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# Risk Communication in Environmental Assessment

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Abstract:

Since the enactment of NEPA and other environmental legislation, the concept of "risk communication" has expanded from simply providing citizens with scientific information about risk to exploring ways of making risk information genuinely meaningful to the public and facilitating public involvement in the very processes whereby risk is analyzed and managed. Contemporary risk communication efforts attempt to find more effective ways of conveying increasingly complex risk information and to develop more democratic and proactive approaches to community involvement, in particular to ensuring the participation of diverse populations in risk decisions. Although considerable progress has been made in a relatively short time, risk communication researchers and practitioners currently face a number of challenges in a time of high expectations, low trust, and low budgets.

Key words:
risk communication, risk perception, public involvement, public participation, message development, framing, trust

Introduction

Perhaps not surprisingly, since its subject is communication, the literature on risk communication has grown enormously since the passage of the National Environmental Policy Act (NEPA) in 1969. The 1978 Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508), helped to define the two major aspects of contemporary risk communication: (1) message development, or conveying technical and specialized information in a way that is comprehensible and usable for lay people, and (2) public participation in decisions involving, or potentially involving, risk. Communication in the basic sense of message development is touched on in 40 CFR 1502.8, which states that "Environmental impact statements shall be written in plain language and may use appropriate graphics so that decision makers and the public can readily understand them." In addition to the various specific requirements for public input, such as public scoping for environmental impact statements, 40 CFR 1506.6 more generally requires agencies to "make diligent efforts to involve the public in preparing and implementing their NEPA procedures."

Subsequent legislation and recent historical events and trends have further contributed to the

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growing significance of risk communication efforts in environmental assessment. Environmental Protection Agency (EPA) policy in relation to the Superfund Amendments and Reauthorization Act (SARA) of 1986, for example, requires that a community relations effort accompany any Superfund remedial investigation and response. The American Indian Religious Freedom Act (1978), along with other legislation protecting Native American rights, and Executive Order 12898 (1994) on environmental justice add requirements for including cultural and demographic considerations in environmental decision-making, with important implications for risk communication. Highly publicized disasters such as the reactor accidents at Three Mile Island (1979) and Chernobyl (1986) and the toxic gas leak at Bhopal, India, in 1984, served to increase public concerns and demands to be fully informed about risks. Concurrently, there has been a decline in public trust in government and industry, a fact which presents risk communication with one of its greatest challenges, since trust is essential to successful communication.

Risk Perception Theory and Message Development

At its most basic level, risk communication is an effort to convey scientific or technical information about risks to a non-scientific, non-technical audience. Early practitioners discovered, however, that the task was more complicated than translating scientific into lay language. Fundamental to the evolution of risk communication as a unique discipline was the theory developed by Paul Slovic, Baruch Fischhoff, and others that "the concept 'risk' means different things to different people" (Slovic 1986, 1987). Building on earlier work by Chauncey Starr (1969), Slovic uses psychometric techniques to produce quantitative representations or "cognitive maps" of lay people's attitudes toward and perceptions of various activities and technologies (e.g., how risky they are, how much regulation is desirable). The research shows that, while technical experts tend to equate riskiness with estimated fatalities, lay people often judge riskiness, and therefore the acceptability of risk, by other characteristics: "In particular, perception of risk is greater for hazards whose adverse effects are uncontrollable, dread, catastrophic, fatal rather than injurious, not offset by compensating benefits, and delayed in time so the risks are borne by future generations" (Slovic 1986). Similar characteristics are designated by Peter M. Sandman as components of "outrage"--i.e., those aspects of hazards which are not directly related to their scientifically demonstrated harmfulness, but which people care about (Sandman 1989).

Risk perception research holds many important implications for message development. M. Granger Morgan, Baruch Fischhoff, and their colleagues have written extensively on the "mental models" approach (Morgan et al. 1992, Atman et al. 1994, Bostrom et al. 1994), which is based on the premise that "people process new information within the context of their existing beliefs" (Morgan 1992). Therefore, risk communicators need to ascertain the current state of recipients' knowledge and beliefs (for example, through open-ended interviews and other means), in order to design messages that will provide information that is both useful and usable.

Other research reveals that not only individual psychological and cognitive patterns, but also cultural factors and values have a significant influence on risk perception. In "The Social

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Amplification of Risk: A Conceptual Framework," Roger E. Kasperson et al. point out that "messages have meaning for the receiver only within a sociocultural context" (Kasperson 1988), an idea that has taken on increased importance with the emphasis on analyzing the impact of environmental decisions on diverse ethnic and cultural groups. For example, in "The Significance of Socioeconomic and Ethnic Diversity for the Risk Communication Process, " Elaine Vaughan notes the accumulating empirical evidence that "risk behaviours and attitudes evolve within, and are framed in reference to, broader sociocultural variables" (Vaughan 1995).

Contemporary Issues and Methodologies (Message Development)

Two major, comprehensive works on risk appeared in 1996: the draft report on *Risk Assessment and Risk Management in Regulatory Decision-Making*, issued by the Commission on Risk Assessment and Risk Management (Commission 1996), and the National Research Council's *Understanding Risk: Informing Decisions in a Democratic Society* (NRC 1996). Responding to public and Congressional concerns (e.g., Bill HR2910, the "risk communication" bill, introduced in 1993), both studies stress that risk information must be usable by all affected parties and must be "transparent," that is, "revealing and characterizing the assumptions, uncertainties, default factors, and methods used to estimate risks" (Commission 1996). Three key issues for message development emerge from a review of these recent works, but all have been raised earlier as well.

*Risk Comparisons.*
The use of comparisons in risk communication involves something of a paradox. Comparisons are a well-established device for conveying unfamiliar information; on the other hand, as shown in an influential work by Covello, Sandman, and Slovic (1988), using comparisons to explain risk can often be counterproductive. In particular, the authors warn against comparing unlike risks or risks with different "outrage" quotients (for example, living near a contaminated waste site vs. driving a car), a tactic which can appear trivializing or irrelevant to affected parties. Although other practitioners have questioned some of the earlier authors' acceptability rankings (for example, see Lundgren 1994), their general guidance remains standard in the literature. The Risk Commission's draft report concludes that risk comparisons can be helpful, but should be used cautiously, avoiding comparisons of unlike risks (Commission 1996). Again, however, a potential challenge emerges, for, as scientists become able to detect ever smaller amounts of suspected carcinogens, finding sufficiently similar risks for a meaningful and acceptable comparison becomes increasingly difficult, and the discussions may be so subtle as to elude the non-scientific reader.

*Uncertainty.*
Uncertainty in risk communication essentially refers to the acknowledgment that quantitative measurements of risk are frequently not precise, as could be mistakenly inferred from the point estimates which are commonly used. Two possible correctives recommended in current literature are to express risk estimates as a range, rather than a single number, and to supplement quantitative information with qualitative information. The Risk Commission report suggests including "a careful description of the nature of the potential health effects of concern, who

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might experience the effects under different exposure conditions, the strength and consistency of the evidence that supports an agency's classification of a chemical or other exposure as a health hazard, and any means to prevent or reverse the effects of exposure," in addition to "the range of informed views about a risk and its nature, likelihood, and strength of the supporting evidence" (Commission 1996). Again, the recommendations imply some challenges for risk communication. If not presented with care, the qualitative information mentioned above, while probably more accessible to lay readers, may also be overwhelming in its sheer volume. A research project by Branden Johnson and Paul Slovic (1995) suggests that presenting a range of estimates rather than a point estimate may have mixed results in terms of reader comprehension and attitudes toward the agency providing the information (for example, it may be variously interpreted as honesty or as incompetence). Nevertheless, the writers conclude that uncertainty, which is inherent in risk assessment, must be part of accurate communication about risk, although considerable research is needed on the best ways of presenting uncertainty to the public.

*Framing and embedded values.*
"Framing" or "framing effects" refer to the way information is presented, the "slant" given to data. For example, mortality rates associated with two therapies might be presented in terms of number of deaths or number of survivors, and the presentation will influence the recipients' choice of treatment (Slovic 1986). Although framing effects can be a useful tool in responsible risk communication--for example, Vaughan says that agency officials communicating with minority communities need to use language and information related to the frames adopted by the community (Vaughan 1995)--Slovic argues that the effectiveness of subtle differences in the way risks are presented "raises ethical problems that must be addressed by any responsible risk-information program" (Slovic 1986). The inherently subjective nature of "factual" information is also acknowledged in *Understanding Risk*: "Measuring each type of outcome presents its particular set of judgments, and each judgment embeds values" (NRC 1996). Nothing can change the fact that even scientific and quantitative communication is not neutral; however, acknowledging this truth and ensuring that various perspectives are made available can help to offset intentional or unintentional framing effects. "So long as decision participants understand which value assumptions underlie an analysis, the analysis can serve the decision." However, when the value assumptions are opaque (e.g., hidden in unnecessarily complex mathematical techniques or models), the analysis begins to take over the decision, and suspicion and distrust result (NRC 1996).

"Two-Way Communication" and the Growth of Public Involvement

At the conclusion of "Perception of Risk," Paul Slovic provides one version of a recurrent theme in risk communication literature:

> Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments. As a result, risk communication and risk management efforts are destined to fail unless they are structured

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as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insights and intelligence of the other (Slovic 1987).

The idea that risk communication is a two-way activity is not new. It is implicit in the public participation requirements in environmental legislation and in the repeated discovery that one-way communication, however well designed, is inadequate from both a practical and a philosophical perspective. Vincent T. Covello and Frederick W. Allen (1992) emphasize that "A basic tenet of risk communication in a democracy is that people and communities have a right to participate in decisions that affect their lives, their property, and the things they value." The literature of the past ten years is filled with exhortations to involve the public early and often and with suggestions for how citizen's participation can be more meaningfully effected (Covello et al.1988; Covello et al. 1989; Chess in Covello et al. 1989; EPA 1992; Lundgren, 1994).

Contemporary Issues and Methodologies (Public Involvement)

In a 1994 survey reported in the proceedings of a national symposium on "Addressing Agencies' Risk Communication Needs," leaders in the field identified the two issues of highest priority as (1) integrating outside (i.e., non-agency) publics and concerns in agency decision-making and (2) communicating with diverse ethnic and socioeconomic groups (Chess et al. 1995).

Current approaches to involving a variety of publics essentially build upon the concept of two-way communication, expanded to accommodate a growing sensitivity to issues of distributive and procedural justice and increasing public distrust of conventional, regulation-driven approaches. For example, the Office of Solid Waste and Emergency Response (OWSER) Directive #9230.0-20 on "Innovative Methods to Increase Public Involvement in Superfund Community Relations" acknowledges that citizen participants question whether they actually influence EPA's decisions and suggests exploring such options as citizen work groups and workshops, the use of bilingual communication, and open houses/availability sessions (EPA 1992). In its *Summary Report to the President: The Presidential Regulatory Reform Initiative*, the EPA describes more recent efforts to forge "grassroots partnerships" with stakeholders. Some examples include the "Partners in Protection Initiative," begun in 1994, in which tribal, minority, and low-income communities at various sites identify agency project activities, and the "Brownfields Economic Redevelopment Initiative," in which affected communities are brought into the decision-making process for the cleanup of contaminated urban land (EPA 1995).

"Science in a Fishbowl: Public Involvement in the Hanford Environmental Dose Reconstruction Project" describes a project initiated by another government agency, the Department of Energy (DOE), to deal with the issue of public distrust--in this case, a perceived conflict of interest if DOE were to control a study of its own site. The project, which lasted from 1987 to 1994, established an independent Technical Steering Panel (TSP) of technical specialists and public, state, and Native American representatives to direct the study. Innovative features included completely open access to TSP meetings; to the laboratory and staff working on the project; and to all documents and communications, whatever their status or stage of development (Shipler

1995).

Increasingly, citizens require not just consultation, but empowerment, as part of the two-way risk communication relationship. Barry Dillon points out that "community involvement" activities which consist of providing information, issuing documents for review, and using citizen advisory groups as sounding boards can do little to avoid controversy because citizens still feel excluded from the actual decision-making process (Dillon 1995). The question of empowerment or control is particularly important in overcoming what Kasperson calls the "participation paradox," in which those most affected by a risk may often be the most uninvolved in the decision-making and the most difficult to reach (Kasperson 1986).

Executive Order 12898 (1994) re-enforces the need for innovative approaches to involving traditionally unempowered communities and communicating risk in a way that is meaningful for such communities. Elaine Vaughan notes that, in predominantly minority or lower-income communities, environmental risks are increasingly being framed as questions of distributive justice (fairness in the allocation of resources and costs) and/or procedural justice (fairness in the decision-making process). "Democratic participation in deciding about an environmental risk situation is being framed as a right of all communities, and communication processes perceived as being exclusive can lead to distrust, opposition to risk management decisions and a loss of credibility for the government agency or industry involved" (Vaughan 1995).

*Understanding Risk* advocates "experimental efforts to provide resources to allow meaningful participation for parties that could not otherwise join effectively in deliberations" (NRC 1996), adding that such efforts should focus on risk decisions that seriously affect the parties in question and should be designed and evaluated in collaboration with those parties. David O. Carpenter describes one example of community empowerment, in which members of the Mohawk Native Americans at the Akwesasne near the St. Lawrence River initiated and served as local investigators in a study of suspected chemical contamination of fish, a major component of the community's diet. Carpenter attributes the success of the project in large part to the fact that the risk communication "messengers" shared the ethnicity and background of the affected community, with outside sources providing further technical expertise and grant money for the field staff (Carpenter 1995). Another, NEPA-related example is the *Environmental Impact Statement for the Nevada Test Site [NTS] and Off-site Locations in the State of Nevada,* for which the Department of Energy invited representatives of the Consolidated Group of Tribes and Organizations (CGTO), representing 17 tribes and organizations with ancestral ties to the NTS, to write sections of the EIS and an appendix presenting their concerns and views on the alternatives and the technical analyses. The DOE/NTS adopted the CGTO's recommendation that they compensate the writers for their services and travel expenses, and provide the writers' group with funding, technical assistance, and resources (DOE 1996).

Other approaches to public involvement discussed in recent literature include the "social learning" procedure described by Thomas Webler et al. in the siting of a municipal waste disposal facility in Switzerland. Distancing themselves from the potentially divisive focus on

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empowerment and subjective satisfaction, the authors call their example, with its emphasis on cognitive enhancement and moral development, an attempt to foster a more community-based, problem-solving approach to environmental questions (Webler 1995). Appendix B of the NRC report describes a multiattribute utility analysis in which participants were asked to list and prioritize their criteria for evaluating decision options related to the siting of a coal-fired power plant in Florida. These criteria were subsequently weighted, discussed, and revised in a series of iterative steps which helped to clarify the decision process (NRC 1996). Suzanne McClendon's "Trust Perception: Using Cognitive Maps to Discover Stakeholder Perspectives" is interesting because it focuses directly on a frequently-cited obstacle to effective risk communication. Extrapolating from Kasperson's idea of the social amplification of risk, McClendon calls trust perception "the social amplification of trust." Cognitive mapping of trust, using association-driven issue display (AID), enables stakeholders themselves to define the elements of trust, thereby clarifying their own attitudes and potentially increasing the chances for consensus (McClendon 1996).

What all these approaches have in common, and what is relatively new about them, is that they encourage affected parties to acknowledge and elucidate subjective views and values (either personal or local), rather than to ignore them. Although the techniques are sometimes cumbersome, they can enhance communication by helping participants better understand their own and others' concerns and wishes.

Challenges, Recommendations, Next Steps

1. Risk communication literature is full of recommendations for effective practice, and most of them are good. Yet, despite some very real advances in agency attitudes and risk communication techniques, writers repeatedly cite the gap between theory and practice. The proceedings from "A Symposium to Discuss Next Steps" express concern over continuing institutional reluctance to employ risk communication and suggest that research should be directed toward agencies themselves and how to overcome institutional barriers to meaningful public participation in decisions (Chess et al. 1995).

Institutional hesitancy may in part be motivated by--but also contributes to--the fact that risk communication today remains something of an experimental field. As recently as 1996, the draft report on *Risk Assessment and Risk Management in Regulatory Decision-Making* can say that "We know very little about how to ensure effective risk communication that gains the confidence of stakeholders, incorporates their views and knowledge, and influences favorably the acceptability of risk assessments and risk-management decisions" (Commission 1996). Similarly, the National Research Council, advocating an "analytic-deliberative process" for risk decisions, notes that "there is little systematic knowledge about what works in public participation, deliberation, and the coordination of deliberation and analysis" (NRC 1996).

One reason for the continued sense of uncertainty about "what works" in risk communication is the ever-evolving concept of risk itself, which, as Magdalena Gadomska points out, is becoming

"more and more extended in the social consciousness," to encompass threats to future generations, to quality of life, the culture of a community, the beauty of a landscape, and the planetary ecosystem (Gadomska 1994). Regarding agencies' responsibilities, the NRC points out that organizations rarely evaluate or report the results of their risk communication efforts (NRC 1996). This need for organizational planning and evaluation has already received attention (Chess in Covello et al. 1989, Covello et al. 1989, Allen in Covello et al., Weinstein and Sandman 1993, Lundgren 1994, and Chess 1995). The NRC report stresses organizations' need to consider such measures as training staff; acquiring analytic expertise in ecological, social, economic, or ethical outcomes; making organizational changes to facilitate internal communication and flexibility; and instituting procedures for evaluation, both during and after communication efforts (NRC 1996).

2.  Many of the newer approaches reviewed here are promising, but some may also seem to portend daunting expenditures of time, money, and effort, as well as a potential conflict with efforts to streamline the NEPA process and reduce the size of documents. Discussing some qualities of effective risk communication, Covello et al. cite a hierarchical organization, which allows people who want answers to find them quickly while people who want details can also find them (Covello et al.1993), an approach which might help writers manage the increasing complexity of risk documents. Shipler acknowledges that the unique level of public involvement in the Hanford dose reconstruction project contributed to its taking longer and costing more than initially planned. However, he also provides suggestions for improving similar efforts in the future, including (1) early, mutual agreement on purposes, goals, roles and responsibilities and (2) a cooperative development of processes and procedures (Shipler 1995).

The NRC offers two responses to concerns that an extensive analytical-deliberative approach could become prohibitively complex and time-consuming. First, they emphasize that a fully implemented version of such an approach would be appropriate for only a relatively small number of risk decisions (for instance, those with a high potential for controversy), but that those cases have an importance disproportionate to their number. Secondly, given the huge costs and delays (e.g., from legal challenges) that can arise from inadequate public involvement, and given the current atmosphere of skepticism toward government and regulatory agencies, they argue that it is better to err on the side of too broad rather than too narrow participation (NRC 1996).

3.  Effective risk communication can lead to better decisions, but, as the NRC report acknowledges, an excellent deliberative process still may not reduce the differences between the parties. Nor can a successful resolution of these differences guarantee that the results will be accepted by decision-makers. However, although the authors stress the need to be aware of such limitations, and to make participants aware of the limitations, they also comment that, "Even if participation does not increase support for a decision, it may clear up misunderstandings about the nature of a controversy and the views of various participants. And it may contribute generally to building trust in the process, with benefits for dealing with similar issues in the future" (NRC 1996). In other words, agencies trying to implement broader risk communication efforts should adopt a realistic, learning-oriented attitude toward both successes and failures.

Endnote.

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