



POISONED FOR PENNIES

THE ECONOMICS
OF TOXICS AND
PRECAUTION

FRANK ACKERMAN

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and Precaution

By FRANK ACKERMAN



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I did not do the work described in this book alone. Six of the twelve chapters have been published as coauthored articles, and appear here only lightly edited into book chapter format. Three other chapters, written by me in their current form, are based on joint work done at the Global Development and Environment Institute (GDAE) at Tufts University. (The authorship and publication histories of individual chapters are listed below.)

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Publication History

Authorship is identified for joint-authored chapters; others are by me alone.

Chapter 1, by Frank Ackerman and Lisa Heinzerling, first appeared as the 2002 report "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection," published by the Georgetown Environmental Law and Policy Institute. A revised version, with the same title, appeared in the *University of Pennsylvania Law Review* in 2002 and was reprinted as one of the ten best land use and environmental law review articles of 2002 in *Land Use and Environmental Law Review*, 2003.

Chapter 2, by Frank Ackerman, Lisa Heinzerling, and Rachel Massey, was originally a 2004 report funded and published by the Center for Pro-

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gressive Reform, "Applying Cost-Benefit Analysis to Past Decisions: Was Environmental Protection *Ever* a Good Idea?" A revised version was published in the *Administrative Law Review* in 2005 and was reprinted as one of the ten best land use and environmental law review articles of 2005 in *Land Use and Environmental Law Review*, 2006. A slightly different version appeared as "Wrong in Retrospect: Cost-Benefit Analysis of Past Successes," in Jon D. Erickson and John M. Gowdy, editors, *Frontiers in Ecological Economic Theory and Application* (Northampton, MA: Edward Elgar, 2007).

Chapter 3 was published in the *Fordham Urban Law Journal* in 2006.

Chapter 4 is a greatly expanded and revised version of my short paper, "The Outer Bounds of the Possible: Economic Theory, Precaution, and Dioxin," which was presented at the "Dioxin 2003" conference (formally speaking, the International Symposium on Halogenated Environmental Organic Pollutants and Persistent Organic Pollutants) and published in the conference journal, *Organohalogen Compounds*, in 2003.

Chapter 5 was published in the *International Journal of Occupational and Environmental Health* in 2007.

Chapter 6 draws on my testimony in 2005 and 2006 on behalf of the United Farm Workers and other groups, which was supported in part by the Farmworker Justice Fund. Rachel Massey helped in the research for that testimony.

Chapter 7, by Frank Ackerman and Wendy Johnnecke, was published in *New Solutions* in 2008, with the title "Modeling Uncertainty: The U.S. Response to BSE." My critique of the Harvard Center for Risk Analysis BSE model first appeared in Tom McGarity with Frank Ackerman, "Flimsy Firewalls: The Continuing Triumph of Efficiency over Safety in Regulating Mad Cow Risks" (Center for Progressive Reform, 2004).

Chapter 8, by Rachel Massey and Frank Ackerman, is based on a 2003 GDAE report, "Costs of Preventable Childhood Illness: The Price We Pay for Pollution," written for the Alliance for a Healthy Tomorrow, a Massachusetts anti-toxics coalition. The report is also by Rachel Massey and Frank Ackerman.

Chapter 9 is based on a 2003 GDAE report, "The Economics of Phasing Out PVC," by Frank Ackerman and Rachel Massey.

Chapter 10, by Frank Ackerman and Rachel Massey, is based on a

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2004 report for the Nordic Council of Ministers, “The True Costs of REACH,” which is also by Frank Ackerman and Rachel Massey.

Chapter 11, by Frank Ackerman, Elizabeth Stanton, Brian Roach, and Anne-Sofie Andersson, was published in *European Environment* in 2008. It is based on a 2006 report to the European Parliament, Directorate-General for External Relations, “Implications of REACH for the Developing Countries,” for which Frank Ackerman was the principal investigator and Anne-Sofie Andersson was the project coordinator. Authors of the report included Frank Ackerman, Rachel Massey, Brian Roach, Elizabeth Stanton, and Raya Widenoja at GDAE; Julien Milanese, William Parenté, and Bernard Contamin at the Research Center on East African Countries, Université de Pau et des Pays de l’Adour, Pau, France; Patrick Bond and Euripides Euripidou at the University of KwaZulu-Natal School of Development Studies, Durban, South Africa; and Anne-Sofie Andersson and Per Rosander at the International Chemical Secretariat in Gothenburg, Sweden.

Chapter 12, by Frank Ackerman, Elizabeth Stanton, and Rachel Massey, was published in *Renewable Resources Journal* in 2007.

Introduction

Once upon a time, protection of human health and the natural environment did not seem to require economic analysis. Throughout its first two decades, in the 1970s and 1980s, the modern environmental movement relied on impassioned public opinion combined with scientific and legal expertise; little or no formal economics was involved. It should be humbling, at least for economists, to recall how much was accomplished in this “pre-economic” era: the Clean Air Act, the Clean Water Act, and other protective measures made our air and water much cleaner, and made us all much healthier—at entirely affordable costs.

For better or worse, the pre-economic phase of environmentalism came to an end during the 1990s. Legal and scientific knowledge alone did not prepare environmental advocates for the new economic debates. Policy problems were increasingly recast as economic questions: if there are too many environmental problems to do something about them all, how should society set priorities? A common answer was, think like a business, rely on cost-benefit analysis, and enact only the policies that are “profitable.”

Specifically, the cost-benefit framework, which is now widely accepted, involves three steps for deciding about a new policy:

1. Calculate the monetary value of the expected benefits of the policy.
2. Calculate the monetary value of the expected costs of the policy.
3. The policy should not be adopted unless the expected benefits exceed the expected costs.

There is a common-sense ring, a superficial plausibility, to this three-step process. Everyone makes decisions by weighing costs and benefits, on some level, in numerous areas of life. But in practice, the formal process of cost-benefit analysis frequently concludes that seemingly attractive environmental initiatives are not justified, since their costs exceed the estimated value of their benefits. There are problems with all three steps in the cost-benefit methodology: the benefits that matter most are subject

to uncertainty and impossible to price; the costs are often exaggerated; and the “bottom line” comparison of the two is, in practice, an obscurely technical process that can easily conceal a partisan agenda. As demonstrated in the following chapters, remarkably small economic costs to business have been found to outweigh major health and environmental risks. Under the cover of economic logic, we are being poisoned for pennies.

The arguments for cost-benefit analysis of health and environmental policies were tolerated under the Clinton administration in the 1990s, and then passionately embraced by the Bush administration starting in 2001. The new administration’s enthusiasm for cost-benefit techniques was matched by its obvious disdain for protecting the environment. This only raised the suspicion that the methodology is the message, that sparing polluters from clean-up costs loomed larger than protecting the rest of us from pollution.

I stumbled into this arena in 2000–2001, initially responding to a request from the Natural Resources Defense Council for an evaluation of EPA’s cost-benefit analysis of standards for arsenic in drinking water. I got hooked on deciphering and rebutting the bizarre hypotheses that often pass for the state of the art in environmental economics, and on working to create a more sensible alternative—and I’ve been at it ever since. This is the second book to emerge from my work on the economics of environmental policy; it can either be read alone, or interpreted as a sequel to the first one.

In *Priceless: On Knowing the Price of Everything and the Value of Nothing*, Lisa Heinzerling and I critiqued the process of cost-benefit analysis and monetary valuation of health and environmental protection. There are no meaningful prices attached to protection of human life, health, nature, and the well-being of future generations, and no end of nonsense has resulted from the attempt to invent surrogate prices for them. The absence of prices is fatal to the cost-benefit project, but it is not the case that unpriced benefits are worthless: what is the cash value of your oldest friendship, your relationship with your children, or your right to vote and participate in a democratically governed country? As the German philosopher Immanuel Kant put it, some things have a price, or relative worth, while other things have a dignity, or inner worth. The failure of cost-benefit analysis, in Kantian terms, stems from the attempt to weigh costs, which usually have a price, against benefits, which often have a dignity.

This book builds on and goes beyond the analysis of priceless benefits. The most important benefits are not only priceless, but often uncertain as well. Uncertainty may exist because the experts still disagree about the extent of hazards, or it may reflect the complexity of the natural systems that are involved. Thus there is a need for precautionary decision making—taking action before complete certainty is reached. A theory of decision making under uncertainty, described in chapter 4, suggests a focus on the most extreme credible outcomes, rather than an attempt to compromise or reach consensus. This does not eliminate consideration of economic costs, but reframes it as part of a deliberative process.

The argument for precautionary policies is a strong one, in part because the economic costs of health and environmental protection repeatedly turn out to be very small. The much-feared ruinous cost of regulations, the dilemma that cost-benefit analysis is conventionally supposed to resolve, vanishes on closer inspection, as seen in chapter 3 and throughout. Complex economic calculations, based on the inaccurate assumption of a problem of enormous costs, all too often serve as a technical-sounding excuse for inaction. Although the information presented in a cost-benefit analysis can often be used for other purposes, the cost-benefit conceptual framework is directly at odds with a precautionary approach.

Along the way to writing *Priceless*, Heinzerling and I wrote a summary of our analysis, “Pricing the Priceless,” which was widely circulated as a pamphlet and was published in the *University of Pennsylvania Law Review*. It is included as the first chapter of this book; among its other merits, it may serve as a synopsis of what happened in the previous volume, for those who are joining the story at this point.

The other chapters in this book are based on work done at the Global Development and Environment Institute, a research institute at Tufts University, during 2003–2007. We launched a program called “Economics for Health and the Environment,” setting out to develop a precautionary economic analysis that supports active efforts to protect human health and the natural environment. (“We,” here and throughout, includes several colleagues and coauthors, as explained in the acknowledgments.) The result was a long series of reports, articles, and testimony, many of them focused on issues of toxic chemicals policy.

The twelve chapters included here, although written separately over

a period of several years, fall naturally into three groups. The first group, on theory and methods, extends the critique of cost-benefit analysis, demonstrates how low the costs of regulation are in general, and sketches an alternative, precautionary approach to decision making. The second group presents U.S. case studies that apply these methods, calculating the vanishingly low economic gains from the use of potentially harmful pesticides; debunking the misleading arguments used to “prove” that the United States does not need to match international standards for bovine spongiform encephalopathy (BSE, or “mad cow disease”) testing; estimating the monetary costs of childhood illnesses attributable to environmental factors; and examining the economics of replacing polyvinyl chloride (PVC) with less toxic materials.

The final group of chapters turns to one of the most ambitious environmental policies of recent years, REACH (Regulation, Evaluation, and Authorization of CHemicals), the European Union’s new chemicals policy. In a series of studies, we found that the costs of REACH will cause only an insignificant change in the price of chemicals sold in Europe; that REACH will not place developing country exporters at a competitive disadvantage; and that compliance with REACH is far more profitable than defiance for U.S. exporters. One implication for U.S. policy is that the much more modest proposals now under consideration here are far too small to harm the economy; indeed, there is room to think more expansively, to consider policies as innovative as REACH, without causing noticeable economic losses.

A publication history for each chapter is included with the acknowledgments; the chapters are based on articles and reports that appeared in different venues over a period of years. As a result, they refer to monetary amounts in different years’ dollars. During the period in question, inflation averaged about 3 percent per year, so that \$1.00 in 2001 had the same purchasing power as \$1.18 in 2007. For comparisons between chapters, therefore, monetary amounts of different vintages should be adjusted up or down by about 3 percent per year, to express them in the same year’s dollars.

A description of the contents of each chapter follows in the next three sections.

Limitations of Cost-Benefit Analysis and the Need for Precaution

The first four chapters flesh out the critique of cost-benefit analysis, exploring its limits and suggesting the need for an alternative, precautionary approach to policy decisions. Chapter 1 summarizes the limitations of cost-benefit methods, as described above. The most important benefits of health and environmental protection have no meaningful monetary prices; the attempts to invent prices for priceless benefits are incoherent in theory, and often laughable in practice. The common practice of discounting the future trivializes our ethical beliefs about social responsibility to our descendants. As a result of these and other limitations, cost-benefit analysis as a decision-making process is neither objective nor transparent; it does not offer a reasonable solution to any important problem in the realm of public health and environmental policy.

Chapter 2 responds to a claim often made by defenders of cost-benefit analysis: perhaps detailed economic calculations were not needed to take the obvious first steps toward environmental protection, but have become more essential now that all the easy decisions have been made. When the Cuyahoga River was catching fire, as it memorably did in 1969, one might not have needed an economic analysis to realize that water pollution had to be controlled. But after a few decades of putting out fires and picking low-hanging fruit, might cost-benefit analysis have become important in answering the more difficult questions about where regulation should go next?

If this were true, then past environmental policy decisions should easily pass a modern cost-benefit test. Yet in the three retrospective case studies examined in chapter 2, contemporary cost-benefit techniques could have produced the wrong answer every time. The elimination of leaded gasoline in the 1970s and 1980s was a lengthy process in which cost-benefit analysis played a valuable supporting role in the final stages; but in the decisive first round of the debate, cost-benefit calculations were not used and could not have been used to endorse the removal of lead. The 1960s decision *not* to build hydroelectric dams encroaching on the Grand Canyon was in fact supported by a cost-benefit analysis—but only because that analysis was spectacularly wrong in hindsight. The strict 1974 standard for workplace exposure to vinyl chloride was not and could not

have been supported by cost-benefit analysis at the time; yet the decision proved to be prescient, as subsequent research has continued to discover new health hazards resulting from exposure to vinyl chloride.

The critique of traditional "command and control" policies and the call for cost-benefit analysis of new proposals rest on a crucial assumption: regulation is thought to be expensive, imposing a trade-off between environmental protection and economic growth. However, as chapter 3 demonstrates, several types of evidence confirm that regulatory costs are typically too small to harm economic growth. The argument is not about the theory; it would logically be possible to spend so much on environmental protection that it would compete with basic economic needs. But has this ever actually occurred?

By way of analogy, one could claim that automobile designers need to account for the effects of relativity on the weight of a car as it accelerates. After all, the theory of relativity and its predictions about the effects of approaching the speed of light are much more widely accepted than any economic theory. All that is missing is the empirical fact that automobiles travel at less than one-millionth of the speed of light, making relativistic effects infinitesimally, undetectably small. In practice, the only sensible approach is to ignore the effects of relativity on automobile transportation as it exists today.

The same is true for the economic burden of most environmental regulations. The problem with the presumed trade-off is not only that the actual costs of regulation are small. In addition, reductions in regulatory costs might not lead to the expected economic improvement. U.S. economic growth is limited in the short run by the Federal Reserve's anti-inflationary policies, not by environmental regulations or by a scarcity of resources. Finally, regulatory critics have taken to claiming that we would all be wealthier, and therefore healthier, without regulations; on the assumption that greater wealth would reduce death rates, regulations that are thought to be costly have been branded "statistical murder." This overwrought rhetoric is refuted by public health research showing that overall death rates are lower when more people are out of work.

Yet another obstacle to precise economic calculation is the uncertainty about many health and environmental risks. Chapter 4 looks at the effects of uncertainty and the resulting arguments for precaution, in

the context of the controversy over dioxin. As with many potential hazards, there is a sharp division of opinion about the dangers of dioxin. Most researchers have concluded that dioxin causes cancer at extraordinarily low levels of exposure; a minority continues to argue that the evidence is inconclusive, and that the harm caused by dioxin has been greatly exaggerated.

Which view should be used in making policy toward dioxin? There is no objective way to assign numerical probabilities, or weights, to the two opposing views of dioxin; as a result, there is no meaningful average, or expected value. Splitting the difference (i.e., taking an unweighted average, in effect assigning equal weights to each extreme) does not seem like a useful approach. Ignoring problems such as this until science reaches a complete consensus would give a veto over public policy to intransigent minorities. The much discussed precautionary principle calls for taking action on the basis of serious warnings of harm, before scientific certainty is reached; but how should decisions be made about precautionary policy proposals?

There is a little-known, formal economic theory of decision making under uncertainty, coauthored by Nobel laureates Kenneth Arrow and Leonid Hurwicz; that theory suggests a methodology for approaching precautionary policies. Under conditions of extreme uncertainty, it turns out that evaluation of a policy depends only on the best and worst possible outcomes. When, as usual, people are risk-averse, then only the worst case matters. That is, under the assumptions of extreme uncertainty and risk aversion, policies can be judged solely on their credible worst case results—a reasonable interpretation of the precautionary principle. (The application of these principles to dioxin in chapter 4 incorporates a number of admittedly arbitrary simplifications; the estimate developed in that chapter is meant as a numerical sketch of the precautionary methodology, not as a precise or definitive calculation of dioxin impacts.)

Decision making based on worst-case possibilities is common enough in other areas of life, from insurance purchases to airport security screening; extension of this way of thinking to health and environmental risks could be interpreted as collective insurance, or screening for environmental security. Indeed, REACH could be described quite literally as screening potential chemical risks, as seen in chapter 10.

The Real Economics of Environmental Protection: Five Case Studies

The next section of the book includes five case studies, applying the principles developed in chapters 1–4 to issues and controversies in U.S. environmental policy. The first two involve the risks of pesticide use.

Atrazine, a powerful herbicide used on most of the corn grown in the United States, is a much debated potential health hazard. There is mounting, though still contested, evidence of effects on human health, and stronger evidence of endocrine disruption and other effects in amphibians and other species. Thus atrazine is a candidate for the precautionary approach discussed in chapter 4. One extreme, the worst case for a continued policy of inaction, is well explored in the scientific literature on health effects. Chapter 5 explores the other extreme, the worst case for a policy of banning atrazine: how large is the economic loss that would result from a ban, if it later turned out to be unnecessary? The question turns primarily on the effect of atrazine on corn yields. Major studies that have supported the need for atrazine have assumed that it adds about 6 percent to corn yields. An industry-sponsored database suggests 2 to 4 percent; other research suggests 1 percent, or even zero effect on corn yields. Two corn-producing countries, Italy and Germany, both banned atrazine in 1991 without any loss in corn yields. Ironically, the same company that makes atrazine also produces one of the best candidates for a replacement, and has sponsored research showing how well the replacement works. A ban on atrazine could mean simply that corn growers would pay slightly more to the same chemical company for an alternative herbicide that is equally effective in killing weeds, but so far does not appear to have serious health effects.

Chapter 6 presents an example of what can go wrong with cost-benefit analysis in practice, in the evaluation of two organophosphate pesticides that are harmful to the health of farmworkers. The discussion in chapters 1 and 2 deals largely with the theory of cost-benefit analysis, assuming it is applied in a fair and unbiased manner. Yet as chapter 6 shows, the densely technical nature of the analysis can conceal a blatantly one-sided treatment of the issues: EPA appeared to have decided in advance that the value of the pesticides to growers outweighed any harm to farmworkers, their families and communities, and the ecosystems of the af-

fected region. Reliance on EPA's economic studies in this case led to the exact opposite of an objective, transparent decision-making process; rather, the opacity of the details hid the lack of objectivity from public view.

In my testimony on behalf of the United Farm Workers and other groups, which forms the basis for chapter 6, I reviewed two rounds of EPA's economic analysis. The agency's first study exaggerated the economic value of pesticides to growers, while minimizing or overlooking health and environmental impacts on farmworkers, communities, and ecosystems. After receiving public comment on this study, EPA then produced a very different analysis. The agency's second look at the issue concluded that the pesticides had almost no economic value to growers, but suggested that EPA's own data on farmworker health hazards should not be taken seriously, and introduced an inaccurate, unsupported claim that rapid phase-out of a harmful pesticide would hurt U.S. exports.

Another potential hazard, BSE, involves a deeper form of uncertainty: the extent of the problem is unknown in advance because the disease, which is fatal and incurable, cannot be definitively diagnosed until an autopsy is performed. Yet unlike many countries, the United States tests only a tiny fraction of all slaughtered cattle for BSE. As chapter 7 shows, seemingly objective economic and statistical analysis again obscures the biases that are built into U.S. policy. While the general result parallels that of chapter 6—dense technical arguments create an unfounded suggestion that the problem is not particularly severe—the economic models and techniques are very different. Elaborate computer models project that BSE is quite rare in the United States, and that if it were present at a low level, it would naturally die out rather than spread. These models reach their reassuring conclusions only by relying on optimistic assumptions and taking for granted that the most disturbing scenarios they have identified are not worth investigating. The U.S. Department of Agriculture has nonetheless relied on these models and rejected the much higher rates of BSE testing that are standard in Europe and Japan, even though international levels of testing would add only a few pennies per pound to the price of beef.

A common theme of the last few chapters is that the costs of precautionary policies, taking protective action against potential hazards, would be extremely small. Matching international standards for BSE testing, or