[31] U.S. ENVTL. PROT. AGENCY, EPA'S REGULATORY IMPACT ANALYSES (RIA) FOR THE 1997 OZONE AND PM NAAQS AND PROPOSED REGIONAL HAZE RULE,. ES-20 (1997), *available at* http://www.epa.gov/ttn/oarpg/naaqsfin/ria.html.

[32] Henry M. Levin and Patrick J. McEwan, COST-EFFECTIVENESS ANALYSIS: METHODS AND APPLICATIONS (2nd edition, 2001).

[33] *See* Circular A-4, *supra* note 25, (stating on p. 11 that "cost-effectiveness analysis is designed to compare a set of regulatory actions with the same primary outcomes (e.g., an increase in the acres of

regulations, one easily understood and comparable goal is the cost of a statistical life saved.

As noted earlier, the CAA mandates that the EPA Administrator should set NAAQS for air pollutants that endanger public health or welfare.[34] Statistical lives saved is a health outcome that regulators typically cite as evidence of a regulation's benefits. Incorporating scientific and medical studies on criteria pollutants' effects on human health, analysts statistically model the number of human lives that would be saved by full or partial compliance with the regulation. For example, according to the EPA, particulate matter can cause premature death in individuals with heart or lung disease.[35] Reducing the concentration of particulate matter in the air may avert some of those premature deaths.

Since 1981, a number of significant environmental regulations have included some estimate of statistical lives saved.[36] Therefore, it is possible to review those regulations and determine each regulation's cost per statistical life saved. Table 1 presents a summary of findings from three reviews; however, not every review produced an estimate of the cost of a statistical life.

Estimates of the cost per life saved vary across regulations and years. The average estimated cost per life saved ranges from $4.8 million to $67.7 billion (in year 2000 dollars).[37] Variance exists as well across studies estimating the same regulation's

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wetlands protected) or multiple outcomes that can be integrated into a single numerical index (e.g., units of health improvement)."

[34] Clean Air Act, § 109(b)(1), 42 U.S.C. § 7409(b)(1) (1977).

[35] US ENVTL. PROT. AGENCY, *available at* http://www.epa.gov/air/particlepollution/health.html.

[36] Robert W. Hahn, Sheila M. Olmstead & Robert N. Stavins, *Environmental Regulation in the 1990s: A Retrospective Analysis*, 27 HARV. ENVTL. L. REV. 377, 414 (2003).

[37] *See generally* Robert W. Hahn, Sheila M. Olmstead & Robert N. Stavins, *Environmental Regulation in the 1990s: A Retrospective Analysis*, 27 HARV. ENVTL. L. REV. 377 (2003) (surveying environmental regulations in the 1990s); W. Kip Viscusi, Jahn K. Hakes & Alan Carlin, *Measures of Mortality Risk*, 14 J.

costs per life saved.[38] However, most of that variance occurs for very high-cost regulations (greater than $20 million per statistical life saved).[39] Estimates for moderate-to-low cost regulations are consistent across the studies.[40]

Table 1 is useful in understanding the opportunity cost of environmental regulations. If policymakers were allowed to consider information on regulations' implementation costs, then they would be better able to decide where to allocate scarce resources. For example, knowing that a regulation may cost many billions of dollars per statistical life saved could induce regulators to rethink such a rule. Allocated elsewhere, those billions of dollars may save more lives.

4.3 Risk-risk analysis

The third standard used to decide whether a regulation harms or helps human health and welfare is risk-risk analysis. Risk-risk analysis offers an alternative to the cost-benefit method of converting "health outcomes into a monetary metric."[41]

When creating regulations designed to reduce risk, a clear policy objective should be that the regulation actually reduces overall risk. Thus, one should consider risks broadly. Such a perspective is prudent because when "one is solely concerned with risk reduction, it [is not always] desirable to set risk regulations at their most stringent level."[42] Reducing one risk to nothing may have the paradoxical effect of increasing

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RISK & UNCERTAINTY 213, 228-29 (1997); John Morrall, *Saving Lives: A Review of the Record*, 27 J. RISK & UNCERTAINTY 221 (2003) (reviewing the cost-effectiveness of saving lives from 76 different regulations). Because the cost estimates in these three articles are stated in different base year dollars, all estimates have been converted to year 2000 dollars using the Bureau of Labor Statistics Consumer Price Index.

[38] *Id.*

[39] *Id.*

[40] *Id.*

[41] W. Kip Viscusi, *Risk-Risk Analysis*, 8 J. RISK & UNCERTAINTY 5, 5 (1994).

[42] *Id.*

overall risk. Risk-risk analysis is useful in this regard because it studies the risk tradeoffs that may arise from setting risk regulations.

One type of a risk-risk tradeoff occurs when a policy poses multiple risks. For example, in the 1970s, the Food and Drug Administration (FDA) considered saccharin, an artificial sweetener, a potential carcinogen.[43] As a result, the FDA considered banning saccharin.[44] A ban to reduce the risk of cancer, however, might have led to an increase in a different sort of health risk—obesity. If saccharin, a relatively low-calorie substitute for sugar, is unavailable, some individuals may use sugar or other high-calorie sweeteners instead.

A second type of risk-risk tradeoff occurs when a policy or regulation induces changes in behavior. A classic example of this tradeoff is mandatory airbags in cars. Some individuals may drive faster in cars equipped with airbags because they feel more secure. As a result, while using airbags may decrease health risks for the driver, faster driving speeds may increase in health risks for pedestrians.[45]

A third type of risk-risk tradeoff occurs when regulatory expenditures lead directly to increases in risky economic activities. For example, some injuries and deaths may occur in the process of manufacturing and installing pollution control equipment that was required by an environmental regulation.[46]

Another type of risk-risk tradeoff is the health-health tradeoff. When regulations take resources away from other uses, that reallocation may negatively affect individual

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[43] Laszlo P. Somogyi, *Food Additives,* HANDBOOK OF FOOD SCIENCE, TECHNOLOGY, AND ENGINEERING, 83-1, 16-17 (Y. H. Hui ed., CRC Press 2006).

[44] *Id.*

[45] Roger LeRoy Miller, Daniel K. Benjamin & Douglass C. North, THE ECONOMICS OF PUBLIC ISSUES, at 8 (13th ed. 2003).

[46] Viscusi, *supra* note 41, at 6.

health and welfare because of a necessary reduction in spending on other goods and services. Health-health analysis points to a relationship between wealth and health, where health is measured by mortality risk and morbidity risk.[47] As Lutter and Morrall point out in their 1994 article:

> Compliance with costly regulations affects the consumption of risk-reducing goods and services in the same way as a wealth decline. Spending on compliance necessarily reduces the resources that may be spent on all other goods and services. The effective size of the [economic] pie being smaller, less of it is put to the purchase of health and safety.[48]

Put differently, the health-health tradeoff occurs because regulations aimed at reducing one health risk may simultaneously increase some other health risk by inducing a reduction in the consumption of health risk-reducing goods and services. Because efforts to reduce target risk in one area may lead to increases in other health risks, there can be a mortality cost resulting from regulatory actions. That mortality cost may outweigh the health benefits of a regulation. To be sure, health-health analysis paints a sometimes bleak picture of the reality of some regulations: costly regulations, regardless of their intention, can sometimes induce fatalities.[49] As former Office of Management and Budget economist, John Morrall, describes, this health-health tradeoff may lead to situations where the reduction in consumption of health risk-reducing goods and services costs lives. According to Morrall, a "key cutoff point [for assessing regulations] is where cost-ineffective regulations do more harm than good. Because resources are used to produce the benefits of risk reducing regulation, there is an opportunity cost to spending

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[47] Randall Lutter and John F. Morrall III, *Health-Health Analysis: A New Way to Evaluate Health and Safety Regulation*, 8 J. RISK & UNCERTAINTY 43, 44 (1994).
[48] *Id.*
[49] *Id.*

that can be measured in risk reduction."[50] Morall and his colleagues estimate in 2002 dollars that "a diversion of $21 million induces one fatality.[51]

Morrall finds that twenty-seven of the seventy-six regulations studied in his 2003 paper cost more than the $21 million per statistical life saved and therefore "cause more harm than good."[52] Sometimes the cost of reducing mortality risk of some activity (such as drinking contaminated water) through regulation *increases* mortality risk because of offsetting decreases in other activities, such as health care consumption. Morall points out that, although 70% of the EPA regulations he studied (16 of the 23 EPA regulations in the sample)were cost-ineffective using the $21 million cutoff, "[o]ne should not generalize . . . that, in particular, environmental regulations as a whole are cost-ineffective."[53] Some EPA regulations may indeed have been cost-effective.[54] Rather, the point is that risk-reducing regulations, including many CAA regulations, may in fact increase risk. Careful analysis prior to the enactment of a new regulation and ongoing study of its effects after a regulation's promulgation can help regulators and policymakers understand whether that is the case. Unfortunately, EPA's statutory authority severely restricts its ability to use this type of analysis prior to setting an ambient air quality standard.

Since the EPA's establishment of ozone and particulate matter standards in 1971, the pollutants' air concentrations have decreased.[55] Achieving further reductions in both

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[50] John F. Morrall III, *Saving Lives: A Review of the Record*, 27 J. RISK & UNCERTAINTY 221, 232 (2003).

[51] *Id.*, *citing* Lutter et al., *The Cost-Per-Life-Saved Cutoff for Safety-Enhancing Regulations*, 37 ECON. INQUIRY 599 (1999) (finding that government regulations that spend more than $15 million per life saved on balance kill more people than they save).

[52] Morall, *supra* n. 50, at 232.

[53] *Id.*

[54] *Id.* at 233.

[55] Morriss, *supra* note 1, at 267-68.

particulate matter and ozone is likely to become more costly per unit of pollutant as the ambient air quality standards become more stringent. This increase in cost reflects the economic principle of increasing marginal costs: Eventually, the cost of a further reduction in a unit of particulate matter, lead, ozone, or any criteria contaminant is greater than the benefits of that reduction. Under the current interpretation of the CAA, however, the EPA Administrator cannot consider whether costs outweigh benefits.[56]

Additionally, ozone and particulate matter appear to be non-threshold pollutants, meaning that it is unlikely that there is a specific level at which scientists could state, with certainty, that they posed no health risk. As a result, every so often, during a mandatory review of the NAAQS for ozone and particulate matter, the EPA may tighten the standards, regardless of whether that tightening results in tremendous economic costs and only miniscule benefits. Under the current law, the possibility of achieving any public-health benefit, no matter how tiny, is the only hurdle the EPA must clear in order to set a more stringent NAAQS; implementation costs do not matter.[57] Prior to instituting environmental regulations, the EPA should consider the costs of achieving the stated goal of the regulation and whether that goal could be more efficiently realized. As a leading text on regulation put it, "[R]egulatory agencies should be cognizant of the harm that is

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[56] *See Whitman*, 531 U.S. at 486.

[57] *Id. See also* Brief of Amici Curiae AEI-Brookings Joint Center for Regulatory Studies, Kenneth J. Arrow, Elizabeth E. Bailey, William J. Baumol, Jagdish Bhagwati, Michael J. Boskin, David F. Bradford, Robert W. Crandall, Maureen L. Cropper, Christopher C. Demuth, George C. Eads, Milton Friedman, John D. Graham, Wendy L. Gramm, Robert W. Hahn, Paul L. Joskow, Alfred E. Kahn, Paul R. Krugman, Lester B. Lave, Robert E. Litan, Randall W, Lutter, Paul W. Macavoy, Paul W. McCracken, James C. Miller 1Il, William A. Niskanen, William D. Nordhaus, Wallace E. Oates, Peter Passell, Sam Peltzman, Paul R. Portney, Alice M. Rivlin, Milton Russell, Richard L. Schmalensee, Charles L. Schultze, V. Kerry Smith, Robert M. Solow, Robert N. Stavins, Joseph E. Stiglitz, Laura D'Andrea Tyson, W. Kip Viscusi, Murray L. Weidenbaum, Janet L. Yellen, and Richard J. Zeckhauser, In Support of Cross-Petitioners, Am. Trucking Ass'ns, v. Browner, 531 U.S. 457 (2001) (No. 99-1426); Richard J. Pierce, Jr., *The Appropriate Role of Costs in Environmental Regulation*, 54ADMIN. L. REV. 1237 (2002).

done when they fail to take costs into account. The concern of economists with cost is not a professional bias, but ultimately has a link to individual welfare."[58]

5. Future regulatory choices under the CAA

Despite the EPA's inability to consider costs in setting NAAQS, CAA regulations may have produced positive net benefits thus far. The EPA produced their own cost-benefit analyses of the CAA and concluded that between 1970 and 1990 the Act's benefits totaled between $5.6 and $49.4 trillion, while the direct costs were only $523 billion.[59] Some have doubted the EPA study's validity, questioning the EPA's methods and assumptions.[60] Regardless of the study's validity, the fact that air pollution levels have decreased so dramatically over the last few decades implies that, barring some dramatic advancements in technology, marginal costs of additional improvements will soon exceed marginal benefits, if they do not already. As the authors of one review of the influence of economics on 1990s environmental policymaking point out, "[e]missions of many air and water pollutants declined dramatically from 1970 to 1990, when the 'low-hanging fruit' among air and water quality problems were being addressed."[61] They support this point with the example of lead reduction in gasoline.[62] After the 1987 shift to unleaded gasoline, the EPA did little to further reduce lead emissions.[63]

Importantly, whether EPA's cost-benefit analyses of previous CAA regulations were valid is immaterial when deciding whether to create new regulations. The regulations promulgated so far under the CAA may or may not have produced positive

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[58] W. Kip Viscusi et al.,*supra* note 19.
[59] *The Benefits and Costs of the CAA, 1970 to 1990*, ENVTL. PROT. AGENCY (Oct. 1997), *available at* http://www.epa.gov/air/sect812/copy.html.
[60] *See* Robert W. Hahn, *The EPA's True Cost*, AM. ENTER. INST. (June 27, 1996), http://www.aei.org/publications/pubID.6699/pub_detail.asp.
[61] Hahn, Olmstead, and Stavins, *supra* note 36, at 379.
[62] *Id.*
[63] *Id.*

net benefits, but at some point further regulation under the CAA will be more costly than beneficial because of increasing marginal costs. Instead of relying on historical estimates, regulators should consider the additional costs necessary to achieve a higher level of air quality and the additional benefits of doing so. Alternatively, regulators should consider cost-effectiveness and determine how many statistical lives will be saved, and at what cost per statistical life.

Performing cost-benefit analyses in hindsight by aggregating the effects of regulation over a twenty-year period does not inform regulators about the cost and benefit of additional regulation. For this, the EPA must examine each regulation, both before and after its promulgation, as the costs and benefits of implementing it could differ severely from those of regulations promulgated in the past.

Graphing the data in Table 1 illustrates the important concept of increasing cost per statistical life saved of environmental regulation. Environmental regulations are in fact becoming increasingly costlier per statistical life saved. Figure 3 plots the yearly average estimate of the cost per statistical life saved for every regulation reviewed by two or more of the studies listed in Table 1. For example, Table 1 lists three environmental regulations promulgated in 1986. The average estimates of the cost per statistical life saved for each of the three regulations is $18.1, $28.3, and $378.4 million. Averaging those three figures yields $141.8 million, which is plotted as the average cost per statistical life saved for regulations promulgated in 1986.

Examining Figure 3, there appears to be a clear upward trend in the cost per statistical life saved as the EPA promulgates additional environmental regulations over time. This development demonstrates the concept of increasing marginal costs for EPA regulations.[64] In theory, increasing marginal cost of environmental cleanup must eventually occur in a world where all other relevant factors, including technology, are held constant.[65] In fact, Figure 3 demonstrates that marginal cost has increased despite advances in technology. Over the timeframe shown in the graph, technology has advanced considerably, but that only serves to emphasize the costliness of environmental regulations. The fact remains that over time, environmental regulations cost increasingly more per statistical life saved, taking into account increases in technology.

If the EPA Administrator continues to set NAAQS without considering implementation costs, then society will eventually be made worse off, if it is not already. The costs of compliance with stricter and stricter regulations, including the costs of developing new pollution control technologies and monitoring pollution output, may eventually increase. The resources used to comply with additional regulations could be used elsewhere, and if the alternative uses present greater benefit than that of stricter air quality regulations, then government will have failed its constituents.

6. Conclusion

One way to prevent a scenario in which setting NAAQS makes society worse off is to amend the CAA. Specifically, Congress could amend the CAA to state that the administrator should consider the costs of compliance, including risk-risk tradeoffs and opportunities forgone, when setting NAAQS. Such an action would allow the EPA to use the tools that are already at its disposal to help inform its regulatory decisions. Cost-benefit analysis, cost-effectiveness analysis, and risk-risk analysis are just a few of the

[64] However, the regulations reviewed may not fairly represent all EPA regulations due to the sample size and the uniqueness of each regulation.
[65] *See* Alfred Marshall, PRIINCIPLES OF ECONOMICS (8th ed., 1920); Viscusi et al, *supra note* 19.

tools that could help regulators make decisions that are more likely to benefit society, and to avoid options that make society worse off.

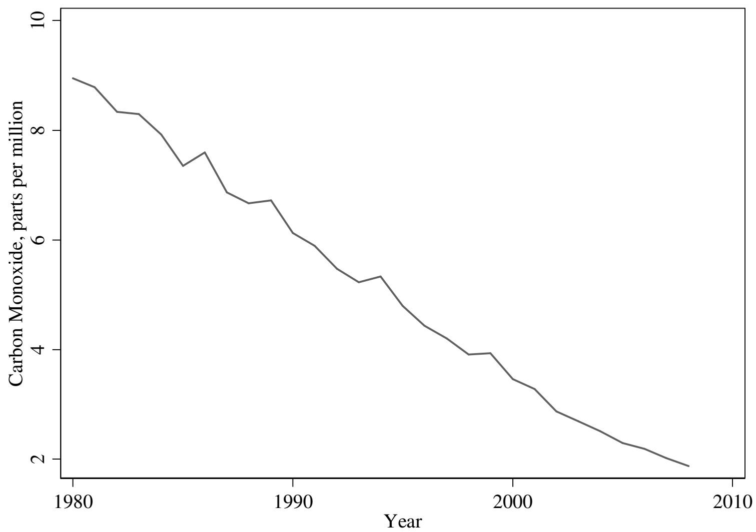
Of course, cost consideration has its own tradeoffs. A cost-consideration requirement when setting NAAQS may lead to an even greater number of legal challenges, given the CAA's history and the possibility of legal challenges to EPA rulemaking. This potential increase in litigation would increase court costs and delay implementation of pollution-reducing technologies. Conversely, if the EPA could consider costs, it might set NAAQS in a manner more acceptable to regulated entities. As a result, these entities would comply more quickly and challenge the regulations less often. While this outcome is uncertain, basic economic theory suggests that setting NAAQS without considering implementation costs will eventually lead to rules that cost society more than the benefit conferred. Indeed, such a point may have already been reached.

Table 1: Cost per statistical life saved of environmental regulations, millions (2000 dollars).[66]

Regulation	Year	Hahn et al.	Morrall	Viscusi et al.	Average
Benzene NESHAP (original: fugitive emissions)	1984	5		4.6	4.8
NOx State Implementation Plan (SIP) Call	1998		5.7		5.7
Ethylene dibromide in drinking water	1991		5.7	7.7	6.7
Benzene NESHAP (revised: coke by-products)	1988		6.1	8.2	7.2
Standards for radionuclides in uranium mines	1984	11	6.5	4.6	7.4
Arsenic emission standards for glass plants	1986		18	18.2	18.1
Arsenic/copper NESHAP	1986		25.6	31	28.3
Hazardous waste listing of petroleum refining sludge	1990		27.5	37.2	32.3
Cover/move uranium mill tailings (inactive)	1983		26.5	42.6	34.6
National prim. & sec. drinking water regs., Phase II	1991	28	47.4		37.7
Benzene NESHAP (revised: transfer operations)	1990		33.2	44.3	38.7
Cover/move uranium mill tailings (active sites)	1983		50.2	60.6	55.4
Asbestos ban	1989	21	73.9	148.9	81.3
Benzene NESHAP (revised: waste operations)	1990		170.6	226.2	198.4
Land disposal restrictions for third scheduled waste	1990	215			215
Sewage sludge disposal	1993	215	502.4		358.7
Hazardous waste: solids dioxin	1986	226	530.8		378.4
1,2-dichloropropane in drinking water	1991			878.4	878.4
Land disposal restrictions, Phase II	1994	1,030	2,464.5		1,747.2
Hazardous waste land disposal ban	1988	452	1,042.7	5,636.9	2,377.2
Drinking water, Phase V	1992	10,800	18,009.5		14,404.7
Municipal solid waste landfills	1988			25,702.6	25,702.6
Atrazine/alachlor in drinking water	1991			123,851.4	123,851.4
Solid waste disposal facility criteria	1991	40,700	94,786.7		67,743.4

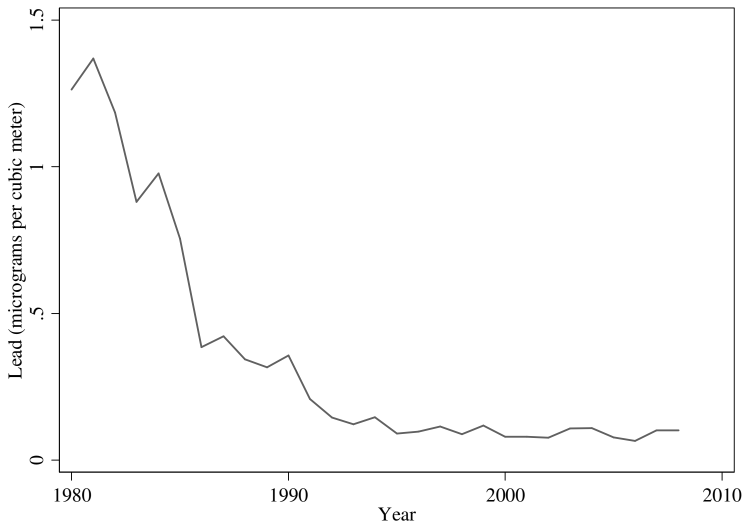
[66] Sources: Robert W. Hahn, Sheila M. Olmstead, & Robert N. Stavins, *Environmental Regulation in the 1990s: A Retrospective Analysis*, 27 HARV. ENVTL. L. REV. 377, 414 tbl.4 (2003); John F. Morall III, *Saving Lives: A Review of the Record*, 27:3 J. RISK & UNCERTAINTY, 221, 231 tbl.2 (2003); W. Kip Viscusi, Jahn K. Hakes, & Alan Carlin, *Measures of Mortality Risk*, 14 J. RISK & UNCERTAINTY, 213, 228-29 tbl.9 (1997). Data from Morrall and Viscusi et al were adjusted to year 2000 dollars using the US Bureau of Labor Statistics's average Consumer Price Index for years 2002 and 1994, respectively. See http://stats.bls.gov/cpi/.

Figure 1. National average carbon monoxide concentrations over time.[67]



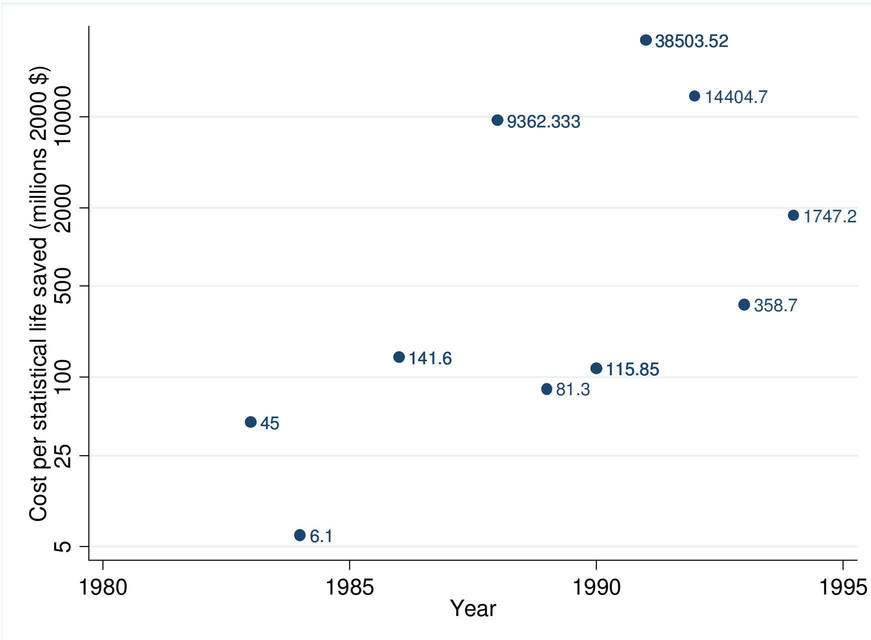
[67] *Air Trends: Carbon Monoxide*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/air/airtrends/carbon.html (last visited Nov. 10, 2010).

Figure 2. National average airborne lead concentrations over time.[68]



[68] *Air Trends: Lead*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/air/airtrends/lead.html (last visited Nov. 10, 2010).

Figure 3. Cost-effectiveness of some major EPA regulations on logarithmic scale.[69]



[69] *See*: Robert W. Hahn, Sheila M. Olmstead, & Robert N. Stavins, *Environmental Regulation in the 1990s: A Retrospective Analysis*, 27 HARV. ENVTL. L. REV. 377, 414 tbl.4 (2003); John F. Morall III, *Saving Lives: A Review of the Record*, 27:3 J. RISK & UNCERTAINTY, 221, 231 tbl.2 (2003); W. Kip Viscusi, Jahn K. Hakes, & Alan Carlin, *Measures of Mortality Risk*, 14 J. RISK & UNCERTAINTY, 213, 228-29 tbl.9 (1997); *infra* Table 1. Data from Morrall and Viscusi et al were adjusted to year 2000 dollars using the US Bureau of Labor Statistics's average Consumer Price Index for years 2002 and 1994, respectively. See http://stats.bls.gov/cpi/.