

# THE SUBTLE VICIES BEHIND ENVIRONMENTAL VALUES

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## I. INTRODUCTION

Few contemporary cows are more sacred than environmentalism and its underlying values. Policy controversies are commonly portrayed as battles between victimized citizens and corporate polluters or between innocent animals and rapacious developers. In this perceived context, who could fail to side with the environmentalists? Yet the given context represents a misleadingly simplistic false dichotomy. Reality is more complex, and the apparent virtues of environmentalism may obscure a darker underside.

The significance of environmental values is highlighted in prevailing controversies pitting public perceptions of risk against more scientific probabilistic measures. The probabilistic measures are not infrequently on the side of the "polluters."<sup>1</sup> While public risk perceptions were once cavalierly derided as ignorant, they now are often lauded as richly value laden. Thompson suggests that a "reasonable person's concept of risk, vague as it is, is *better* suited to the regulatory requirements of risk management than are probabilistic concepts."<sup>2</sup> Scientific probabilism, sometimes criticized for inaccuracy, is more commonly rejected as impoverished in its lack of normative values. Scientists themselves are perhaps uncomfortable with subjectivity and may too quickly concede this point.

Science, like all human endeavors, reflects values. Reliance on scientific probabilism in environmental policymaking reflects a concern for factual accuracy as a means to achieve goals such as equality and maximization of life saving within exogenous resource constraints. Reliance on science is broadly consistent with liberty and democracy. These values of the scientific method are far more valid than some of the values underlying public risk perceptions.

Many different issues are relevant to the question of whether lay opinion should govern public policy. Some in academia rather

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1. Critics of probabilism have contended that the method furthers a "right-wing political agenda." See William Leiss, *Assessing and Managing Risks*, 25 POL'Y SCI. 341, 343 (1992).

2. Paul B. Thompson, *Risk Objectivism and Risk Subjectivism: When Are Risks Real?*, 1 RISK: ISSUES IN HEALTH AND SAFETY 3, 22 (1990).

blithely assume that public values should necessarily be embraced by risk managers.<sup>3</sup> This article focuses on the nature of values central to public perceptions of risk and strives to persuade the reader that public values generally should not be relied upon for risk regulation.<sup>4</sup>

## II. SOURCES OF PUBLIC PERCEPTION

The place of values in public opinions of risk is diverse. Even in a democracy, government need not worship at the shrine of public opinion. Cass Sunstein has observed in a somewhat different context that public preferences are quite malleable and may be inappropriate determinants of government policy.<sup>5</sup> Hence, the sources of public perception must be explored before its results are embraced.

At the outset, it is critical to recognize that public perceptions of risk can be partly explained by misinformation. The general public is subject to a variety of cognitive limitations and gets its risk information from systematically and pervasively skewed sources.<sup>6</sup> To the extent that perceptions are grounded in ignorance or bias, they hardly warrant reliance.

Research suggests that ignorance does not explain fully the sources of public perception of risk, nor its divergence from scientific

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3. See, e.g., Adam Finkel, *Afterthoughts, in* WORST THINGS FIRST?: THE DEBATE OVER RISK-BASED NATIONAL ENVIRONMENTAL PRIORITIES 335, 336-37 (Adam M. Finkel & Dominic Golding eds., 1994) (suggesting that citizens' value assessments should prevail over scientific estimation). Others have a more nuanced view. Cass Sunstein suggests that citizens' value judgments about risk deserve respect so long as they are "both reflective and informed." Cass R. Sunstein, *Congress, Constitutional Moments, and the Cost-Benefit State*, 48 STAN L. REV. 247, 267 (1996). While the thrust of the article appears to credit public perceptions, his caveats of informed reflection might well obliterate a role for such perceptions. In addition, he has also observed that the "mere fact that certain values are expressed through public action does not, of course, mean that those values must be endorsed." Richard H. Pildes & Cass R. Sunstein, *Reinventing the Regulatory State*, 62 U. CHI. L. REV. 1, 71 n.233 (1995). This article attempts to elaborate the seldom recognized point that public values about risk may be unworthy of incorporation in government regulation.

4. It is also important to recognize that public perception may underestimate risks. While the typical debate confronts a public perceiving high risk vs. low probability estimates, the public probably underestimates more risks. See, e.g., Dermot J. Hayes et al., *Valuing Food Safety in Experimental Auction Markets*, 77 AM. J. AGRIC. ECON. 40 (1995) (documenting public underestimation of risk from foodborne pathogens).

5. See Cass R. Sunstein, *Preferences and Politics*, 20 PHIL. & PUB. AFF. 3 (1991). He observes that the "phenomenon of endogenous preferences casts doubt on the notion that a democratic government ought to respect private desires and beliefs in all or almost all contexts." *Id.* at 5. With respect to risk perception, see William H. Foege, *Plagues: Perceptions of Risk and Social Responses*, 55 SOC. RES. 331, 334-335 (1988) (concluding that we "know from recent studies that the perception of risk that people have for many conditions is unrealistic, unstable, and influenced by illusions of control").

6. See Frank B. Cross, *The Public Role in Risk Control*, 24 ENVTL. L. 887, 897-912 (1994).

probabilism.<sup>7</sup> Rather, it has been demonstrated that a system of values also enters the equation.<sup>8</sup> A variety of variables have been suggested as reflective of these values (*e.g.*, the catastrophic potential of risk, voluntariness of risk, etc.).<sup>9</sup> Research fairly consistently shows that the public considers risk factors beyond those of scientific probabilism.<sup>10</sup> A recent World Bank study, for example, found that qualitative factors could explain material differences in public perception of risk among various lifesaving programs.<sup>11</sup>

Identifying the presence of value concerns is easier than determining precisely what values are of concern to the public. Some purported values, such as catastrophic potential, may not in fact explain public perceptions.<sup>12</sup> There is considerable evidence that public perception is driven in material part by at least two factors—a rather amorphous concept called “dread” and the voluntariness of the risk at issue.<sup>13</sup> I will focus my discussion of risk perception values on these two concepts and suggest that neither offers a compelling normative reason to rely on public perception in public health policy.

### III. THE UNFAIRNESS OF PERCEPTIONS OF DREAD

The concept of “dread” risk is central to public perceptions.<sup>14</sup> Dread represents a myriad of intercorrelated characteristics, including “involuntary, unknown, uncontrollable, [and] unfamiliar” features.<sup>15</sup> A new development, such as biotechnology, may be dreaded

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7. See Paul Slovic et al., *Characterizing Perceived Risk*, in PERILOUS PROGRESS: MANAGING THE HAZARDS OF TECHNOLOGY 91, 1115 (Robert W. Kates et al. eds., 1985); George A. Quattrone & Amos Tversky, *Contrasting Rational and Psychological Analyses of Political Choice*, 82 AM. POL. SCI. REV. 719, 735 (1988). See also Cross, *supra* note 6, at 891.

8. See Cross, *supra* note 6, at 889-90.

9. See *id.* at 891-95.

10. See *id.* at 892, 898-99.

11. See Maureen L. Cropper & Uma Subramanian, *Public Choices Between Lifesaving Programs: How Important Are Lives Saved?*, WORLD BANK POLICY RESEARCH WORKING PAPER No. 1497 (Aug. 1995). The variation in preference among lifesaving programs was up to 2.5 times the probabilistic life saving. This is roughly consistent with other research. See, *e.g.*, John M. Mendeloff & Robert M. Kaplan, *Are Large Differences in “Lifesaving” Costs Justified? A Psychometric Study of the Relative Value Placed on Preventing Deaths*, 9 RISK ANALYSIS 349 (1989) (finding differences up to two-fold in preferences among programs with equal lifesaving).

12. See, *e.g.*, HOWARD MARGOLIS, DEALING WITH RISK 114 (1996) (suggesting that factors identified as causes of public concern may simply be ways to rationalize such concerns). People give relatively little heed to certain catastrophic risks, such as dam failure.

13. See Cross *supra* note 6, at 914-918, 924-926.

14. See *id.* at 924 n.130.

15. Paul Slovic, Sarah Lichtenstein, & Baruch Fischhoff, *Modeling the Societal Impact of*

because it is unfamiliar to people who have no history of dealing with its consequences. Lack of experience enables us to imagine the worst.

A recent study of food safety perceptions in the United Kingdom demonstrated the importance of dread.<sup>16</sup> The authors found that substances deemed natural, familiar, or often present in food were not much feared. By contrast, identifying a risk as “chemical” increased the perception of risk significantly. This perception is directly contrary to the findings of the National Academy of Sciences and other researchers reporting that natural constituents of food are far more hazardous than any chemical additives.<sup>17</sup>

Unfamiliarity or lack of empirical experience is not an unreasonable concern. However, such fear of the unfamiliar yields a conservative prejudice for the status quo and against meaningful change. More seriously, a bias for the familiar can produce a noxious prejudice on behalf of the commonplace middle class experience and against “different” peripheral groups and activities.

Fear of young black men undoubtedly is a species of dread of those who look, sound, and act differently. Historically, Americans have had similar fears about immigrants. Likewise, the public fear of AIDS transmission from casual contact (while overlooking risks from heterosexual intercourse) surely reflects fear of the periphery and comfort with more familiar practices. Perceptions of dread risk can serve as a “powerful tool of an entrenched and xenophobic status quo against outsiders.”<sup>18</sup> Research on perceptions of crime shows that fear is driven less by actual crime incidence than by such factors as the presence of “strangers in the neighborhood.”<sup>19</sup> Perceived risks of crime reflect a “distinct middle-class bias” against activities that “violate the collective sensibilities of middle-class neighborhoods.”<sup>20</sup> Dread risk can be a tool to disadvantage those dissimilar to the majority.

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*Fatal Accidents*, 30 MGMT. SCI. 464, 467 (1984).

16. Monique M. Raats & Richard Shepherd, *Developing a Subject-Derived Terminology to Describe Perceptions of Chemicals in Foods*, 16 RISK ANALYSIS 133 (1996).

17. See NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, *CARCINOGENS AND ANTICARCINOGENS IN THE HUMAN DIET* (1996).

18. Frank B. Cross, *The Risk of Reliance on Perceived Risk*, 3 RISK: ISSUES IN HEALTH & SAFETY 59, 66 (1992).

19. Randy LaGrange, Kenneth Ferraro & Michael Supancic, *Perceived Risk and Fear of Crime: Role of Social and Physical Incivilities*, 29 J. RES. IN CRIME & DELINQUENCY 311, 319 (1992).

20. *Id.* at 328.

There is, of course, a moral difference between dread of a discrete and disempowered human minority group and dread of a new technology. The evidence on the dread of minority groups must raise questions about the legitimacy of the general concept, however. How can one justify a position that values behind public fear of minorities are bad but values behind public fear of technology are good, especially when both are grounded in a similar conservative bias? The case for reliance on public perceptions is fundamentally grounded in a populist vision that the values of the average person are inherently good, but the all too common presence of racism negates this proposition. Even if one could theoretically distinguish between fear of persons and of technologies, the ability to isolate dread of minorities from dread of technology is not as simple as it might at first seem.

Reliance on public perception must inevitably lead to a focus on the interests of an empowered and successful majority community and a concomitant overlooking of the interests of the poorer minority. Perceived risk is by its nature majoritarian. Perceptions have a further bias in favor of the concerns of the richer. Those with the time and income to focus on environmental risks tend to be relatively well-to-do, at least on average. Kristin Shrader-Frechette has noted that “environmentalists tend to be white, middle-aged, middle-class professionals—not young, blue-collar workers, or blacks.”<sup>21</sup> This relatively advantaged group also has the resources to employ the media, influence government, and otherwise spread their perceptions.

Disadvantaged groups often have greater concerns than pollution. Minorities do have environmental concerns, but their concerns are often different from those driven by majoritarian perceptions. Minority communities lack the “organization, financial resources, or personnel to mount and sustain effective long-term challenges to such unpopular facilities as municipal and hazardous waste landfills.”<sup>22</sup> This explains why the populist campaigns of NIMBY (Not In My Backyard) can functionally become PIBBY (Place In Blacks’ Backyards).<sup>23</sup> Business is most likely to place a hazardous waste site in a locale that is least likely to protest effectively.<sup>24</sup> In such a battle

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21. KRISTIN SHRADER-FRECHETTE, RISK AND RATIONALITY: PHILOSOPHICAL FOUNDATIONS FOR POPULIST REFORMS 21 (1991).

22. ROBERT D. BULLARD, DUMPING IN DIXIE: RACE, CLASS AND ENVIRONMENTAL QUALITY 18 (1990).

23. See Robert W. Collin, *Environmental Equity: A Law and Planning Approach to Environmental Racism*, 11 VA. ENVTL. L.J. 495, 509-510 (1992).

24. See Vicki Been, *What's Fairness Got To Do with It? Environmental Justice and the Siting of Locally Undesirable Land Uses*, 78 CORNELL L. REV. 1001 (1993).

of political power, the poor usually lose out. The inequities noted by authors on “environmental racism” can be attributed to “the fact that priorities generally have not been based on relative risks, but rather in response to public pressure.”<sup>25</sup>

Public perception will not only devalue the environmental concerns of the disadvantaged, but regulations based upon such perceptions may well increase the risks presented to the members of disadvantaged groups. The NIMBY/PIBBY effect is but one small example of this phenomenon.

The unfortunate effects of public perception are pronounced in pesticide policy. Austin and Schill, minority environmental activists, have observed:

In response to pressure from environmentalists concerned about saving wildlife and protecting the health of the general population, pesticides of great persistence, but low acute toxicity (like DDT and chlordane) have been ... replaced by pesticides that degrade rapidly, but are more acutely toxic (like parathion). The substitutes, of course, pose a greater risk to farmworkers and their offspring, who are for the most part people of color.<sup>26</sup>

Wildaussy also noted, “as DDT was phased out and organophosphates were used more, [farmworker] mortalities increased sharply.”<sup>27</sup> Furthermore, banning ethylene dibromide over a phantom public risk likewise increased farmworker risk.<sup>28</sup>

The shift of risk from the public to blue collar workers is not limited to the pesticide context. “[R]educing public risk often means creating occupational risk,”<sup>29</sup> and affected workers tend to be poorer than the white collar prompters of regulatory action. Demands to remove all asbestos from buildings created some risk to removal

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25. Albert L. Nichols, *Risk-Based Priorities and Environmental Justice*, in *WORST THINGS FIRST?*, *supra* note 3, at 267, 268.

26. Regina Austin & Michael H. Schill, *Black, Brown, Poor & Poisoned: Minority Grassroots Environmentalism and the Quest for Eco-Justice*, 1 *KAN. J.L. & PUB. POL'Y* 69, 78 (1991).

27. AARON B. WILDAVSKY, *BUT IS IT TRUE?* 73 (1995).

28. See Donald T. Hornstein, *Paradigms, Process and Politics: Risk and Regulatory Design*, in *WORST THINGS FIRST?*, *supra* note 3, at 147, 160 (indicating that the EDB ban was “based on overblown fears of consumer carcinogenicity and an underestimate of the risks to pesticide applicators who would be forced to use more carcinogenic substitutes”).

29. Chris Whipple, *Nonpessimistic Risk Assessment and De Minimis Risk as Risk Management Tools*, in *THE RISK ASSESSMENT OF ENVIRONMENTAL AND HUMAN HEALTH HAZARDS* 1109 (Dennis J. Paustenbach ed., 1989).

workers, even though preexisting risks were often absent.<sup>30</sup> Cleaning up hazardous sites may create several times more risk to workers than “the health risk from not cleaning up.”<sup>31</sup> A government regime grounded in public perception evinces relatively little concern for occupational risks faced by discrete groups of blue collar workers.

Even if environmental action does not directly shift risks to the disadvantaged, the actions may still have regressive opportunity costs. When government actions are driven by public perceptions and pressure groups, those actions generally are responding to middle class concerns and ignoring the problems of the poor. EPA acted vigorously to address problems that later proved overstated at largely white communities in Love Canal and Times Beach, but failed to attend comparably to minority communities.<sup>32</sup> Penalties for violations of hazardous waste laws tend to be lower in minority areas, sites in these areas wait longer for cleanup, and weaker remedies are employed.<sup>33</sup> Economically advantaged communities tend to have more Superfund sites designated for cleanup, so that the “net effect of cleaning up abandoned hazardous waste sites is most likely to redistribute resources regressively from consumers and taxpayers chiefly to wealthier and better-educated communities.”<sup>34</sup> After statistically demonstrating this effect, Hird ascribed the explanation to “public opinion.”<sup>35</sup> “Environmental reforms” are too often “used to direct social and economic resources away from problems of the poor toward priorities of the affluent.”<sup>36</sup>

In addition to shifting risks to the disadvantaged, environmental regulations often burden the disadvantaged with a disproportionate share of their costs. While environmentalists may believe that compliance costs are borne by captains of industry, the bulk of these costs

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30. See Frank B. Cross, *Asbestos in Schools: A Remonstrance Against Panic*, 11 COLUM. J. ENVTL. L. 73 (1986).

31. JOHN D. GRAHAM & JONATHAN BAERT WIENER, *RISK VS. RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT* 16 (1995).

32. See Tom Arrandale, *Environmentalism and Racism*, GOVERNING, February 1992, at 63 (reporting how EPA “overlooked minority protests by approving such objectionable projects as a PCB disposal facility in predominantly black Warren County, North Carolina, and a hazardous waste landfill in Kettleman City, a Latino farmworker community in California”).

33. See Marianne Lavell & Marcia Coyle, *Unequal Protection: The Racial Divide in Environmental Law*, NAT. L.J., Sept. 21, 1992, at S1.

34. John A. Hird, *Environmental Policy and Equity: The Case of Superfund*, 12 J. POL’Y ANALYSIS & MGMT. 323, 338 (1993).

35. See *id.*

36. BULLARD, *supra* note 22, at 17.

are passed on to consumers.<sup>37</sup> The result is a distribution of costs that is “even more regressive than the typical sales tax.”<sup>38</sup> Even if costs are not passed on directly by way of prices, companies may lay off workers, and such layoffs are most commonly felt in occupations that have “provided the best employment opportunities for the poor.”<sup>39</sup> Regulatory costs may also be reflected in lower wage rates.<sup>40</sup> One effect of environmental action is often to siphon money from the poor to promote the interests of the more advantaged.

Some of the greatest inequity can arise from the anti-technology bias of public concepts of dread.<sup>41</sup> The attack on technological advance characterizes much within perceived risk, yet such dread can readily become a beggar-thy-neighbor policy adversely affecting discrete groups of needy individuals. A group of prominent scientists, including 27 Nobel laureates, warned of an “irrational ideology which is opposed to scientific and industrial progress,” that remains the key to “overcoming major problems like overpopulation, starvation and worldwide diseases.”<sup>42</sup> Technological advance has historically benefited disadvantaged groups.<sup>43</sup> Bayard Rustin complained of anti-

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37. See H. David Robison, *Who Pays for Industrial Pollution Abatement?*, REV. ECON. STAT. 702, 703 (1985).

38. Frank B. Cross, *When Environmental Regulations Kill: The Role of Health/Health Analysis*, 22 ECOL. L.Q. 729, 763 (1995) (citing multiple studies on the regressive incidence of pollution control costs). The costs of water pollution control requirements in Boston reportedly have forced 100,000 households to “cut back on food, clothing, and medical care.” David Stipp, *Poor Pay a Big Price to Drink Clean Water*, WALL ST. J., Jan. 15, 1992, at B1.

39. Cross, *supra* note 38, at 763. See also Ralph L. Keeney, *Mortality Risks Induced by the Costs of Regulation*, 8 J. RISK & UNCERTAINTY 95, 106 (1994) (suggesting that environmental regulations shift job opportunities from manufacturing to white collar occupations).

40. See Ann P. Bartel & Lacy Glenn Thomas, *Predation Through Regulation: The Wage and Profit Effects of the Occupational Safety and Health Administration and the Environmental Protection Agency*, 30 J.L. & ECON. 239, 246 (1987).

41. It is suggested that “[a]voiding technological risks is a central preoccupation of our age.” SHEILA JASANOFF, RISK MANAGEMENT AND POLITICAL CULTURE 1 (1986); see generally, Robin Gregory, James Flynn, & Paul Slovic, *Technological Stigma*, AM. SCI., May/June 1995, at 220-223.

42. *Beware of False Gods in Rio*, WALL ST. J., June 1, 1992, at A12.

43. For a vigorous liberal defense of technology and criticism of much contemporary environmentalism as Luddite, see Walter Truett Anderson, *There's No Going Back to Nature*, MOTHER JONES, Sept./Oct. 1996, at 34. The anti-technology bias of ecofeminism is particularly ironic, as women have consistently benefited from advances. See also Johana Brenner & Nancy Holmstrom, *Women's Self-Organization*, 34 MONTHLY REV. 34 (1983) (technology had enabled women to advance in the workplace); Sharon Camp, *Population: The Critical Decade*, FOREIGN POL'Y, March 22, 1993, at 126 (describing how additional technological advance can “further improve women's status and economic security”). In poorer nations, the “preservation of species and the protection of nature” have depended “upon social exclusion of races, of women, and of other nationalities.” Cecile Jackson, *Environmentalisms and Gender*

growth environmentalists, who “would condemn the black underclass, the slum proletariat, and rural blacks to permanent poverty.”<sup>44</sup> Dread of change is inherently a conservative, status quo impulse that offers little to those unhappy with the status quo.

Scientific probabilism, as an alternative to public perception, is no panacea for all the environmental problems of the poor. But at least such probabilism treats all lives as of equal concern. Historically speaking, there has been a “rough equation of a more ‘scientific’ social order with a more egalitarian one.”<sup>45</sup> Vice President Al Gore, while a United States Senator, recognized the equity of science in proposing the Environmental Justice Act of 1992.<sup>46</sup> His proposal for advancing environmental equity was grounded in basing policy on the best scientific evaluations of the health problems associated with environmental contamination.<sup>47</sup>

There is evidence confirming the virtue of using a scientific method for determining environmental policy. Perhaps the greatest success story in environmental regulation involves lead—a substance that created unusually great health harms, most of which were felt by the urban poor. The elimination of lead in gasoline and other regulatory measures reduced exposures and attendant consequences dramatically.<sup>48</sup> Regulation of lead stands out from most government action because it was driven by science rather than public perceptions.<sup>49</sup> The experience stands as a compelling example of how a strategy grounded in scientific probabilism “would appear to represent a major gain for minority communities.”<sup>50</sup> The Harvard School of Public Health has similarly noted that risks to disadvantaged groups “do not receive sufficient governmental priority precisely because the limited

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*Interests in the Third World*, 24 DEV. & CHANGE 649, 654 (1993).

44. WILLIAM TUCKER, PROGRESS AND PRIVILEGE: AMERICA IN THE AGE OF ENVIRONMENTALISM 37 (1982). Carl Anthony describes a Berkeley public hearing at which anti-development environmentalists booed blacks testifying on the need for jobs, causing him to feel as if he were dealing with the Ku Klux Klan. See Carl Anthony, *Eco-Justice*, TURNING WHEEL, Spring 1993, at 19.

45. PAUL R. GROSS & NORMAN LEVITT, HIGHER SUPERSTITION: THE ACADEMIC LEFT AND ITS QUARRELS WITH SCIENCE 22 (1994).

46. S. 2806, 102d Cong. (1992).

47. See *id.*

48. See Sandra Blakeslee, *Concentrations of Lead in Blood Drop Steeply*, N.Y. TIMES, July 27, 1994, at A18 (reporting a 78% reduction in lead levels in the bloodstream of the affected public).

49. See Nichols, *supra* note 25, at 270.

50. *Id.* at 268.

political power of disadvantaged populations is not counteracted by the use of comparative risk analysis."<sup>51</sup>

The illiberal nature of public perception of dread risks should not be too surprising. The history of American populism is tainted by Anti-Semitism, nativism, and intolerance, expressed by the likes of Gerald L. K. Smith and Father Coughlin.<sup>52</sup> Today's populism is similarly characterized by a "white backlash."<sup>53</sup> The middle class enthusiasms of environmental populism may be likewise objectionable, if more indirectly. Even if the poor seek to develop a countermovement of populism, they lack the resources to be effective. Public dread is a poor guide for policymaking.

#### IV. THE SELFISHNESS OF PERCEPTIONS OF VOLUNTARINESS

Risk perception research has consistently found a difference in public attitudes toward "voluntary" and "involuntary" exposures to risk. Other factors being equal, an activity that seems fundamentally voluntary in nature (such as skydiving) will be perceived as relatively less risky than an activity that appears essentially involuntary (such as breathing polluted air). For example, some observers have complained that the individuals who argue most strongly against environmental exposure to carcinogens may also be cigarette smokers.<sup>54</sup> While some inconsistency is apparent, these individuals can respond that smoking, while very risky, is a voluntary choice that they have made for themselves. They have little option when it comes to breathing the local ambient air. It has been suggested that this voluntariness factor can explain the one thousand fold variations in risk perception.<sup>55</sup>

Voluntariness has a legitimate value foundation, recognizing the right to control one's own body. When a person chooses to accept a voluntary risk, she does so in a manner consistent with her personally perceived benefits of the risky activity, as well as her future plans,

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51. HARVARD GROUP ON RISK MANAGEMENT REFORM, REFORM OF RISK REGULATION: ACHIEVING MORE PROTECTION AT LESS COST 18 (1995).

52. See, e.g., RICHARD HOFSTADTER, THE AMERICAN POLITICAL TRADITION (1948); Victor Ferkiss, *Populist Influences on American Fascism*, 10 WESTERN POL. Q. 350 (1957)

53. See CHRISTOPHER LASCH, THE TRUE AND ONLY HEAVEN: PROGRESS AND ITS CRITICS 504 (1991).

54. See Janet M. Fitchen, *Cultural Values affecting Risk Perception: Individualism and the Perception of Toxicological Risks*, in NEW RISKS: ISSUES AND MANAGEMENT 602 (Louis A. Cox, Jr. & Paolo F. Ricci, eds., 1990).

55. See M. Granger Morgan, *Choosing and Managing Technology-Induced Risk*, in READINGS IN RISK 21 (Theodore S. Glickman & Michael Gough eds., 1990).

value preferences and other factors. This process produces risk decisions best suited to that person, who is treated as an individual and not a mere cipher amongst the public body.

There is a moral difference between choosing to smoke and blowing your smoke into the face of another. Voluntariness also invokes procedural values. Even if one does not mind an imposition, it is nice to be asked. Shrader-Frechette has vigorously emphasized the importance of this value, declaring that "no matter how experts define a hazard, its imposition is ethically justifiable only if the persons affected by it have given free informed consent and are compensated for the danger they face."<sup>56</sup> This position has obvious deontological appeal.

Legal doctrines such as informed consent reflect the appeal of voluntariness. In medicine, we do not ask if the patient is an expert, nor do we inquire of her faulty risk perceptions. She generally retains the right to consent to a medical risk or not. The doctrine is grounded in respect for human dignity. Reliance on voluntary risk acceptance also helps ensure that the same individuals incur both the risk and the benefit of an activity, thereby helping ensure fairness in risk policy.

Obviously, voluntariness merits some consideration in risk regulation. However, its practical application in the context of risk regulation is problematic. Significant reliance upon a voluntariness criterion is naive and often a reflection of bias.

The first problem with voluntariness is in its definition. In the context of public values, the issue is not so much actual voluntariness as public perceptions of voluntariness.<sup>57</sup> Such public perceptions of voluntariness may be skewed much as perceptions of probabilistic risk are skewed. Such skewing may also reflect a classist bias, as described above.

Indeed, the definition of voluntariness is more difficult than generally acknowledged. In a Skinnerian world, no risks are truly voluntary, because we are conditioned, genetically or environmentally, to make certain decisions. By contrast, in the world of Coase, virtually all risks are voluntary, because one can bargain for their elimination. While public perception subscribes to neither extreme, the definitional problem remains.

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56. SHRADER-FRECHETTE, *supra* note 21, at 86.

57. See MARGOLIS, *supra* note 12, at 39 (noting that characteristics like voluntariness mean "*perceived* voluntariness").

Consider for example occupational risks, often deemed to be accepted voluntarily. Various studies have found that workers seem to receive higher compensation in exchange for their acceptance of higher risks of accidents or other harms. This certainly seems like a voluntary acceptance of risk. The true voluntariness of the exchange may be somewhat tainted by the presence of a severe family need for higher income. In times of unemployment, it is increasingly difficult to accept the decision to take work as a purely voluntary choice. To the honors graduate of Harvard Law School, the choice of an employer may seem a voluntary one. To the average blue collar worker, the voluntariness is not so clear.<sup>58</sup> There is surely some component of voluntariness to many occupational decisions. Yet the decision is not wholly voluntary. The binary nature of the voluntary/involuntary distinction inevitably breaks down.

Occupational risk is not the only area in which voluntariness is debatable. One of the largest sources of risk in contemporary society is driving. The decision to own and drive an automobile is partially voluntary. Yet in many American cities, driving a car is a virtual condition of employment. No matter how safely one drives, he remains hostage to the driving behaviors of others. Is the risk of an automobile accident voluntary? Are risks to pedestrians voluntary once they choose to cross a street?

The above examples are commonplace. One survey found substantial disagreement among how individuals rated the "voluntariness of technologies such as prescription antibiotics, commercial aviation, handguns, and home appliances."<sup>59</sup> A study of air pollution risk found voluntariness highly perceptual and dependent upon personality type. Ninety-two percent of risk averse individuals considered the risk from smelter emissions involuntary, but sixty-four percent of more risk tolerant individuals believed the risk to be a voluntary one.<sup>60</sup> At some level, a person makes a voluntary decision to live and work in a particular community.

A second shortcoming of voluntariness is information. In the historic recognition of voluntariness in medical practice, consent

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58. See, e.g., Annette Baier, *Poisoning the Wells*, in *VALUES AT RISK* 66 (Douglas MacLean ed., 1986) (observing that a coal miner might accept his employment out of compulsion, "even when he is not, like a member of a chain gang, literally coerced into working there").

59. Baruch Fischhoff, *Risk: A Guide To Controversy*, in *NATIONAL RESEARCH COUNCIL, IMPROVING RISK COMMUNICATION* app. C, 273 (1989).

60. See Brian Baird, *Tolerance for Environmental Health Risks: The Influence of Knowledge, Benefits, Voluntariness, and Environmental Attitudes*, 6 *RISK ANALYSIS* 425, 430 (1986).

must be sufficiently informed to be meaningful, and uninformed consent is not considered to be a truly voluntary choice. The concept of informed consent typically serves to undermine efforts to rest upon the concept of voluntary risk. Few people have the time or inclination to inform themselves of each of the myriad of risks found in the world. Few if any of the risks of everyday living could therefore be considered voluntary. Ms. Shrader-Frechette provides a hypothetical example of the difficulty:

Consider, for example, the type of community most likely to accept a particularly dirty, dangerous factory or a controversial toxic waste dump. It would, very likely, be a town where people needed the jobs, or the tax benefits of the facility, or where levels of education about the relevant dangers of the facility were less known than in other places. In other words, the communities least able to give free, informed consent to a risk are typically those that allegedly consent.<sup>61</sup>

This reasoning is consistent with principles underlying informed consent but it potentially obliterates the voluntariness standard for environmental risks to public health.

One suspects that detailed investigations into consent are not incorporated in public perceptions. Most would consider the explicit acceptance of the toxic waste dump to be voluntary. This aspect of public attitudes about risk is grounded less in actual voluntariness than in perceptions of voluntariness.<sup>62</sup> As voluntariness reduces merely to perceptions of voluntariness (which may themselves be factually inaccurate), the moral legitimacy of the consideration dwindles. The moral compulsion of respect for human autonomy is grounded in actual, not perceived, voluntariness. Furthermore, the typical American's perception of voluntariness may fail to appreciate, and therefore be biased against, the situation faced by the disadvantaged.

A third shortcoming of the voluntariness standard is its unrealizability in a complex interdependent society such as ours. Take the considerable risks attendant to driving an automobile. As a driver, I impose some risk of harm upon everyone nearby. Must I obtain their consent before driving? Such consent cannot be easily presumed. I

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61. SHRADER-FRECHETTE, *supra* note 21, at 73.

62. See Baird, *supra* note 60, at 430 (suggesting that the distinction is between an event "perceived as voluntary while the other is perceived as involuntary").

suspect that there are pedestrians and bicyclists who would quite readily withhold their consent from all operators of automobiles.<sup>63</sup> Similar complexity exists for pollution. Must every new business (homeowner?) receive informed consent from everyone potentially exposed to emissions, however small?

The fourth and most serious defect of the voluntariness standard is that it is fundamentally an individualist, selfish standard. It is widely recognized that taking a polluting action imposes externalities. Coase notwithstanding, it seems less widely recognized that voluntary risk-taking or withholding consent for involuntary risks may likewise impose external costs upon others.<sup>64</sup>

In the context of voluntary risks, the risk takers reap the benefits of their activity, while some of the costs of the risk-taking are shifted to society. Leiss and Chociolko note that “the risk-averse segment of the population is compelled to share the losses of the risk-prone.”<sup>65</sup> When the risk ultimately materializes, at least some of the costs are shifted to society (through helicopter rescues, medical care, disability payments, etc.). They go on to protest that it is “unreasonable, illogical, economically ruinous, and ultimately self-defeating to seek to protect citizens from involuntary exposure to certain risk levels if, simultaneously, many of those selfsame citizens voluntarily expose themselves to levels of other risks that are often higher by several orders of magnitude.”<sup>66</sup> I suggest that the externalities of refusing to consent to involuntary risks are vast and far greater than the external consequences of voluntary risk-taking.

To consider the potential selfishness of a voluntariness standard, take the following analysis. One might voluntarily accept a risk such as skiing or smoking, thinking: “I will accept X amount of risk from activity Y, knowing that I personally will reap the enjoyment from the activity.” The same individual might subsequently decide: “I will not accept even X/100 amount of risk from activity Z, because I perceive few if any direct benefits to me from this activity, how ever much it may benefit others.” Fischhoff has noted that the “acceptable-

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63. See Andreas Teuber, *Justifying Risk*, 119 DAEDALUS 235, 249 (1990) (suggesting that “you are not morally required to obtain the permission of everyone who might be in the path of your car should it go out of control on your way to the post office”).

64. Joel Feinberg contends that risks to life cannot be so automatically prohibited without considering “the independent value of the risk-creating conduct both to the actor himself, to others directly affected by it, and to society in general.” JOEL FEINBERG, HARM TO OTHERS 191 (1984).

65. WILLIAM LEISS & CHRISTINA CHOCIOLOKO, RISK AND RESPONSIBILITY 57 (1994).

66. *Id.* at 265.

technology principle is exclusively egoistic” as “individuals judge the acceptability of a technology solely by the risks and benefits that they personally receive from it.”<sup>67</sup>

The egoism appears pervasive in public risk perceptions. The entire thrust of the NIMBY movement is based on transferring risks to the yards of others. The public rejected the regulation of risks from saccharin and compulsory seat belt interlocks, because they directly felt the inconvenience of these government actions. Yet the public is quicker to demand regulation of much smaller risks, so long as the cost and inconvenience of regulation is transferred to others.

Michael Fumento provides an interesting and obvious example of this selfishness phenomenon. After some research suggested that electromagnetic fields from overhead public power lines might increase the risk of cancer, people in Boulder, Colorado complained of the undue risk and demanded that the overhead power lines in their city be buried. The city responded that it would not pay to reduce this highly uncertain risk but stated that the concerned citizens “could form a special district and pay the costs” themselves to reduce their perceived risks.<sup>68</sup> This decision was not compelled by poverty; Boulder is a rather well off town. Rather, the citizens made the perfectly logical choice that no risk is acceptable so long as others will pay to prevent it. More risks become acceptable once one assumes the burden of prevention.

A new book by Howard Margolis suggests that such concepts of selfishness<sup>69</sup> (generally not his word) are fundamental to public risk perceptions. He claims, less cynically, not that the perceptions are necessarily selfish, but notes that costs are often “off-screen” and not considered.<sup>70</sup> Whether people are selfishly ignoring costs to others or are unaware of those costs, the results are the same. Margolis observes that when his condition of fungibility exists (the same people who benefit also bear the costs), the public perceptions suddenly be-

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67. Baruch Fischhoff, *Acceptable Risk: A Conceptual Proposal*, 5 RISK: ISSUES IN HEALTH AND SAFETY 1, 23 (1994). This effect translates into policy—politicians are notoriously hesitant to legislate or regulate when large numbers of citizens are directly involved in the risk-creating activity. See also WILLIAM C. MITCHELL & RANDY T. SIMMONS, *BEYOND POLITICS* 149 (1994).

68. See MICHAEL FUMENTO, *SCIENCE UNDER SIEGE: BALANCING TECHNOLOGY AND THE ENVIRONMENT* 255 (1993).

69. Margolis refers to the situation as “fungibility,” where the same person bears both the risk and reaps the benefits. See MARGOLIS, *supra* note 12, at 76-77. In the absence of fungibility, individuals can make selfish choices contrary to society’s best interests.

70. See *id.* at 129.

come “much more balanced.”<sup>71</sup> Thus, there is reason to believe that selfishness, or the absence of fungibility, explains much of the divergence between public and expert estimates of risk.<sup>72</sup>

While advocates of extensive regulation have relied upon the voluntariness/consent criterion, it is noteworthy that the approach represents the underlying morality of the untrammelled free market. Reliance on consent to risk has roots in a “libertarian, individualistic political ideal” that “forbids one person from imposing unconsented-to burdens on another.”<sup>73</sup> An individualistic consent philosophy is inherently in conflict with a call for government regulation that by its very nature questions the reasonability of a *laissez faire* market apportionment of risk. Consent historically has been justified as “instrumental to economic efficiency” and supported by Americans’ “abiding, almost obsessive suspicion of state power.”<sup>74</sup> Amitai Etzioni observes that individual choice is fundamental to the neoclassical economic paradigm that he calls “misplaced liberty.”<sup>75</sup> Requiring total consent is a philosophy of atomistic individualism.

A primary role of democratic government is to take actions in the overall public benefit without the need to obtain individual consent from each affected individual.<sup>76</sup> While the overall structure of our government is dependent on the consent of the governed, this does not imply that every government action be hostage to the consent of each and every citizen. Paying income tax is not voluntary, eminent domain requires compensation but not consent, and most of our wars were not fought with an army of volunteers.

Of course, our government is limited in its powers—it cannot stifle speech, for example, without consent. Consent still has some vir-

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71. See *id.* at 169.

72. Margolis would emphasize that the key to decision making is not the actual fungibility of risks and benefits, but the perceptions of risks and benefits. Thus, an individual decides based on whether he or she perceives personal benefits from an activity, not whether actual benefits accrue. This does not change the deontological selfishness of the choice, but does suggest that some people are incompetent at being selfish.

73. Peter Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COLUM. L. REV. 277, 283 (1985).

74. Peter H. Schuck, *Rethinking Informed Consent*, 103 YALE L.J. 899, 901 (1994).

75. AMITAI ETZIONI, *THE MORAL DIMENSION: TOWARD A NEW ECONOMICS* 9-10 (1988).

76. See MARGOLIS, *supra* note 12, at 40 (observing that “[w]e ordinarily see it as selfish for an individual to insist on absolute protection of his rights and property with no regard for the costs to others or to society generally” and that “we do not feel that it is unfair if the community is less than sympathetic to people demanding their rights when no significant harm is threatened”).

tues, one of which is to prevent a general utilitarian standard that sanctions "using members of a minority who are most at risk so as to benefit the majority."<sup>77</sup> Yet this approach overlooks the externalities of the consent requirement. An individual withholding consent could likewise injure a discrete minority<sup>78</sup> or even the majority.

At this point, some will surely object to such a parallelism of consequences. They would dispute the equivalency of a physical risk (to life) from an activity and the economic consequences (to the polluter) from withheld consent. Yet, as noted above, this reflects a false dichotomy and simplistic vision of economic consequences. The economic consequences felt by the poor in itself presents a risk to life.<sup>79</sup>

There is a simpler and more direct response, however. The externalities of withheld consent will most often take the form of physical risks to the lives of others. After urging the consent standard, Shrader-Frechette acknowledges an exception in that "people do not have the right to refuse vaccination, because, if many do so, they will put other citizens at risk."<sup>80</sup> Yet this exception in practice will prove so large as to virtually swallow the entire consent rule.

People naively perceive that there is such a thing as a risk-free lunch, that government action taken to prevent one risk is unlikely to create a countervailing risk. We increasingly know that this is not the case. Although Lester Lave noted the possibility of countervailing risk some time ago, the concept has only recently received an audience. John Graham and Jonathan Wiener detailed how risk reduction efforts may create even greater countervailing risks in nine public health policy areas.<sup>81</sup> When a refusal to accept a certain risk has the effect of creating additional risks for others, the calculus of consent is changed.

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77. SHRADER-FRECHETTE, *supra* note 21, at 117.

78. Surely some whites in places such as Vidor, Texas perceive that allowing blacks or hispanics to settle in their community would present a physical risk. Yet we do not require the consent of each citizen before authorizing a minority housing project in the community.

79. *See, e.g.*, Cross, *supra* note 38.

80. SHRADER-FRECHETTE, *supra* note 21, at 218. Indeed, the consent requirement can descend into circularity and nihilism. If your withholding consent creates a risk to me, do you need my consent before withholding your consent?

81. *See* GRAHAM & WIENER, *supra* note 31; *See also*, Frank B. Cross, *Paradoxical Perils of the Precautionary Principle*, 53 WASH. & LEE L. REV. 851 (1996) (where I recently provided somewhat less detailed accounts of dozens of circumstances in which efforts to reduce one risk have created greater countervailing risks).

The above analysis is not sufficient to invalidate all consideration of consent. There are some obvious situations where risk-taking is clearly voluntary and relatively well informed. These circumstances call for less regulation. There are doubtless also situations in which a group of individuals is suffering an essentially involuntary risk, with little unavoidable countervailing risk from controls. This situation calls for more regulation. It is not wise or proper, however, to require consent as a condition to exposure to all involuntary risks in our complex times.

Scientific probabilism has a substantial role in defining the perimeters of the voluntarism/consent standard for risks. In medicine, courts that have strictly required a patient's informed consent to procedures have limited the required disclosures to risks that are "material."<sup>82</sup> Although there is no uniform definition of materiality, courts consistently invoke scientific probabilities to determine whether the materiality of a risk is sufficient to compel a warning. Informed consent and voluntary choice are required only for risks that are significant. In the context of broader environmental risks, the materiality standard should be expanded to at least consider the risks of withheld consent.

Of course, materiality could be based on public perceptions of risk rather than scientific probabilities.<sup>83</sup> Indeed, this seems to be the prevailing approach in risk regulation, if not in medical malpractice law. Voluntary versus involuntary risks requiring consent would thus be determined according to public perceptions of voluntariness and the need for consent. However, this approach is not only vulnerable to inaccurate perceptions, it also compounds the very problem that consent was meant to remedy. Remember Shrader-Frechette's warning about the ability of a majority to impose an unreasonable risk upon a minority, absent a consent requirement. If the majority also determines when consent is required, no protection would be offered, allowing the majority even greater opportunity for unfair risk distribution.

The medical cases correctly condition consent on material, scientifically determined risks. This approach protects minorities from probabilistically significant risks, and prevents individuals from self-

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82. See Schuck, *supra* note 74, at 939.

83. Rick Pildes has suggested to me that the nature of voluntariness and the necessity of consent might be defined by a communitarian assessment of risk. While this alleviates some of the obvious practicality problems of requiring consent for environmental risks, the approach simultaneously obliterates much of the libertarian appeal of the consent standard itself.

ishly and even destructively withholding consent to *de minimis* risks. While scientific conclusions may be biased or wrong, they are consistently less biased and more accurate than the alternative of public perception.<sup>84</sup>

#### V. DEMOCRACY DOES NOT COMPEL RELIANCE ON PUBLIC PERCEPTION

Some might argue that a democracy should reflect the will of its constituents, even if it is marked by xenophobic dread or selfish voluntariness. This position reflects an oversimplistic vision of democracy, or at least of the sort of representative government in the United States that we commonly call democracy. It is now common to acknowledge that we are a deliberative democracy that does not move with each shift in the polling numbers.<sup>85</sup> This point is increasingly recognized in the context of risk regulation.<sup>86</sup> Reliance on scientific probabilism tends, over the long run, to promote democratic governance.<sup>87</sup>

Reliance on public perception could even be undemocratic in nature. Most Americans may not want regulation which is based upon the public perceptions of the majority. For example, a majority of citizens believe to some degree in astrology. However, this does not necessarily mean that they want government policy made by astrologers. Most Americans want environmental policies based centrally

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84. See MARGOLIS, *supra* note 12, at 31 (contending that "it is hard to believe that there has never been a single good case in which lay judgment turned out to be better than expert judgment").

85. See, e.g., JAMES FISHKIN, *DEMOCRACY AND DELIBERATION* 36 (1991) (generally making the case for deliberation over a plebiscitary democracy); Sunstein, *supra* note 5, at 4 (noting that U.S. democracy is deliberative and involves "institutions of representation" rather than "an aggregation of interests").

86. See Pildes & Sunstein, *supra* note 3, at 59 (suggesting that "[o]urs is a republic, not a pure democracy, and a high premium is placed on deliberation rather than on snapshots of public opinion"); Cross, *supra* note 6, at 953 (urging that deliberation be a fundamental aspect of risk governance). The Harvard School of Public Health risk policy group contends that it "is not plausible to think that existing risk regulation reflects a considered democratic judgment," as it "appears to be a response to sensationalistic anecdotes, or to interest-group pressures, rather than to deliberative judgments by the public about priorities for risk management." HARVARD GROUP ON RISK MANAGEMENT REFORM, *supra* note 51, at 17.

87. See Cross, *supra* note 18, at 68-69 (relating the liberating effects of reliance on science vs. subjectivism). John Graham contends that the transparency of scientific analysis "is consistent with the principles of Jeffersonian democracy." John D. Graham, *Hammers Don't Cut Wood, Why We Need Pollution Prevention and Comparative Risk Assessment*, in *WORST THINGS FIRST?: THE DEBATE OVER RISK-BASED NATIONAL ENVIRONMENTAL PRIORITIES* 229, 233 (Adam M. Finkel & Dominic Golding eds., 1994).

upon scientific understanding.<sup>88</sup> Many adamant environmentalists feel likewise.<sup>89</sup> Perhaps this is based in the public's modest recognition of their limitations or in the pragmatic limits of perception-based policies.<sup>90</sup> It is perfectly democratic to contend that risk policies should be driven by scientific probabilism rather than public perception.

While public perceptions are driven to some degree by factors such as dread and voluntarism, people do not necessarily want these "values" incorporated in government decisionmaking. While people demonstrate a relative dread of pesticides, they may still prefer government to pursue regulations of substances according to comparative risk.<sup>91</sup> Even studies that find some effect of values on preferences for lifesaving expenditures conclude that the significance of the values on government choices is not great.<sup>92</sup> The government appears to have gone overboard, deferring to public attitudes far more than the public itself might choose.<sup>93</sup> A policy of deferring to public attitudes might not even further the ends of those attitudes, as public perception is so protean that it might preclude effective governmental action.<sup>94</sup>

Reliance on public perception could also cost lives. To the extent that such reliance shifts risks to other groups or compels the inefficient allocation of government resources, more will die than under a

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88. See John D. Graham, *The Risk Not Reduced*, 3 N.Y.U. ENVTL. L.J. 382, 399 (1995) (suggesting that people "recognize that it is dangerous to allow the whims of journalists and public opinion to be the primary determinants of risk policy"); Frank B. Cross, *Why Shouldn't We Regulate the Worst Things First?*, 4 N.Y.U. ENVTL. L.J. 312, 317-318 (1996) (citing various sources indicating that credibility of environmental policy depends on grounding in sound science).

89. For example, Anne and Paul Ehrlich's most recent book relies centrally on scientific justifications of environmentalism. PAUL R. EHRLICH & ANNE H. EHRLICH, *BETRAYAL OF SCIENCE AND REASON* (1996).

90. When government policies are based on public perceptions, they tend to produce only symbolic action with relatively little beneficial effect. See John Dwyer, *The Pathology of Symbolic Legislation*, 17 *ECOLOGY L.Q.* 233 (1990).

91. See John Horowitz, *Preferences for Pesticide Regulation*, 76 *AM. J. AGRIC. ECON.* 396 (1994) (finding particular concern for pesticide regulation vs. auto exhaust regulation but also discovering that 71% of subjects would prefer the regulation that saved the most lives regardless of the risk source).

92. See, e.g., John M. Mendeloff & Robert M. Kaplan, *Are Large Differences in "Lifesaving" Costs Justified? A Psychometric Study of the Relative Value Placed on Preventing Deaths*, 9 *RISK ANALYSIS* 349 (1989) (finding variance in public value preferences to be far smaller than actual differences in government actions to reduce risk).

93. See *id.*

94. See Cross, *supra* note 6, at 933 (quoting former EPA Administrator William Reilly to the effect that "public concerns are constantly changing, demanding that we make everything a top priority").

regime of scientific probabilism. This end might be justified democratically, as nothing in the Constitution demands maximization of lifesaving. Yet to the extent that public perception functions to systematically shift risks to disadvantaged populations, we should be troubled by a policy that causes more deaths.

Democracy means that strongly held and persistent public demands cannot be ignored. Public perceptions must inevitably play some role in risk regulation. Government should however, have a presumption in favor of scientific probabilism, and require evidence that the public perceptions are widely held and persistent before acquiescing in them. Fortunately, government policy appears to be moving in precisely this direction.