

The Emergence of Risk Communication Studies: Social and Political Context

Alonzo Plough and Sheldon Krinsky

Why has the concept of risk communication suddenly become a widely discussed framework for public policy in the environmental and health areas? Prior to 1986 there were only a few essays in the scholarly and policy literature with "risk communication" in their titles. Since that year, however, scores of titles with the term have appeared¹ along with conferences, special sessions in scientific meetings, agency-sponsored workshops, and grants. From one perspective this is not so unusual. New problems often capture the attention of researchers and become the centerpiece of academic and policy research for a period of time. Scientific subfields both from within and across disciplines are constantly emerging. Risk communication might be just another fashionable rubric for the activity of a specialized group of researchers. If that were the case, then its birth as an area of study would be of interest primarily to historians and sociologists of science.

The emergence of risk communication as a research theme cannot be fully appreciated or accounted for without understanding its link to a set of issues that symbolize the discord between scientific experts and the public around the issue of risk. These tensions are played out in disputes between different research traditions on fundamental questions regarding the perception of risk and the essential nature of human rationality. Federal regulatory agencies in the health and environmental areas draw on this diverse and at times conflicting body of research very selectively, choosing analytical frameworks that are most compatible with their policy agendas. Citizen groups, less concerned with formal theories, are increasingly aware that getting a message across to government in disputes over health and environmental hazards is essentially a

political activity. On the other hand, experts in risk analysis have come to appreciate the gap between their analytically derived conclusions and the conceptions of popular culture. In the final analysis, those who control the discourse on risk will most likely control the political battles as well.

In this essay we will analyze the emergence of risk communication as a significant new organizing theme for a set of diverse but conceptually related problems concerning the political management of public risk perceptions and individual behavioral responses to risks. Our discussion begins with a brief look at the historic conditions that gave rise to the current thematic focus on risk communication in the social and behavioral sciences; we then examine the role of heuristics in defining the legitimate areas of study; and finally we argue that the research activities centered on risk communication have precipitated new debates over technical and cultural meanings of rationality.

Risk communication is more than a research framework. It has become a concept that is strongly marketed by specific interest groups and used instrumentally to achieve particular ends. At the federal policy level, the Environmental Protection Agency (EPA) has been the strongest marketer of the concept of risk communication. Its chief administrator has stated: "On the national level we will build risk communication into regulatory policy whenever possible."² The EPA has elevated the concept of risk communication to a strategic level of importance in both its regulatory activities and its research agenda. Industries that are regulated by the EPA also see risk communication as a key policy and management issue.

In the public health area the terminology of risk communication is slightly different (federal health officials speak about *educating* the public about risks) but the concept is equally important. The current policy discourse on preventing health problems such as AIDS, teen pregnancy, and substance abuse focuses on communicating risk to a target population.³ This emphasis has gone beyond the health education strategies of an earlier era in public health. It incorporates slick national media campaigns developed by public relations or advertising firms in conjunction with science-based strategies in the attempt to change "unhealthy" personal behaviors.

Alonzo Plough and Sheldon Krinsky are Associate Professors in the Department of Urban and Environmental Policy, Tufts University, Medford, MA 02155, and are co-investigators on a project, "On Improving Risk Communication," funded by a grant from the U.S. Environmental Protection Agency under assistance agreement CR813481-01-1 to the Center for Environmental Management, Tufts University. This paper was partially supported by this grant and does not necessarily represent the views of the Agency.

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Risk communication has always been an important component in medical practice, particularly in doctor-patient relationships. More recently, with the rise of chronic disease as a major source of health problems and the uncertainty associated with the risk factors for these diseases and the course of treated illnesses, risk communication in medicine has attained a more central and visible role.⁴

Although the study of risk communication is considered new, the practice of it may be as old as human culture itself. There is also nothing new about the social problems that shape the public discourse on risk. Throughout human history individuals and groups have had to contend with a variety of risks for survival and personal well-being. Risk is inherent to the human condition. The vagaries of an ever-changing environment, incurable diseases, and man-made threats like war have presented risks to both individual and collective survival.

The origins of structured risk analysis have been traced to the Babylonians in 3200 B.C.⁵ All of human history is very much a story of assessing and adapting to risks. Methods used by the ancients to predict risks and to communicate knowledge about avoiding hazardous situations were based on myths, metaphors, and ritual. Risk communication was embedded in folk discourse.

The Professionalization of Risk

The transition from folk discourse about risk to an expert-centered communication was preconditioned by a series of key historical events beginning in the late 18th century and continuing through the present time. One necessary condition was the rise of the modern state with an implied responsibility for general social welfare functions. The modern state's legitimacy, in part, derives from its claim to protect the population from physical harm.

By the early 20th century the development of public health institutions provided a second condition that furthered the professionalization of risk. Medicine emerged as an influential profession which defined health risks and controlled intervention strategies. Public health departments began the first large-scale environmental risk monitoring in the sanitation and food safety areas under new governmental mandates.⁶ Formal risk messages communicated the danger of hazards such as unsafe water and unpasteurized milk and indicated that experts should be trusted to apply new technologies to reduce the risks of infectious diseases.

A third tributary to the expert-driven field of risk assessment is decision analysis. During World War II the government's need for scientifically based decision methodologies gave rise to a new era of federal research support that spawned fields like operations research and systems analysis. In the late 1940s a variety of quantitative methodologies were introduced to promote understanding of chance processes and to create a rational framework for economic and strategic military decisions. Eventually, these models were applied to the practical problems of predicting and altering the course of risk factors in public health, medicine, and the environment. The methods first used in mathematics, economics, and statistics slowly dif-

fused into the social and health sciences and gave rise to a number of hybrid approaches for calculating risks and quantifying decisionmaking. By the late 1960s the decision methodologies brought promise of a systems science that could provide a rational basis for complex policy decisions concerning technological risks. This was a compelling idea to federal regulators. The schools of rational risk analysis assumed a great burden, namely, to create a bridging logic between the *assessment of risk* and political decisions concerning the *types, levels* and *distribution* of risks acceptable to society. The results have not fulfilled the original expectations. It has been difficult to find common ground between the social world of risk perceptions guided by human experience and the scientists' rational ideal of decisionmaking based on probabilistic thinking.

The modern field of risk analysis is concerned primarily with predicting or quantifying the risks of "scientifically identified hazards" (i.e., toxicity of chemicals, probabilities of accidents, spread of a disease).⁷ The communication of information about risks usually occurs within a context of fear and uncertainty. Nuclear radiation, toxic wastes, AIDS, asbestos, and other hazards invoke a range of responses in the scientific, regulatory, and lay communities. Questions of the acceptability of any identified risk are deeply connected to perceptions of fairness and justice. There is wide agreement within the professions that value and equity problems in making decisions about risk are serious. There is less consensus about the extent to which political and ethical choices are an unavoidable part of *risk assessment*.

With the passage of the Environmental Policy Act of 1969 and the Occupational Safety and Health Act of 1970, the creation of the Office of Technology Assessment in 1972 and the development of a host of other programs in the early 1970s, the institutionalization of risk evaluation has been realized, making equal weighting of technical and value considerations difficult to achieve in practice. Legislation requires a formal and legally defensible assessment of risk as exemplified by the requirement of environmental impact statements for most federal agencies. Consulting firms marketing their quantitative expertise blossomed in response to the national emphasis on risk and risk management. Concurrently, graduate schools of public policy and public health, responding to the new role of quantitative decisionmaking within the federal government, began to require courses in decision analysis. In schools of public policy the effective management of environmental and health risks is synonymous with quantitative assessment of problems. Within this orientation, the social and cultural context of risk is of marginal concern.

Quantitative models of risk including comparative risk assessment disregard the many value issues embedded in risk analysis. These problems re-emerge in the domain of risk management when regulatory agencies must decide what actions to take once risk assessments have been accomplished. William Ruckelshaus defines risk management as "the distribution of current resources to shape some desirable future state; risk management in its broadest sense means adjusting our environmental policies to obtain the array of social goods—environmental, health-related, social, economic, psychological—that forms our vi-

sion of how we want the world to be."⁸ While these certainly are the factors that must be considered if equitable decisions on risk are to be made, there is no public consensus that government can conduct this broad social management of risk in a fair and equitable manner. Thus, the rise of environmental advocacy in the 1970s challenged the expert model of risk management.

Environmentalism became a powerful social movement. Regulatory policies evolved that gave greater attention to the need for public participation. Inevitably, conflicts arose between the rational quantitative approach to risk assessment and public perceptions of risk. The dilemmas of reconciling democratic ideals and citizen-centered values with the rationality of elite institutions and formal decision processes became more pronounced. While some experts and regulators lamented the rise of "irrational" discourse in environmental debates (the dreaded "not-in-my-backyard" response to siting issues), this same discourse was an expression of their own democratic ideals, which included the opportunity to oppose official decisions that ignored the experiential context of risk.

In the field of public health, the risk debate during the 1970s began to focus on the individual's responsibility for poor health outcomes. Health care costs increased from 7 to 10% of the gross national product, and the complex patchwork of federal health policy seemed unmanageable. To some policymakers, the greatest risk area in the late 1970s was containing costs of medical care. Prevention became more focused on poor health outcomes related to lifestyle variables such as smoking, diet, exercise, and sexual behavior.

Risk factor research and intervention programs increasingly focused on the risky individual and less on the social and cultural context of risk. Personal health risk assessment shares with environmental risk assessment the notion of the "irrational individual." In the former, the individual does not make rational choices about risky behaviors such as smoking and not wearing a seat belt and therefore the individual takes irresponsible risks. In the latter case the faulty logic is reversed: The individual maintains an "exaggerated" fear of hazards which experts consider to be relatively safe. The field of comparative risk assessment actually connects both of these constructions of the irrational individual.

A partial answer to the question of why risk communication has emerged as a framing issue for environmental issues can be found in the differences between professional risk analysts and popular culture. To explore this further we shall look at how risk communication has been conceptualized within the policy sciences.

From Definitions to Heuristics

The term "risk communication" describes a wide range of activities. It has both a conventional definition and a symbolic definition. The former reflects the use of the term in risk management while the latter derives from the role of risk in political discourse. To frame the concept exclusively in conventional terms restricts the meaning of risk communication to surface behavior or what natural scien-

tists like to call "the phenomenon of the event." The conventional account neglects cultural themes, motivations, and symbolic meanings which may be of equal or greater importance to the technical understanding of how and why a risk message gets transmitted. When risk communication becomes embedded in the political arena, it is less about risks per se than about responsibility or accountability for certain events. We shall discuss the symbolic definition of risk communication after we discuss its conventional definition.

"Risk communication" can refer to any public or private communication that informs individuals about the existence, nature, form, severity, or acceptability of risks. In this broad use of the term, risk communication may be directive and purposeful or nondirective and fortuitous. It may describe the controlled release of information toward certain well-defined ends or it may represent the unintended consequences of informal messages about risks. This broad interpretation has been adopted by Kasperson and Palmlund; they state that risk communication "enters our lives in a multitude of forms, sometimes part of the imagery of advertising, sometimes a local corporation's formal statement, or its failure to say anything, sometimes a multi-volumed and impenetrable technical risk assessment."⁹ Almost any communication from any source that speaks to the issue of risk satisfies the authors' definition.

In risk management a narrower use of the concept usually focuses on an intentional transfer of information designed to respond to public concerns or public needs related to real or perceived hazards. Thus, risk communication incorporates tacit or explicit goals for targeted groups about specific events or processes. The information is channeled from experts to a general audience.

The conventional definition of risk communication centers on the intentionality of the source of information and the quality of the information. Covello and his colleagues have defined risk communication as "any purposeful exchange of scientific information between interested parties regarding health or environmental risks"¹⁰ This definition constraining risk communication to scientific information between interested parties raises several questions. For example, are the claims of lay people in news reports about environmental hazards excluded under this definition? Further, it is not clear what relevance the term "interested parties" has in this definition; the Surgeon General may receive a bored or disinterested response to his reports of the risks of cigarette smoking, but few would disqualify these messages as risk communication.

We can envision risk communication as having five components in its definition: intentionality; content; audience directed; source; and flow. Different definitions of risk communication are narrow or broad depending on the latitude of interpretation of these elements (Table 1). the most restricted interpretation would define a risk communication as a plan executed by a regulatory body targeted to a special audience and embodying specific outcome goals for behavior or attitudinal change.

The conventional definition of risk communication restricts the purview of its study to how "experts" inform others about the truth. Under this notion, some research-

Table 1. Definition latitude of risk communication.

	Broad	Narrow
Intentionality	Risk communication goal unnecessary	Intentional and directed; outcome expectations about the risk message
Content	Any form of individual or social risk	Health and environmental risks
Audience directed	Targeted audience not necessary	Targeted audience
Source of information	Any source	Scientists and technical experts
Flow of message	From any source to any recipient through any channel	From experts to nonexperts through designated channels

ers view the exchange of risk information as flowing from technical elites to the polity as a form of scientific noblesse oblige. The process involves the transfer of "scientific" facts and a set of conclusions drawn from those facts. In the broader and more comprehensive definition, technical elites are not the exclusive trustees of risk information. For those who study social process, this broader definition highlights the importance of nonelites as risk communicators.

To understand the symbolic meaning of risk communication, we have to study risk in its social context. A scientist speaking to a community about the health risks of a chemical dump may be carrying out a ritual that displays confidence and control. The technical information (the message) is secondary to the real goal of the communicator: "Have faith, we are in charge." Local residents citing a litany of symptomatology that they attribute to contaminated water are using risk communication as a channel for their anxieties over environmental overload. "Popular" or "barefoot" epidemiologists are lay people who spot disease clusters and use risk communication to organize for additional public health studies and eventual toxic cleanup. For a company, risk communication is frequently not about risks but about safety and confidence. When a contract research firm in Cambridge, Massachusetts, wrote a "Dear Neighbor" letter to thousands of residents on the issue of its research with chemical warfare agents, risk communication meant "we wouldn't dream of doing anything hazardous to the community, trust us."¹¹ In the area of public health, risk communication is the final result of a complex political process through which a problem gets a relatively simple policy construction and is brought to the public consciousness in a restricted form. For community organizers, risk communication is a strategy for solidifying a movement and rebuilding the social complexity of an adverse health or environmental outcome.¹² The symbolic definition of risk communication differs substantially from the conventional view. While the former includes cultural and experiential inputs, the latter generally is reductionist, focusing on quantifiable variables.

Risk, Rationality, and Culture

Risk communication evolved out of a need of risk managers to gain public acceptance for policies grounded in

risk assessment methodologies. The prevailing view of many experts and risk managers is that local communities and the general public react to limited, false, or inadequate information. These lay groups exercise a personal or democratic prerogative in response to "bad" information that is inconsistent with the more fully informed conclusions of risk assessment experts on whom policymakers depend for developing rational responses to complex problems. Frequently, the exercise of local democracy and personal choice is at odds with the rationality of technical experts. Quantitative risk analysis, rather than narrowing differences, may actually exacerbate antagonisms between the technosphere (the culture of experts) and the demosphere (popular culture). Casting the issues in a technical language reduces the possibility of a dialogue between the public and elites.

Recent studies in the risk perception literature reinforce the conception that rationality and democracy are antagonistic to one another. There are many areas where public perceptions about hazards are inconsistent with so-called objective information. For example, people are said to exhibit too little concern about some hazards (smoking, auto accidents, geological radon, and exposure to sunlight) and too much concern about others (nuclear power, toxic wastes, pesticides, and genetic engineering).

Recently, the EPA convened experts from its principal divisions to determine which events, technologies, and situations represented the greatest environmental risks.¹³ The results were not surprising. The experts' inventory of environmental priorities did not correlate positively with the agency's regulatory priorities. The EPA was allocating a large share of its resources for reducing adverse environmental effects in areas its own experts did not consider to warrant the most attention.

The discrepancy between what experts deem most important and what the public demands of its government raises difficult policy questions. Two things deserving respect, namely, scientific rationality and democracy (the rights of local communities to express their will on issues of health and safety), are in conflict. How does one proceed? The options that policymakers usually consider include:

1. Circumventing the public by avoiding disclosure, by distraction, by preemption, or by citing social contract doctrine according to which agencies represent the public through their elected officials and can decide for the people.
2. Appealing to some exemplary and independent authoritative body that will apply the rational decision framework and secure public confidence.

3. Communicating the risks and educating the public into thinking about the problem the way the experts do. Public perception must be brought into conformity with scientific rationality.

Of the three options, only the last is directed specifically at reducing the opposition between the demosphere and the technosphere from the experts' perspective. The emphasis is on a restricted notion of informed democratic practice. Within this context, risk communication is the responsibility of elites and falls into the general rubric of "public understanding of science." The success of risk communication is measured by the degree to which popular attitudes reflect the technical rationality of risk and the extent that popular behavior conforms to technocratic values. A lack of convergence is attributed to a failure of risk communication.

The rapid growth in research on risk perception began to cast doubt about the public education model. Popular conceptions of risk resisted the conclusions of elites despite clear presentation of the "facts." Studies appeared that purported to explain the discrepancies between expert and lay perceptions of risk. Variables that are intended as proxies for cultural determinants were introduced to account for the differences. Two events with the same risk (probability of mortality) evoke different risk perceptions in experimental studies. One event is *perceived as* voluntary while the other is *perceived as* involuntary. Lay people do not compare events strictly in terms of actuarial risks.

Psychologists began codifying these and other factors that appeared to explain the discrepancies between technical risk assessment and public perceptions. This has resulted in a labeling of risk events according to the restricted logic of cognitive science. The conventional risk communication approach was modified to accommodate adjustment parameters (voluntary vs. involuntary; familiarity vs. unfamiliarity; natural vs. man-made). However, instead of building a culture-based theory of risk perception, psychometricians isolated the cultural factors and treated them as another variable in an experimentally derived technical framework. Every risk event possesses objective hazard estimates and certain qualities that begin to take on ontological status. Thus, a risk event that is voluntary would not be compared on pure rational grounds to one that is involuntary. This system preserves the dichotomy between expert judgment and lay perception of risk. It merely categorizes "irrationalities" and does not explore the cultural underpinnings of risk perception. Moreover, cultural noise affecting the popular response to risk is rationalized. This form of the analysis treats the cultural inputs into risk perception as deviant but comprehensible. Risk communication is still viewed as information transfer from experts to lay people.

A cultural approach that seriously considers popular behavior and symbolic dimensions distinguishes two forms of rationality applied to risk: technical and experiential. Both make contributions to the problem of constructing and analyzing a risk event, but neither is sufficient. Deviance is not the appropriate metaphor to understand differences between the demosphere and the technosphere. Once these distinct modes of rationality are understood, the problem of risk communication is transformed; the problem becomes one of mutual understanding and mu-

tual learning. This cultural model is based on the notion that expert and popular approaches to a risk event can each be logical and coherent on their own terms but may exhibit differences in how the problem is articulated, in the factors relevant to the analysis, and in who the experts are.

Technical Rationality

This form of thinking rests on explicitly defined sets of principles and scientific norms. These include hypothetico-deductive methods, a common language for measurement, and quantification and comparison across risk events. In its more advanced forms technical rationality encompasses a mature theory with predictive power. The emphasis is on objective (nonpersonal) inputs rather than subjective (experiential) information. Perceived responses to risk are important only in understanding the extent to which ordinary people's ideas deviate from the truth. Logical consistency is an imperative. Two events that have an identical risk profile are treated the same—they are interchangeable.

Cultural Rationality

One of the common mistakes in attempting to codify the public attitudes about risk is to measure people's responses to hypothetical questions. Cultural rationality can only be understood when people's cognitive behavior is observed as they are threatened by a real risk event. It is only then that the full panoply of factors come into play that create a complete picture of a public response. To understand cultural rationality, one must address anthropological and phenomenological issues as well as behavioral ones. Technical rationality, on the other hand, believes that risk can be studied independently of context. Mary Douglas provides some insight on this point: "The question of acceptable standards of risk is part of the question of acceptable standards of morality and decency, and there is no way of talking seriously about the first while evading the task of analyzing the cultural system in which the second take their form."¹⁴

Lay people bring many more factors into a risk event than do scientists. For technical experts, the event is denuded of elements that are irrelevant to the analytical model. Table 2 illustrates some of the differences. Many events that are deemed to have very low or insignificant risk by experts are viewed as serious problems by the laity. Burial of low level radioactive wastes and releasing a natural organism minus a few genes into the environment are among such cases. Where there has been discussion of rationality, it has focused on the scientific grounds of a decision. And yet there are clear instances of reasonable decisionmaking at the community level that are inconsistent with expert opinion. Once it is accepted that two inconsistent decisions can be rational and consistent *on their own grounds*, it is possible to reach beyond the deviant model of risk communication.

Cultural reason does not deny the role of technical reason; it simply extends it. The former branches out, while

Table 2. Factors relevant to the technical and cultural rationality of risk.

Technical Rationality	Cultural Rationality
Trust in scientific methods, explanations, evidence	Trust in political culture and democratic process
Appeal to authority and expertise	Appeal to folk wisdom, peer groups, and traditions
Boundaries of analysis are narrow and reductionist	Boundaries of analysis are broad; include the use of analogy and historical precedent
Risks are depersonalized	Risks are personalized
Emphasis on statistical variation and probability	Emphasis on the impacts of risk on the family and community
Appeal to consistency and universality	Focus on particularity; less concerned about consistency of approach
Where there is controversy in science, resolution follows status	Popular responses to scientific differences do not follow the prestige principle
Those impacts that cannot be uttered are irrelevant	Unanticipated or unarticulated risks are relevant

the latter branches in. Cultural rationality does not separate the context from the content of risk analysis. Technical rationality operates as if it can act independently of popular culture in constructing the risk analysis, whereas cultural rationality seeks technical knowledge but incorporates it within a broader decision framework.

If these forms of rationality are unalterably antagonistic, technical reason and popular response to risk may be truly incommensurable. Both forms of rationality must be capable of responding to a process of mutual learning and adjustment. If the technosphere begins to appreciate and respect the logic of local culture toward risk events and if local culture has access to a demystified science, points of intersection will be possible.

Conclusion

In this essay we have described the historical and social context of risk communication as a fundamental and enduring human problem and, recently, as a focus of academic study. The research activities in risk communication are closely linked to the requirements of governmental agencies with a mandate to protect the public from technological, environmental, and health risks. As a body of work, the first wave of risk communication studies and strategies generally have followed a useful but limited framework for defining the central problem of the field: divergence between expert, policy, and lay communities on matters of risk.

Two issues seem important from this review. First, experts and institutions have developed models of risk and communicated them in various forms throughout history. Conflicts between groups over risk assessments (should we go to war; will there be a famine) are fundamental to all cultures. The current discourse on risk and its reliance on sophisticated quantitative models of assessment and cognitive typologies of perception represent a change in the form of risk communication but not in the underlying value controversies over the social context of risk. What we have are new methods addressing persistent structural problems.

The second issue centers on the fit between these new methods and the structural problems of risk communication. Research on the risks described in this essay has an overwhelming tendency to avoid the experiential context of risks—that is, actual people considering real threats to their well-being or other persons' well-being. Laboratory experiments of cognitive psychologists represent risk perception within the bounded models of experts. These models reveal more about the cognitive context of the research tradition than about how persons construct and experience a risk event in a social context. Researchers who view the differences between popular culture and technical rationality as a form of deviance are not likely to generate better strategies for risk communication.

We argue that risk communication has emerged from a context of political conflict. The analytic models attempted to respond to real problems. However, the dominant model of risk communication creates a template that trivializes the complexity of cultural factors. We regard this as an imbalance in the research agenda which should be corrected.

As Mary Douglas reminds us, ideas about the world come directly out of human experience.¹⁵ This, we would argue, holds true for both experts and lay persons. There is a social context of expertise and officialdom as well as of lay communities. Bias, irrational action, and narrow-interest group behavior intrude into both of these contexts.

Notes

1. Vincent Covello, "Introductory Remarks," Workshop on the Role of Government in Health Risk Communication and Public Education, 21–23 January 1987.
2. Lee Thomas, "Risk Communication: Why We Must Talk About Risk," *Environment*, Volume 28, Number 2 (March 1986): 40.
3. See, for example, U.S. Public Health Service, *Promoting Health/Preventing Disease: Objectives for the Nation* (Washington, DC: U.S. Public Health Service, 1980).
4. Alonzo L. Plough, *Borrowed Time: Artificial Organs and the Politics of Extending Lives* (Philadelphia: Temple University Press, 1986).
5. Vincent Covello and Jeryl Mumpower, "Risk Analysis and Risk Management: An Historical Perspective," *Risk Analysis*, Volume 5, Number 2 (1985): 103–120.
6. Barbara Gutmann Rosenkrantz, *Public Health and the State: Changing Views in Massachusetts: 1842–1936* (Cambridge, MA: Harvard University Press, 1972).

7. James F. Short, "The Social Fabric at Risk: Toward the Social Transformation of Risk Analysis," *American Sociological Review*, Volume 49 (December 1984): 711-725.
8. William D. Ruckelshaus, "Risk, Science, and Democracy," *Issues in Science and Technology*, Volume 1, Number 3 (Spring 1985): 19-38.
9. Roger Kasperson and Ingar Palmund, "Evaluating Risk Communication," unpublished paper, Center for Technology, Environment, and Development, Clark University, Worcester, MA, January 1987.
10. Vincent T. Covello, Detlof von Winterfeldt, and Paul Slovic, "Communicating Scientific Information about Health and Environmental Risks: Problems and Opportunities from a Social and Behavioral Perspective," in V. Covello, A. Moghissi, and V. R. R. Uppulori, eds., *Uncertainties in Risk Assessment and Risk Management* (New York: Plenum Press, forthcoming).
11. The letter contained the sentence: "As neighbors, I would like you to know what we are doing and to be accurately informed about the safety and security precautions we have built into our new toxic materials laboratory so that you can feel as safe as my colleagues and I do when we come to work . . . each day." For an overview of the case, see Sheldon Krinsky, "Research under Community Standards: Three Case Studies," *Science, Technology, & Human Values*, Volume 11, Issue 3 (Summer 1986): 14-33.
12. Kasperson notes that in local controversies "risk communication becomes a vehicle of protest by which community groups create resources with which to bargain with government in the risk management process." Roger E. Kasperson, "Six Propositions on Public Participation and Their Relevance for Risk Communication," *Risk Analysis*, Volume 6 (1986): 276.
13. U.S. Environmental Protection Agency, *Unfinished Business: A Comparative Assessment of Environmental Problems* (Washington, DC: EPA, February 1987).
14. Quoted in Short, *op. cit.*, p. 720.
15. Mary Douglas, *Risk Acceptability According to the Social Sciences* (New York: Russell Sage, 1985), pp. 100-101.