

A Balanced Prescription for More Effective Environmental Regulations

W. Kip Viscusi

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PACE ENVIRONMENTAL LAW REVIEW**ARTICLE****A Balanced Prescription for More Effective Environmental Regulations**

W. KIP VISCUSI*

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ABSTRACT

Government agencies increasingly base the structure and approval of environmental regulations on a benefit-cost test. For regulations that pass this test, total benefits exceed total costs. Under a benefit-cost framework, the degree of regulatory stringency is set at an economically efficient level whereby the tightness of the regulation is increased up to the point where the incremental benefits equal the incremental costs. Setting regulatory standards to achieve the efficient degree of pollution control does not fully discourage entry into polluting industries, provide compensation to those harmed by pollution, or establish meaningful incentives for effective enforcement. This article proposes that the benefit-cost approach be retained as the guiding principle for regulatory policy, but that sanctions for regulatory violations be greatly enhanced. A different, more ambitious

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proposal by Elliott and Esty advocates pollution control to the lowest level that is technologically feasible, coupled with compensation for those injured by pollution. The unbounded regulatory framework advocated by Elliott and Esty sets aside benefit-cost balancing, generating the prospect of inordinate costs with few environmental dividends from the highest levels of stringency. Their more promising proposal is to establish a compensation system for environmental harms. Compensation for those harmed by pollution has some parallels with successful workers' compensation programs, but to be successful it must address challenges not faced in the employment context. More stringent regulation of long-term risks may be more welfare-enhancing for future generations than their proposed environmental damages compensation fund. Protection may yield greater dividends for more affluent future generations than compensation.

Keywords: Environment, benefit-cost analysis, compensation, pollution, Environmental Protection Agency

I. INTRODUCTION

Environmental regulations are the dominant category of all new regulatory initiatives.¹ Nevertheless, despite the prominence of these efforts, there is support for making much greater progress on a variety of environmental fronts that are critical to the well-being of current and future generations. Elliott and Esty are leading advocates of a more aggressive regulatory approach.² Their proposed agenda is for the U.S. Environmental Protection Agency (EPA) to develop more stringent regulatory standards that are not constrained by benefit-cost tests or by economic considerations, but only by what is technologically possible.³ They also propose coupling these more stringent regulations with a new compensation system for environmental harms.⁴ Unfortunately, the resources that can be committed to environmental considerations are not unlimited. Society has an interest in allocating economic resources as effectively as possible. The current regulatory oversight process seeks to achieve this balance by applying a benefit-cost test to regulations, to the

1. See OFF. OF MGMT. & BUDGET, EXEC. OFF. OF THE PRESIDENT, 2018, 2019, AND 2020 REPORT TO CONGRESS ON THE BENEFITS AND COSTS OF FEDERAL REGULATIONS AND AGENCY COMPLIANCE WITH THE UNFUNDED MANDATES REFORM ACT 12–19 tbl.I (2020).

2. E. Donald Elliott & Daniel C. Esty, *The End Environmental Externalities Manifesto: A Rights-Based Foundation for Environmental Law*, 29 N.Y.U. ENV'T L.J. 505, 534 (2021).

3. See *id.* at 530.

4. See *id.* at 507.

extent that doing so is consistent with agencies' legislative mandates.⁵ The policy approach I advocate here retains the current application of benefit-cost tests when designing and evaluating environmental regulations. However, I also propose that the EPA augment these regulations with greatly enhanced sanctions for violations of environmental regulations to make the level of the sanctions consistent with how the EPA values environmental risks in its prospective regulatory impact analyses.

The point of departure for my discussion is a review of the role of benefit-cost analysis, which is the current policy framework and a principal target of environmental advocates such as Elliott and Esty.⁶ Because the Elliott and Esty proposal diminishes the current reliance on benefit-cost balancing, it is instructive to first understand what benefit-cost analysis does. This is the focus of Part II, which provides a brief overview of what a benefit-cost test entails. Whether regulations based on this approach will produce the environmental outcome sought through the regulation also requires that firms comply with the regulations. An effective enforcement effort can foster this objective by imposing much greater sanctions than are currently permitted to make the fines commensurate with the harms caused by noncompliance with regulations.⁷

In Part III, I consider the Elliott and Esty approach to standard-setting, which shifts the emphasis from balancing benefits and costs to what is technologically feasible to reduce pollution.⁸ They couple the regulatory requirements for pollution control with a proposed system of compensation for harms, which is discussed in Part IV.⁹ Part V presents an assessment of how their proposed policy would deal with speculative harms and future harms, which involve the critical dimensions of environmental policy impacts pertaining to uncertainty and intertemporal effects.¹⁰ Part VI assesses the most promising avenues for improving environmental policies.

II. BENEFIT-COST ANALYSIS: A DEFENSE AND CRITIQUE

The underlying concept embodied in benefit-cost analysis is that government agencies should design policies to achieve the greatest net

5. See Exec. Order No. 12,866, 3 C.F.R. 638 (1994).

6. Elliott & Esty, *supra* note 2, at 507.

7. W. Kip Viscusi, *The Fatal Failure of the Regulatory State*, 60 WM. & MARY L. REV. 589, 593 (2018).

8. Elliott & Esty, *supra* note 2, at 530.

9. *Id.* at 534.

10. *Id.* at 528–29.

benefits to society.¹¹ Agencies should require that the benefits derived from policies outweigh their costs.¹² Regulatory standards should be set at levels that yield the greatest spread between the benefits produced by the regulation and the costs of the regulation.¹³ In making this assessment, regulatory impact analyses generally monetize these benefits and costs, though this need not be the case.¹⁴ The benefit and cost components are not restricted to common financial measures, such as lost property values due to pollution.¹⁵ The guiding principle for benefit assessment is society's willingness to pay for the benefit, which encompasses the valuation of ecological outcomes, health risks, and other environmental impacts.¹⁶ For policies that pass a benefit-cost test, the value to those who gain from the policy exceeds the losses to those that are harmed by the policy. The gainers can potentially compensate the losers, which is often referred to as the Kaldor-Hicks compensation principle.¹⁷ However, compensation is only potentially provided and may not be actually provided.¹⁸ Consequently, a policy with benefits greater than costs could lead to situations in which people are harmed by regulations and are not made better off, such as automobile factory workers who will lose their jobs as the country adopts policies to phase out internal combustion engines to reduce greenhouse gas emissions. While not everybody will be made better off if a policy passes a benefit-cost test, this approach does serve to provide a mechanism for eliminating policies that cause more overall harm than good.

The basic mechanics of a benefit-cost test are straightforward. The total benefits of a policy must exceed the total costs.¹⁹ In addition to this overall threshold issue, benefit-cost analysis also provides guidance on how to determine the stringency of regulatory standards. The following example illustrates how the benefit-cost approach influences standard setting. In the usual economic models, as the level of pollution is successively reduced, there is an escalation in the incremental costs of pollution reduction, i.e.,

11. W. KIP VISCUSI ET AL., *ECONOMICS OF REGULATION AND ANTITRUST* 34 (The MIT Press 5th ed. 2018).

12. *Id.*

13. *See id.* at 35 fig.2.2.

14. *See, e.g.*, Exec. Order No. 12,866, 3 C.F.R. § 6(a)(3)(C)(i)–(iii).

15. *Id.* (discussing the assessment components of cost/benefit analysis).

16. *See* U.S. OFFICE OF MGMT. & BUDGET, OFFICE OF INFO. & REGULATORY AFFAIRS, CIRCULAR A-4 1–3 (2003).

17. *See* Mathew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 190 (1999).

18. *Id.*

19. *See* VISCUSI ET AL., *supra* note 11, at 34.

the marginal costs for each level of pollution reduction.²⁰ For simplicity, suppose that reducing each unit of pollution has a constant unit of marginal benefit value.²¹ The value of marginal benefits reflects the value that society is willing to pay for each unit of pollution reduction, such as the value of a statistical life for mortality risk reduction.²² Setting the optimal level of the standard requires setting the pollution limit so that marginal benefits equal marginal costs.²³ In effect, the government is setting the price of pollution equal to the marginal benefits of pollution reduction. Equating marginal benefits and marginal costs in this fashion will also lead to the level of pollution reduction with the greatest spread between benefits and costs, thus maximizing the net benefit to society.²⁴ Note that if the level of pollution reduction is set beyond the point where marginal benefits equal marginal costs to institute a more stringent policy, there is more pollution reduction, but its value is outweighed by the extra costs to achieve these gains. Under a conventional regulatory standards system, the firm can pollute for free up to the pollution standard.²⁵

Alternatively, the same efficient level of pollution can be achieved with a market-based system.²⁶ For example, a price for pollution could be set equal to the unit marginal benefit value so that firms pay for all units of pollution that are emitted, not just pollution levels above the standard.²⁷ Firms will make pollution mitigation decisions to maximize profits given this pollution price. When there is an appropriate price for all levels of pollution, the efficient level of pollution reduction is achieved even without a formal standard.²⁸

While setting optimal standards or establishing an optimal price for pollution will yield the efficient level of pollution control, there could be a remaining shortfall with respect to entry of firms into the industry. Consider the situation where the policy is a pollution standard in which firms are permitted to pollute up to some level, after which they must implement pollution controls. In this situation, firms get to pollute for free until they

20. See *id.* at 36 fig.2.3.

21. See *id.* at 783.

22. See *id.* at 743.

23. See *id.* at 35–36.

24. See *id.* at 35 fig.2.2.

25. See *id.* at 789.

26. See *id.* at 784–85 figs.21.2 & 21.3.

27. See *id.* at 789.

28. See, e.g., *id.* at 823 (discussing the development and evolution of safety features for the Ford Pinto as a result of cheap design).

reach the standard. Only violations of the standard will impose costs on the firm. Because firms are not penalized for the pollution up to the standard, there consequently will be too great of an incentive for firms to enter the polluting industry. The same problem, though less pronounced, is also true if firms are charged a set price for all pollution that they generate based on the marginal environmental benefits.²⁹

Unfortunately, the two problems of compelling existing firms to control pollution to the efficient level and providing efficient incentives for firms to enter the polluting industry cannot simultaneously be solved with a single policy mechanism alone. The economic solution to getting the right number of firms to enter the polluting industry involves the use of a fee to enter the industry, coupled with either regulatory standards or a pricing scheme for pollution.³⁰ It takes two policy instruments—a fee to enter the industry and either a regulatory standard or pollution tax—to achieve these two objectives—the efficient level of pollution and the correct number of firms in the polluting industry.³¹ There may be no apparent political feasibility of implementing such a dual approach, which would impose much greater costs on industry.

Although regulatory standards cannot address all pollution issues simultaneously, setting standards based on a benefit-cost test can potentially yield efficient levels of pollution control. Whether such outcomes specified by a regulation will be realized depends on whether firms comply with the standard. Compliance in turn will depend on whether there are meaningful economic incentives for compliance based on the presence of regulatory sanctions for violations.³² Unfortunately, these penalties are severely constrained by statutory penalty caps that limit the fines that EPA can levy for regulatory violations.³³ There is consequently a mismatch between the value that the agency places on environmental harms and the much lower level of sanctions that are imposed. I have proposed that in situations in which there are harms inflicted by regulatory

29. See Dennis W. Carlton & Glenn C. Loury, *The Limitations of Pigouvian Taxes as a Long-Run Remedy for Externalities*, 95 Q.J. ECON. 559, 562 (1980) (proposing the policy of using taxes to establish competitive equilibrium simultaneous with the social optimum).

30. See *id.* at 564 (proving that a “lump sum entry tax-subsidy” can achieve simultaneous competitive equilibrium and the social optimum).

31. Joa Nicolaisen, Andrew Dean & Peter Hoeller, *Economics and the Environment: A Survey of Issues and Policy Options*, 16 OECD J. ECON. STUD. 7, 9 (1991).

32. See, e.g., VISCUSI ET AL., *supra* note 11, at 841–44 (discussing regulation and subsequent trends within auto industry).

33. See Viscusi, *supra* note 7, at 593.

violations, the scale of the penalties corresponds to how the agency values the harms in its prospective regulatory impact analyses.³⁴

Penalty caps for environmental violations are stringent and limit the sanctions to fines below the values EPA uses in monetizing mortality risk benefits, given by the value of a statistical life.³⁵ Under the Clean Air Act, any emissions that violate the Act are subject to fines that are capped at \$51,796 per day, with a total maximum cap of \$414,364.³⁶ Under the Clean Water Act, the daily penalty limit is \$59,973 per violation.³⁷ The civil penalties under the Toxic Substances Control Act are limited to a penalty maximum of \$43,611 per day.³⁸

There is also a provision for criminal sanctions that could go beyond these low penalty amounts. Under the Clean Air Act, violations that are misdemeanors resulting in death could be subject to criminal penalties, but the fines cannot exceed \$250,000 for individuals³⁹ and \$500,000 for organizations.⁴⁰ For example, after an explosion at two oil and chemical processing facilities in Texas killed one worker and seriously injured two other workers, the four companies responsible for the explosion incurred \$3.3 million in criminal fines and \$200,000 in community service payments.⁴¹ For hazards posing an imminent risk of death or serious bodily injury, the Toxic Substances Control Act has a criminal penalty cap of \$250,000 per violation for an individual⁴² and \$1,000,000 per violation for an organization.⁴³ The criminal sanctions levied in the presence of these caps sometimes can entail negligible penalty amounts given the gravity of

34. See *id.* at 640–41.

35. See W. KIP VISCUSI, PRICING LIVES: GUIDEPOSTS FOR A SAFER SOCIETY 23–24 (2018).

36. EPA Adjustment of Civil Monetary Penalties for Inflation, 40 C.F.R. § 19.4 tbl.1 (2022).

37. § 19.4 tbl.1.

38. § 19.4 tbl.1.

39. 18 U.S.C. § 3571(b)(4).

40. § 3571(c)(4).

41. See Press Release, U.S. Att’y’s Off. E. Dist. of Tex., U.S. Dep’t of Just., Four Texas Companies Agree to Pay \$3.5 Million for Criminal Violations of the Clean Air Act at Two Oil and Chemical Processing Facilities (Oct. 12, 2016), <https://www.justice.gov/opa/pr/four-texas-companies-agree-pay-35-million-criminal-violations-clean-air-act-two-oil-and-chemical-processing-facilities> [https://perma.cc/2YMM-XVFG].

42. 15 U.S.C. § 2615(b)(2)(A) (“Any person who knowingly and willfully violates any provision of section 2614 or 2689 of this title, and who knows at the time of the violation that the violation places an individual in imminent danger of death or serious bodily injury, shall be subject on conviction to a fine of not more than \$250,000, or imprisonment for not more than 15 years, or both.”).

43. § 2615(b)(2)(B).

the harms. After the deaths of two young children due to misapplication of pesticides,⁴⁴ under the Federal Insecticide, Fungicide, and Rodenticide Act,⁴⁵ the EPA sought criminal sanctions in which the applicator was sentenced to “six months incarceration and six months of home confinement as well as a period of supervised release,”⁴⁶ while the company incurred a \$3,000 fine and 36 months of probation.⁴⁷

To better align regulatory sanctions with the value of the environmental harms, my policy proposal is to retain the application of benefit-cost tests in the design of regulatory policies, but to greatly increase or remove the statutory caps on damages amounts.⁴⁸ The EPA in turn should base penalties on the environmental harm that is caused. Suppose a regulatory violation leads to one expected death. Also, assume that in setting regulatory standards, the EPA values each expected death at \$11 million. Then the appropriate penalty amount that reflects society’s willingness to pay for the risk reduction is \$11 million, which far exceeds current damages caps. In effect, to more fully establish EPA regulatory structure as a market-based approach, the enforcement of regulations and regulatory sanctions should reflect the same respect for the insights provided by the market as it does for the setting of pollution standards.

Given the economic parallels between economically efficient standard-setting and pollution-pricing schemes, it is reasonable to consider benefit-cost analysis as being a market-oriented approach based on the average value of the harms. The focus of the analysis is to set an appropriate price of pollution, which firms then compare to the costs of pollution reduction to select the optimal level of pollution control. Policies governed by benefit-cost principles seek to replicate what would prevail based on a hypothetical well-functioning market for environmental harms for which the price of additional pollution is given by the unit price of pollution. However, the financial incentives for enforcement fall short of a market-based system.

III. REGULATIONS WITHOUT LIMITS

In light of the parallel with market-based systems, it is surprising that Elliott and Esty do not embrace benefit-cost analysis despite their avowed

44. See Press Release, David B. Barlow, U.S. Att’y Dist. of Utah, U.S. Dep’t of Just., Bugman Pest and Lawn, Inc. and Coleman Nocks Plead Guilty to Unlawful Use of Pesticide (Oct. 11, 2011), <https://www.justice.gov/archive/usao/ut/news/2011/bugman%20plea.pdf> [<https://perma.cc/R6SJ-3UET>].

45. *Id.*

46. *Id.*

47. *Id.*

48. See Viscusi, *supra* note 7, at 651.

support of “market-based solutions to environmental problems.”⁴⁹ Instead, they trace the shortfall in environmental policy to the constraints imposed by relying on a benefit-cost approach: “We believe the primary culprit has been the emergence of a dominant vision of environmental policy based on benefit-cost analysis rather than the right to a healthy environment.”⁵⁰ However, adopting their approach based on rights rather than costs and benefits to society does not emerge from any market-based system.

Instead of seeking to balance the competing concerns, Elliott and Esty assert that there is a natural law right to have a healthy environment: “We believe that everyone living in a community has a legal right, recognized both as a matter of natural right and positive law, to be free from avoidable interferences with their bodily integrity and that this in turn implies that they have a right to a healthy environment.”⁵¹ Framing environmental regulation issues as a matter of rights makes environmental quality a pre-emptive concern. Instead of respecting other attributes that are valued by society as in a comprehensive assessment of benefits and costs, there is a lexicographic ordering of preferences in which optimizing environmental quality is the paramount objective.⁵² No level of competing impacts can counterbalance the preeminence of this absolute right.

There are some statutory urgings that are not inconsistent with a claim of rights to environmental quality, such as the National Environmental Policy Act (NEPA), which they cite: “The Congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.”⁵³ Nevertheless, notwithstanding this aspirational language, there has been no effort to implement an absolutist urging in the more than five decades since the passage of NEPA. The EPA routinely considers the consequences of policies other than environmental quality.⁵⁴

49. Elliott & Esty, *supra* note 2, at 506.

50. *Id.* at 514.

51. *Id.* at 511.

52. See *Lexicographic preferences*, DICTIONARY OF THE SOCIAL SCIENCES 273 (Craig Calhoun ed. 2002) (“[a] model of preferences that holds that an individual prefers any allocation of goods that has more of a certain good *x* regardless of what else is contained in the allocation”).

53. 42 U.S.C. § 4331(c).

54. See, e.g., NAT’L CTR. FOR ENV’T ECON., EPA, GUIDELINES FOR PREPARING ECONOMIC ANALYSES 7–9 tbl.7.1, 8–8 (2010) (listing several types of benefits associated with environmental policies and defining types of costs associated with environmental policies).

Focusing on environmental rights leads to the exclusion of other concerns that would be included in a more balanced assessment, such as household income levels. There also may be an infringement of matters for which others might claim that there are also rights. Some might well argue that people also have an equally valuable “right” to good health, which is a right that will be compromised by their policy proposal, as I indicate below.⁵⁵ The environmental rights guiding principle also does not distinguish gradations of environmental harm. Instead of assessing the extent of the environmental benefits, as in the benefit-cost approach, the focus is on maximizing environmental quality irrespective of cost.

Armed with the premise of environmental rights, Elliott and Esty propose that regulatory standards install all technologically feasible controls.⁵⁶ The consequence of these ambitious policies is to end all harmful pollution up to the point where it is technologically feasible.⁵⁷ The rebuttable presumption under their proposal is that firms must not externalize environmental costs and should eliminate harm to others.⁵⁸ This feasible level might be a zero pollution amount, but if compliance costs are ever-increasing, the costs of adopting highly protective technologies might be inordinately large. A zero-pollution level might not even be feasible with any available technologies.

Justice Breyer has observed that there is a fundamental problem with such unyielding approaches, which he calls the problem of “the last 10 percent.”⁵⁹ Eliminating 90% of the damage caused by a particular pollutant may be feasible, but costs escalate dramatically if one embarks on a search for the most stringent pollution control technology and mandates its adoption.⁶⁰ The task for policymakers is to strike an appropriate balance between cost and benefits.

Regulations promulgated before meeting benefit-cost tests became the dominant approach reflect the high level of costs that could emerge. As

55. See generally Mary Gerisch, *Health Care as a Human Right*, AM. BAR ASS'N: HUM. RTS. MAG. (Nov. 19, 2018), https://www.americanbar.org/groups/crsj/publications/human_rights_magazine_home/the-state-of-healthcare-in-the-united-states/health-care-as-a-human-right/ [https://perma.cc/V28Y-HQ9J] (defending the right to health).

56. See Elliott & Esty, *supra* note 2, at 509.

57. See *id.* at 509–10, 534.

58. See *id.* at 529–30.

59. STEPHEN BREYER, *BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION* 11 (1993).

60. See *id.* at 14 (describing EPA asbestos regulation involving escalating costs with stringent standards).

the estimates by Morral⁶¹ and the inventory of regulatory cost-effectiveness by Breyer found, sometimes EPA regulations imposed a cost of over \$100 million per expected life saved, where these figures are in current dollars.⁶² Why should there be any concern with costs that are incurred for the desirable objective of better environmental quality? The downside to profligate expenditures is that there are fundamental offsetting effects whereby the regulations will do more harm than good even from the standpoint of risk impacts.⁶³ Suppose that the only dimension considered is how EPA regulations protect individual health and that costs per se are not a matter of concern. Incurring costs per life saved at exorbitant amounts takes funds from society that could be used for a variety of health-enhancing purposes, such as being able to afford more health care, living in a safer neighborhood, or having access to a more nutritious diet. The link between wealth and health is sufficiently strong that regulatory costs of around \$100 million will lead to one expected death.⁶⁴ In effect, overly zealous environmental policies that impose extremely high costs will kill more people than they will protect. Even from the standpoint of health alone, such unlimited policies will have an adverse effect. Conceptions of a right to a clean environment can conflict with a right to health.

Thus far, my discussion of technological feasibility has sidestepped the more fundamental issue of whether the firm's activities should even be permitted to exist. There might be no technologically feasible way for an industry to operate without also inflicting substantial environmental harm. For example, some might suggest that rights to environmental quality imply that the coal industry and the use of coal in power plants should both be completely eliminated.⁶⁵ It is not simply a matter of installing all technologically feasible controls if even with these controls the industry will inflict environmental harms. Application of benefit-cost tests to such situations will indicate whether there are no net welfare benefits to society

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

62. *Id.* at 230–31 tbl.2; see BREYER, *supra* note 59, at 13.

63. See James Broughel & W. Kip Viscusi, *The Mortality Cost of Expenditure*, 39 CONTEMP. ECON. POL'Y 156, 160 (2021).

64. See *id.* at 157.

65. U.N. Hum. Rts. Off. of the High Comm'r, Joint Statement by Human Rights Experts – Accelerate the End of the Coal Era to Protect Human Rights (Oct. 29, 2021), <https://www.ohchr.org/en/statements/2021/11/joint-statement-un-human-rights-experts-accelerate-end-coal-era-protect-human> [https://perma.cc/BNG4-C3UR].

for an industry to continue to exist. A benefit-cost test could potentially indicate that some industries should be shut down altogether. However, once there is no reference to benefit-cost frameworks in the policy design and instead the design relies on environmental rights coupled with advocacy of technologically feasible solutions, the environmental rights guidance does not provide a test for assessing the desirability of shutting down a firm or an industry.

IV. COMPENSATION FOR HARMS

Even after taking advantage of all technologically feasible reductions in environmental risks, some pollution may continue. Elliott and Esty propose that firms provide compensation to those who have incurred the losses caused by the remaining pollution.⁶⁶ In their view, companies should fully pay for harms.⁶⁷ Their proposal involves two principal components: i) polluters should install the most protective feasible technologies,⁶⁸ and ii) polluters also must pay financial compensation to those injured from any remaining pollution.⁶⁹ Why they have espoused this compensation system is not fully articulated, but the main rationales appears to be a belief that providing compensation provides a correction for market failures and is a matter of environmental justice.⁷⁰ Viewed in economic terms, the proposed compensation system could serve a desirable insurance function to the extent that the losses from environmental harms can be ameliorated through financial compensation. The usual deterrence-related rationale for such payments is not present given the structure of their policy proposal. By default, there is no apparent incentive role for compensation under their proposal since companies are already being pushed to the limit in terms of installing the most protective technologically feasible pollution controls. The presence of these additional costs could potentially discourage entry into polluting industries by reducing the profitability of engaging in a highly polluting industry but will not affect the adopted technologies since they are already at the limit of feasibility.

Whether there is any rationale for compensation depends in part on the nature of the regulatory regime. A compensation gap is a more common concern in a benefit-cost analysis world where environmental regulations do not push firms to their technological limit but simply require that the

66. Elliott & Esty, *supra* note 2, at 507.

67. *Id.* at 509, 534.

68. *Id.* at 509–10.

69. *Id.* at 510.

70. *See id.* at 519.

benefits to society exceed the costs. Under the familiar Kaldor-Hicks potential compensation principle, the parties that gain from the policy for which the benefits exceed the costs can potentially compensate the losers, but they need not do so.⁷¹ To the extent that environmental benefits are optimized, concern with whether the gainers actually compensate the losers from pollution may be less prominent in the Elliott and Esty world in which environmental rights are the driving concern. In this regime, nothing more could feasibly be done beyond the adopted policy to promote environmental quality. However, there would be losses incurred by those adversely affected by pollution controls, though Elliott and Esty do not propose any compensation for them.⁷²

Under the federal regulatory system,, compensation for environmental damages is not part of the policy structure. However, there could be civil actions that provide compensation for pollution victims. The potentially substantial role of these civil actions is reflected in the Gold King Mine settlements. In 2015, EPA-hired workers triggered the release of 3 million gallons of toxic wastewater into the Animus River Watershed at the Gold King Mine in Silverton, Colorado.⁷³ In 2016, the EPA designated the Bonita Peak Mining District as a Superfund site due to high levels of heavy metals in the soil, groundwater, and surface water caused by the spill.⁷⁴ Sunnyside Gold Corporation, which oversaw the construction of the barriers below the mine, settled with payments of \$1.6 million to Colorado,⁷⁵ \$11 million to New Mexico, and \$10 million to the Navajo Nation.⁷⁶ The EPA faced many lawsuits and paid for cleanup costs, remedial efforts, and compensation to

71. See Adler & Posner, *supra* note 17, at 190.

72. See Elliott & Esty, *supra* note 2, at 535.

73. U.S. EPA, EPA/830/R-18/003, FINAL REPORT: ANALYSIS OF THE BIOLOGICAL DATA COLLECTED FROM ANIMALS AND SAN JUAN RIVERS FOLLOWING THE GOLD KING MINE RELEASE (2018).

74. News Release, U.S. EPA, EPA Adds Bonita Peak Mining District Site in San Juan County, Colo. To Superfund List (Sept. 7, 2016), <https://archive.epa.gov/epa/newsreleases/epa-adds-bonita-peak-mining-district-site-san-juan-county-colo-superfund-list.html> [<https://perma.cc/DR24-DPQR>].

75. Maya Earls, *Sunnyside Gold to Pay Colorado \$1.6 Million for Gold King Spill*, BLOOMBERG L. (Feb. 1, 2022), <https://news.bloomberglaw.com/environment-and-energy/sunnyside-gold-to-pay-colorado-1-6-million-for-gold-king-spill> [<https://perma.cc/PD4H-K967>].

76. Sylvia Carignan & Tripp Baltz, *N.M., Navajo Nation Settle \$21 Million Gold King Mine Case (1)*, BLOOMBERG L. (Jan. 14, 2021), <https://news.bloomberglaw.com/environment-and-energy/navajo-nation-settles-gold-king-mine-dispute-for-10-million> [<https://perma.cc/N64M-PNWR>].

the state of Utah, for a total of \$360 million.⁷⁷ There were additional payments by Kinross Gold Corporation and Sunnyside Gold Corporation to the United States and Colorado.⁷⁸ Elliott and Esty do not indicate whether their proposal would bolster or supplant currently such available legal remedies.

The concept of having a publicly run mechanism for providing compensation for harms is not unprecedented. Elliott and Esty draw a comparison to workers' compensation systems and occupational safety and health regulations.⁷⁹ As they observe, the norm for occupational risks is providing compensation for workers injured in industrial accidents.⁸⁰ The financial support provided by workers' compensation payments serves to promote the insurance objective, and the linkage of workers' compensation premiums to the riskiness of firms fosters additional deterrence.⁸¹ Occupational safety and health regulations do not provide compensation, but do establish safety standards. The EPA could utilize both policy instruments under their system—provision of compensation as under workers' compensation and setting pollution control standards to reduce risk levels.

To what extent is the workers' compensation parallel meaningful? Examining the lessons provided by the workers' compensation system provides the basis for assessing whether and to what extent an environmental harm compensation system would be effective. Understanding why the workers' compensation system was adopted, who benefits from workers' compensation, how much they are compensated, and why it differs from the environmental context helps to indicate the extent to which the workers' compensation experience is replicable.

Workers' compensation programs emerged roughly a century ago as state-run systems whereby an administrative compensation system supplanted the role of tort liability as a mechanism for providing income

77. See News Release, U.S. EPA, EPA, Utah Agree to Resolve Gold King Mine Claims (Aug. 5, 2020), <https://www.epa.gov/newsreleases/epa-utah-agree-resolve-gold-king-mine-claims> [<https://perma.cc/MX4T-MRYL>].

78. News Release, U.S. EPA, Federal Government and State of Colorado Finalize Settlement with Mining Companies at the Bonita Peak Mining District Superfund Site in Colorado (Apr. 29, 2022), <https://www.epa.gov/newsreleases/federal-government-and-state-colorado-finalize-settlement-mining-companies-bonita-peak> [<https://perma.cc/H9UX-ALDV>].

79. See Elliott & Esty, *supra* note 2, at 518–19.

80. *Id.* at 525.

81. See W. KIP VISCUSI, REFORMING PRODUCTS LIABILITY 177–78 (1991) [hereinafter PRODUCTS LIABILITY].

support to injured workers.⁸² In the context of an ongoing employment relationship, litigation by the worker against the firm after every industrial accident could potentially harm the long-term relationship between the worker and the employer. Eliminating any requirement that the worker not be at fault in order to recover damages also simplifies the task of determining whether there is a valid compensation claim. In return for workers' compensation coverage, the employee cannot sue the employer for damages even if the worker chooses not to seek benefits through this administrative compensation scheme.⁸³ Would behavior by the pollution victim affect the likelihood and amount of compensation under the Elliott and Esty proposal? Would the provision of an environmental harm compensation scheme in the Elliott and Esty approach preclude civil actions against the polluter? Whether the no-fault and no litigation aspects of workers' compensation would be incorporated in the Elliott and Esty proposal is not indicated.

The employment context differs from environmental situations in some consequential respects. The nature of the job-related harm and the circumstances of the harm are often readily observable, as in the case of traumatic workplace accidents. The main workers' compensation success stories stem from the handling of acute accidents rather than longer-term risks with substantial latency periods. In the case of longer-term hazards, such as carpal tunnel syndrome and risks that have a substantial latency period and multiple causes, such as cancer risks from asbestos exposures, workers' compensation is less successful in delivering compensation promptly and without substantial administrative burdens.⁸⁴ Environmental risks usually differ from job accident risks in that they are more diffuse, and there is usually no market-based relationship between the polluters and the victims of pollution. We know whether a worker was employed at a firm, but it is more difficult to identify all the people harmed by many environmental risks. Who are the people who suffer losses from greenhouse gas emissions or the pollution of major waterways? The feasibility of identifying the victims of environmental harms will vary depending on the context and will be greatest when there is a clear link between the polluter and the victim, which I conjecture is not the norm.

82. Arthur Larson, *Nature and Origins of Workmen's Compensation*, 37 CORNELL L. REV. 206, 206 (1952); U.S. CHAMBER OF COM., ANALYSIS OF WORKERS' COMPENSATION LAWS 5 (2019).

83. Larson, *supra* note 82, at 206; *see also* PRODUCTS LIABILITY, *supra* note 81, at 175.

84. PRODUCTS LIABILITY, *supra* note 81, at 180.

Assuming that the polluter and the party suffering the damage can be identified, what should be the basis for setting the level of compensation? Elliott and Esty advocate full payment for the harms.⁸⁵ For monetary losses this is meaningful guidance, in that full payment equals the monetary value of the damages. A greater challenge is how should optimal compensation levels be conceptualized for nonmonetary harms?⁸⁶ The thought experiment I would propose for exploring this issue is to ask what level of insurance the victim would choose to purchase if actuarially fair insurance was available. The level of compensation required to completely offset the welfare loss of major health impacts or damage to unique environmental amenities may be substantial and not readily restored through financial transfers. The optimal insurance amount for severe health effects will not make the victim “whole” in the sense of restoring the pre-injury level of well-being.⁸⁷ Unique environmental amenities and archeological sites similarly might not be readily restored through financial transfers. The workers’ compensation system, which provides the inspiration for the Elliott and Esty approach, does not seek to provide funds sufficient to compensate for all financial losses and the welfare loss from injuries. There is no attempt to address pain and suffering, and the income support that is provided falls short of the worker’s income loss and serves as a form of partial insurance.⁸⁸ A similar type of optimal insurance framework may provide reasonable guidance for environmental damages should a compensation system be adopted.

The chief benefit of Elliott and Esty’s proposal to establish a compensation system for environmental harms is that it may facilitate payments to those who have incurred losses from environmental harms.⁸⁹ The successful workers’ compensation system is not directly transferable, but the success of workers’ compensation does highlight the potential desirability of an administrative compensation scheme.⁹⁰

V. FUTURE HARMS AND SPECULATIVE HARMS

Parties that may suffer harm in the future or have an increased probability of harm also might be designated as recipients of compensation

85. See Elliott & Esty, *supra* note 2, at 510.

86. See W. Kip Viscusi, *Utility Functions for Mild and Severe Health Risks*, 58 J. RISK & UNCERTAINTY 143, 144–45, 147 (2019).

87. *Id.* at 146.

88. See, e.g., U.S. CHAMBER OF COM., *supra* note 82, at 51–60 chart.VI (displaying income benefits in various jurisdictions for total disability).

89. Elliott & Esty, *supra* note 2, at 509, 531.

90. *Id.* at 531.

under the Elliott and Esty approach.⁹¹ Each of these additional dimensions for compensation makes the establishment of a workable compensation system more challenging. Consider first the case of future generations. Elliott and Esty suggest that the current generation pay into a trust fund to compensate future generations for the harm that the current generation has done.⁹² This proposal faces many challenges, wholly apart from the likely unwillingness of the current generation to fund such an effort. There is a myriad of activities with potential ramifications for future generations, such as every irreversible land use decision. Perhaps focusing on a small set of the most consequential impacts will make the task more manageable.

Climate change policies may be the most prominent. The failure of the current generation to undertake suitably vigorous action to address problems such as climate change imposes costs on future generations. But is a compensation trust fund the best remedy? Is it better for the current generation to set aside an amount of money in a fund to compensate future generations or to spend those funds to control current emissions to limit the harm caused to future generations? It might well be that providing protection against future risks will enhance future generations' welfare by more than would future financial compensation. Protection may provide more benefit to them than compensation, particularly given rising per capita incomes over time.

If the current generation is unwilling to make adequate provisions for protecting future generations, will they instead have a willingness to contribute to a fund to compensate them? If there is compensation, how great should it be? Should we rely on measures of the social cost of carbon or some other metric for setting compensation for climate change impacts?⁹³ Or perhaps instead of providing compensation to future generations, we might offer society the alternative of either providing for future generations or preventing harm to them. Unfortunately, they cannot communicate their preferences to us. Since there is no well-defined future generation, but rather a temporal trajectory of generations, what time frame is being used to identify the recipients? Will the compensation be global or domestic?

91. *Id.* at 531–32.

92. *Id.* at 520.

93. See generally Ted Gayer & W. Kip Viscusi, *Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic Versus Global Approaches*, 10 REV. ENV'T ECON. & POL'Y 245, 246 (2016); Exec. Order No. 13,990, 3 C.F.R. § 5(a) (2021).

The environmental equity impetus for a future generation trust fund is also unclear. To the extent that future generations will be more affluent than the current generation if income growth continues unabated,⁹⁴ focusing on environmental controls instead of compensation limits the regressive prospect of transferring funds from the current generation to a more affluent future generation.

Elliott and Esty also offer multiple prescriptions for probabilistic harms that may affect current or future generations. First, they recommend that companies prove that a substance is not harmful before releasing it into the environment.⁹⁵ This suggestion is never feasible because it is not possible to show that any substance is completely safe. The most that can be done from a statistical standpoint is to conclude that it is not possible to reject the hypothesis that particular substances pose zero risk based on the available evidence.⁹⁶ Is their proposal a variant of the precautionary principle?⁹⁷ Does the risk have to be zero or does some de minimis risk level suffice? If so, what is this risk level? Will EPA use worst case scenarios to calculate the risk or mean estimates? Does the size of the exposed population matter in making this determination? Second, even if there is evidence that a particular emission is not risk-free, should it be disclosed under their mandatory disclosure system?⁹⁸ The public receives diverse risk information from multiple sources and generally lacks the scientific training and general expertise to map information on emissions into expected welfare losses. Even with a scientific background, one would need information on the dosage and the dose-response relationship. Disclosing the information to the EPA is more promising, as the agency can then decide what information should be communicated to the public and determine how the information can best be communicated.

In addition to disseminating information, there would also be compensation for those who have suffered the possibility of harm, but not yet the certainty of any harm.⁹⁹ There would be a rebuttable presumption

94. LIDA R. WEINSTOCK, CONG. RSCH. SERV., IF10501, INTRODUCTION TO U.S. ECONOMY: PERSONAL INCOME fig.1 (2020) (showing increasing average individual income and increasing median family income from 1929-2019).

95. Elliott & Esty, *supra* note 2, at 521.

96. BRUCE HANSEN, PROBABILITY AND STATISTICS FOR ECONOMISTS 272 (2022) ("A hypothesis test is a decision based on data. The decision either accepts the null hypothesis or rejects the null hypothesis in favor of the alternative hypothesis.").

97. Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003, 1003-04 (2003) (explaining briefly the basic premise behind the precautionary principle).

98. Elliott & Esty, *supra* note 2, at 537.

99. *Id.* at 530.

to pay full compensation to the extent feasible.¹⁰⁰ There are some litigation precedents for such an approach. Tort liability cases based on the loss of chance provide compensation to those who have suffered an increased probability of harm.¹⁰¹ For example, the loss-of-chance approach arises in medical malpractice cases in which patients were not given appropriate treatment.¹⁰² In the medical malpractice situation, it is often feasible to identify the victim class to avoid problems of duplicate compensation.¹⁰³ But care must be taken in implementing this approach to avoid double payments for risks. For example, we would not want the company to pay both for the increased probability of harm before the harm occurs and also to pay the same people for damages should the harm eventuate.

VI. WHERE DO WE STAND?

Relying on a benefit-cost approach can establish efficient levels of pollution control and has been instrumental in promoting policies that are subject to an overall assessment of their merits.¹⁰⁴ The application of these tests at the time when regulations are adopted does not guarantee that the regulations will be vigorously enforced. To assist in that task, I have proposed that environmental statutes be revised so that sanctions for regulatory violations can be greatly increased to be aligned with the benefit values that are assigned to environmental outcomes in prospective regulatory impact analyses.¹⁰⁵

Some of these sanctions could be distributed in a compensation system for environmental damages. The optimal deterrence amounts may exceed the optimal insurance amounts when health outcomes are involved, producing a gap between the penalties and the compensation levels should a compensation mechanism be implemented for environmental harms.¹⁰⁶

100. See *id.* at 529.

101. See David A. Fischer, *Tort Recovery for Loss of a Chance*, 36 WAKE FOREST L. REV. 605, 606 (2001).

102. See *id.* at 605.

103. See *id.* at 612.

104. See ORG. FOR ECON. COOP. & DEV. [OECD], COST-BENEFIT ANALYSIS AND THE ENVIRONMENT: FURTHER DEVELOPMENTS AND POLICY USE 2 (2018), <https://www.oecd.org/env/tools-evaluation/CBA-brochure-web.pdf> [<https://perma.cc/A4U3-4R66>].

105. See Viscusi, *supra* note 7, at 619.

106. See VISCUSI ET AL., *supra* note 11, at 789; see also W. Kip Viscusi, *Misuses and Proper Uses of Hedonic Values of Life* 13 J. FORENSIC ECON. 111 (2000) (for example, in the case of wrongful death awards and pain and suffering compensation, the optimal insurance amount

Subsequent pollution levels in the presence of such a penalty structure will not be zero or as low as is feasible, but they will reflect the extent to which there are societal benefits from increasing the stringency of the standards. Moreover, setting standards based on a balanced benefit-cost approach will avoid the adverse repercussions of spending inordinate funds on overly ambitious environmental goals.

Embarking on a compensation system for environmental damages is not incompatible with a benefit-cost approach. An environmental compensation system could be feasible for firms that are not in compliance with the regulations. Penalties set to reflect the extent of the harms could provide some of the resources for such compensation. If firms are already in compliance, then it may be challenging to set compensation at levels that do not distort the firm's behavior by pushing the firm to select pollution control levels beyond the economically efficient amount.

The prospects for implementing a workable compensation system are brightest in contexts where the injurers can be identified and where there are well-defined victims of environmental damages. If compensation has a role parallel to that of workers' compensation, then it would also pre-empt potential liability of firms for harms. Moreover, victims would not have the discretion to choose between the administrative compensation system and tort liability. Transferring the workers' compensation experience to the environmental context is a potentially promising but quite complex initiative. How and to what extent it is desirable to adopt the workers' compensation model hinges on how the workers' compensation structure is modified for the environmental context.

is less than the optimal deterrence amount, such as the value of a statistical life in wrongful death contexts).