ATTACHMENT 2

VINYL CHLORIDE SAFETY ASSOCIATION MEETING 1988

TOPICS QUESTIONNAIRE

Please indicate interest as: H (High) M (Medium) L (Low)

	Extent of Interest	Willing to Present?
1. Case Histories		
1.1 Old Case Histories		
All Case Histories which are Well Documented with Cause and Corrective Action.	X H	
2. True Confessions		
Any New Incidents within your Company, which are of Particular Interest.	X H	
3. Health		
3.1 Angio-Sarcoma Update		
3.2 PVC Dust		
3.3 Other Health Problems Allegedly Associated with VCM/PVC Dust		
4. Monitoring Equipment		
4.1 Area Monitoring Systems		
4.2 Personal Monitors		
4.2.1 Badge Monitors		
4.2.2 Pump Systems		
4.3 Leak Detectors		
4.3.1 Dust Monitoring		
.1 Environmental		
.2 Exhaust Stacks		

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5.	Work Order Systems		
5.1	Maintenance Work Orders	M	
5.2	Work Permits		
5.3	Vessel Entry Permits		
5.4	Lock-Out Systems		
5.5	Plant Operating Instructions		
6.	Legislation-Regulatory		
6.1	Regulatory Update		
6.2	Update on EPA-OSHA Actions		
6.3	PVC Food Application Regulation Regulations		
6.4	Other Legislation Topics		
7.	Chemical Hazards		
7.1	Polyperoxide Formation		
7.2	Storage and Handling of Peroxide Initiators		
7.3	Inhibition of Recovered Monomer		
7.4	Other Chemical Hazard Topics		
8.	Plant Design		
8.1	Location of Control Rooms		
8.2	Design of Control Rooms		
8.3	Bunding of Monomer Storage		
8.4	Materials of Construction	X M	
8.5	Electrial Classification in Hazardous Areas		
8.6	Relief Systems		
8.7	Other Plant Design Topics		
8.8	Gasket and Sealing Materials	X M	

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9. Safety Programmes		
9.1 Safety Committeees and How to Make them Effective		
9.2 Dupont Stop Programme	X M	
9.3 Incentive/Reward Systems Their Role in Promoting Safety		
9.4 Safety Surveys		
9.5 Incident Investigation Techniques	X H	
9.6 Other Safety Programme Topics		
10. Process Safety		
10.1 Controlling Runaway Reactions		
10.2 Closed Reactor Hazards		
10.3 Inspection Procedures	X H	
.1 Process Vessels	X M	
.2 Process Piping	X H	
.3 Nozzles		
10.4 Gasholder Hazards		
10.5 Other Process Safety Topics		
11. Any Other Safety Topics of Particular Interest		
Man - machine investigation	X M	X

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OCC 2710

Explaining Environmental Risk

OCC 2711

Some Notes on
Environmental Risk
Communication

by
Peter M. Sandman
November 1986

Environmental Protection Agency, and other organizations), the sessions on how to alert people to serious risks were sparsely attended, while overflow crowds pondered ways of calming people down. People sometimes need to be calmed down—but the ultimate goal of risk communication should be rational alertness, not passive trust.

If a public that views risk with rational alertness strikes you as a desirable outcome, "Explaining Environmental Risk" should help. This is neither a theoretical treatise nor a nitty-gritty cookbook; along with the practical suggestions for effective communication, I have tried to explain why some strategies work and others fail, so that you can build on this understanding to design your own strategies.

Though I hate to admit it, risk communication is a simpler field than risk assessment or risk management. It just isn't that hard to understand how journalists and nontechnical publics think about risk. But it *is* crucial to understand, and not mastering the rudiments of risk communication has led a lot of smart people to make a lot of foolish mistakes. With apologies to busy readers, I have therefore resisted the urge to produce an executive summary or a list of recommendations. Technicians can get by on cookbooks, perhaps, but decision-makers need to understand.

Much depends, in fact, on whether you think risk communication is a job that can safely be left to "technicians" (public relations staff, community affairs officers) or whether—as I am convinced—you believe it must become an integral part of risk management. Although I hope public information people will find some value in what I have to say, my main goal is for environmental protection commissioners and plant managers to read it ... not merely pass it along to the public information office.

The temptation to pass it along to the public information office—and then forget it—is almost overwhelming, I know. It's not just that decision-makers are busy people. It's not even that decision-makers don't realize how greatly their success depends on dealing effectively with the media and the public. It's more that they wish it weren't so, that dealing with the media and the public seems in so many ways the least pleasant, least controllable, least *fair* part of their work. Most risk managers, I suspect, spend a good deal of time hoping the media and the public will go away and leave them to do their jobs in peace.

But since they won't, the next best thing is to understand better why they won't, how they are likely to react to what you have to say, and what you might want to say differently next time. I hope "Explaining Environmental Risk" will help.

Four on-going research projects have added greatly to my understanding of risk communication. They are: (1) "Environmental Risk Reporting" and "Risk Communication for Environmental News Sources" (with David B. Sachsman, Michael Greenberg, Audrey R. Gotsch, Mayme Jurkat, and Michael Gochfeld), both funded by the National Science Foundation Industry/University Cooperative Center for Research on Hazardous and Toxic Substances; (2) "Getting to Maybe: Building Toward Community-Developer Negotiations on New Hazardous Waste Facilities" (with Jim Lanard and Emilie Schmeidler), funded by the Fund for New Jersey; (3) "Manual and Conference for DEP Risk Communication" (with Caron Chess and B.J. Hance), funded by the New Jersey Spill Fund, New Jersey Department of Environmental Protection; and (4) "Radon Risk Communication Symposium and Recommendations" and "Radon Knowledge, Attitudes, and Behavior in New Jersey" (with Neil Weinstein), both funded by the New Jersey Department of Environmental Protection. Of course my colleagues and funders on these projects are not responsible for my speculations in this report.

Several organizations have invited me to address them on strategies of risk communication, providing an opportunity to develop the ideas expressed in this report and test them on thoughtful and experienced audiences. I am grateful especially to the National Governors' Association, the New Jersey Hazardous Waste Facilities Siting Commission, the Council of Scientific Society Presidents, the Institute for Environmental Studies of the University of North Carolina, and the Air Pollution Control Association.

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position on the extent of the risk. And only a handful of the articles told readers what standard (if any) existed for the hazard in question, much less the status of research and technical debate surrounding the standard.

The media's focus on the politics of risk rather than the science of risk is most visible in the sources relied upon in risk coverage. In the New Jersey study, 57 percent of the sources cited were government, with state government (22 percent) leading the pack. Industry captured 15 percent of the paragraphs; individual citizens and advocacy groups were cited in 7 percent each. Uninvolved experts such as academics—those least likely to have an axe to grind, most likely to have an intermediate opinion and a technical basis for it—were cited in only 6 percent of the paragraphs. Of course sources from government, industry, and environmental groups may also have scientific rationales for their judgments, and "experts" are not always neutral. Still, it is important that the media get their risk information from people who are directly involved in the news event; only occasionally do they seek out uninvolved experts for guidance on the extent of the risk.

Trying to interest journalists in the abstract issues of environmental risk assessment is even tougher than trying to get them to cover chronic risk; abstract issues are not the meat of journalism. Yet the public needs to understand abstractions like the uncertainty of risk assessments, the impossibility of zero risk, the debatable assumptions underlying dose-response curves and animal tests. Where possible, it helps to embed some of these concepts in your comments on hot breaking stories—though reporters and editors will do their best to weed them out. When there is no breaking story, try to sell your favorite reporter on a feature on the fight over how conservative risk assessment ought to be. Emphasize that the problem underlies many of the stories he or she is covering. But understand why you will have only partial success, why the science of risk is inevitably less newsworthy than the politics of risk.

3. Reporters cover viewpoints, not "truths." Journalism, like science, attempts to be objective, but the two fields define the term very differently. For science, objectivity is tentativeness and adherence to evidence in the search for truth. For journalism, on the other hand, objectivity is balance. In the epistemology of journalism, there is no truth (or at least no way to determine truth); there are only conflicting claims, to be covered as fairly as possible, thus tossing the hot potato of truth into the lap of the audience.

Imagine a scale from 0 to 10 of all possible positions on an issue. Typically, reporters give short shrift to 0, 1, 9, and 10; these views are too extreme to be credible, and are covered as "oddball" if they are covered at all. (You may think some pretty extreme viewpoints get respectful media attention—but you haven't met the people reporters decide not to quote.) Reporters also pay relatively little attention to 4, 5, and 6. These positions are too wishy-washy to make good copy; how do you build a story out of "further research is needed?" And sources with intermediate positions are unlikely to be heavily involved in the issue, certainly unlikely to seek media attention. Most of the news, then, consists of 2's and 3's and 7's and 8's, in alternating paragraphs if the issue is hot, otherwise in separate stories as each side creates and dominates its own news events. Objectivity to the journalist thus means giving both sides their chance, and reporting accurately what they had to say. It does not mean filling in the uninteresting middle, and it certainly does not mean figuring out who is right. Journalists who insist on trying to figure out who is right are encouraged to become columnists ... or to leave.

If a risk story is developing and you have a perspective that you feel has not been well covered, don't wait to be called. You won't be. And you don't need to wait. Reporters are busy chasing after the sources they *have* to talk to, and listening to the sources who *want* to talk to them. If you're in the former category—if you're safety manager at a plant that just experienced an uncontrolled release, for example—reporters will find their way to you, like it or not. Otherwise, rather than suffer in silence, become one of the relatively few experts who keep newsroom telephone numbers in their rolodex. You will find reporters amazingly willing to listen, to put you in their rolodexes, to cover your point of view along with all the others. Insofar as you can, try to be a 3 or a 7—that is, a credible exponent of an identifiable viewpoint. Don't let yourself be pushed to a position that is not yours, of course, but recognize that journalism doesn't trust 0's and 10's, and has little use for 5's.

In deciding whether to brave the considerable risks of media exposure, bear in mind that the story *will* be covered, whether or not you arrange to be included. News items are allotted media attention to the extent that journalists see them as important and interesting. Then the search begins for information to fill the vacuum—preferably new, solid, comprehensible information that reflects an identifiable point of view, but if there's not enough of that to fill the time or space that the story "deserves," reporters will scrounge for angles to make up the difference. The result can be an enlightening feature on the problems of technical prediction, but it's more likely to be a "color story"—the fears of

the face of the source's technical training to keep oneself out of one's research, and they confuse the evidentiary requirements of policy decisions with the looser ones of personal choices. But for reporters, questions that personalize are the best questions. They do what editors are constantly asking reporters to do: bring dead issues to life, make the abstract concrete, focus on real people facing real decisions. Personalizing also forces the source to dichotomize, to make the same "yea" or "nay" decision the reader or viewer must make.

In a sense, experts and policy-makers work at a different level of analysis than reporters and the public. As an EPA study on the ethelyne dibromide controversy noted, the agency wanted to talk about "macro-risk" (how many deaths will result from EDB contamination), while reporters kept asking about "micro-risk" (is it okay to eat the cake mix). The connections between macro-risk and micro-risk are difficult to draw. But for the individual citizen (faced with a cake mix, not a regulatory proposal), micro-risk *is* the issue, and reporters are not off-base in pushing technical sources to trace the connections. This is what personalizing questions are designed to do.

Knowing that reporters will inevitably ask personalizing questions, be prepared with answers. It is often possible to answer with both one's personal views and one's policy recommendations, and then to explain the difference if there is one. Or come with colleagues whose personal views are different, thus dramatizing the uncertainty of the data. If you are not willing (or not permitted) to acknowledge your own views, plan out some other way to personalize the risk, such as anecdotes, metaphors, or specific advice on the individual micro-risk level.

6. Claims of risk are usually more newsworthy than claims of safety. On our 0-to-10 scale of risk assertions, the 3's and 7's share the bulk of the coverage, but they don't share it equally. Risk assertions receive considerably more media attention than risk denials. Sometimes, in fact, the denials get even less coverage than the intermediate position, and reporters wind up "balancing" strong assertions of risk with bland statements that the degree of risk is unknown. In the New Jersey study, the proportions were 58 percent "risky," 18 percent "not risky," and 24 percent mixed or intermediate.

This is not bias, at least not as journalism understands bias. It is built into the concept of newsworthiness. If there were no allegation of risk, there would be no story. That something here might be risky is thus the core of the story; having covered it, the media give rather less attention to the counterbalancing notion that it might not be risky.

Other factors contribute to the tilt toward alarming news. One is the reporter's desire to "build" the story, to come back with something that editors will want to showcase. (Reporters are much more interested in selling stories than in "selling newspapers.") Another factor is the journalist's preference for simple, graphic language, for "dump" rather than "land emplacement." Risks sound riskier in simple language than in technical jargon. The factor closest to outright bias—but still distinguishable in the minds of journalists—is the media's traditional skepticism toward those in authority. Most news is about powerful people, but along with the advantage of access government and industry must endure the disadvantage of suspicion. Environmental groups, by contrast, receive less attention from the media, but the attention is more consistently friendly.

On the other hand, the media are often and justly criticized for being too slow to alert the public to new environmental hazards. Considering that we rely largely on journalism as an "early warning system" for social problems on the horizon, this is a serious criticism. To gain a journalistic hearing, the first source to assert a particular risk must be reasonably credible, highly committed, and very lucky or very skilled. Almost invariably, new technologies start out with sweetheart coverage. The environmental controversy comes later, and only after the controversy is on the media agenda (and the technology is perhaps too deeply embedded to be dislodged) does the risky side of the argument catch up and pull ahead. This may be the worst of all possible patterns: to fail to warn us about risks when it's early enough to make a societal go/no-go decision, then to frighten us deeply about risks after the decision has been made.

The principal exception to this pattern is emergencies. On a chronic risk story, the risk is the story. But a genuine emergency is by definition a big story; freed from the need to build the story, the reporter—especially the local reporter—may try to prevent panic instead. The President's Commission on the Accident at Three Mile Island conducted a content analysis of network, wire service, and major newspaper coverage during the first week of the 1979 accident. The Commission's expectations of sensationalism were not confirmed. Of media passages that were clearly either alarming or reassuring in thrust, 60 percent were reassuring. If you stick to the technical issues, eliminating passages about inadequate flow of information and general expressions of fearfulness from local citizens, the preponderance of reassuring over alarming statements becomes 73 percent to 27 percent.

It didn't seem that way at the time, of course. The information that something previously assumed safe may or may not be hazardous naturally strikes as

Dealing With The Public

1. Risk perception is a lot more than mortality statistics. If death rates are the only thing you care about, then the public is afraid of the wrong risks. That is, public fears are not well correlated with expert assessments or mortality statistics. This is often seen as a perceptual distortion on the part of the public, but a more useful way to see it is as an oversimplification on the part of many experts and policy-makers. In other words, the concept of "risk" means a lot more than mortality statistics.

Virtually everyone would rather drive home from a party on the highway than walk home on deserted streets. Even if we do not miscalculate the relative statistical likelihood of a fatal mugging versus a fatal car crash, the possibility of getting mugged strikes us as an outrage, while we accept the possibility of an auto accident as voluntary and largely controllable through good driving. (Eighty-five percent of all drivers consider themselves better than average.) Similarly, a household product, however carcinogenic, seems a lot less risky than a high-tech hazardous waste treatment facility—the former is familiar and under one's own control, while the latter is exotic and controlled by others.

Risk perception experts (especially psychologists Paul Slovic, Sarah Lichtenstein, and Baruch Fischhoff) have spent years studying how people interpret risk. The following list identifies some of the characteristics other than mortality that factor into our working definitions of risk. Remember, these are not distortions of risk; they are part of what we mean by the term.

Less Risky	More Risky
Voluntary	Involuntary
Familiar	Unfamiliar
Controllable	Uncontrollable
Controlled by self	Controlled by others
Fair	Unfair
Not memorable	Memorable
Not dread	Dread
Chronic	Acute
Diffuse in time and space	Focused in time and space
Not fatal	Fatal
Immediate	Delayed
Natural	Artificial
Individual mitigation possible	Individual mitigation impossible
Detectable	Undetectable

The very same risk—as experts see these things—will be understood quite differently by the lay public depending on where it stands on the dimensions listed above. Some thirty percent of the homes in northern New Jersey, for example, have enough radon seeping into their basements to pose more than a one-in-a-hundred lifetime risk of lung cancer, according to estimates by the U.S. Environmental Protection Agency and the State Departments of Health and Environmental Protection. But despite considerable media attention (at least in the beginning), only five percent of North Jersey homeowners have arranged to monitor their homes for radon, and even among these few the level of distress is modest—compared, say, to the reaction when dioxin is discovered in a landfill, objectively a much smaller health risk. State officials were initially concerned about a radon panic, but apathy has turned out to be the bigger problem.

The source of the radon in New Jersey homes is geological uranium; it has been there since time immemorial, and no one is to blame. But three New Jersey communities—Montclair, Glen Ridge, and West Orange—have faced a different radon problem: landfill that incorporated radioactive industrial wastes. Though their home readings were no higher than in many homes on natural hotspots, citizens in the three communities were outraged and fearful, and they successfully demanded that the government spend hundreds of thousands of dollars per home to clean up the landfill. The state's proposal to dilute the soil nearly to background levels and then dispose of it in an abandoned quarry in the rural community of Vernon has provoked New Jersey's largest environmental demonstrations in years, with thousands of residents swearing civil disobedience sooner than let the trucks go through. In nearby communities threatened by naturally occurring radon, meanwhile, the concern is minimal.

It doesn't help to wish that people would confine their definitions of risk to the mortality statistics. They won't. Mortality statistics are important, of course, and policy-makers understandably prefer to focus on the risks that are really killing people, rather than the risks that are frightening or angering people because they are involuntary, unfamiliar, uncontrollable, etc. But successful risk commuication begins with the realization that risk perception is predictable, that the public overreacts to certain sorts of risks and ignores others, that you can know in advance whether the communication problem will be panic or apathy. And since these differences between risks are real and relevant, it helps to put them on the table. Merely acknowledging that a risk seems especially fea[redacted]use it

behalf, I may choose to tolerate a risk or to protect against it, but for you to decide that my risk is tolerable is itself intolerable. Quantitative risk assessments, risk-benefit calculations, risk-cost ratios, and risk-risk comparisons are all hard to hear when we bear the risk and someone else makes the decision.

4. Equity and control issues underlie most risk controversies. Trust and credibility are often cited as the key problems of risk communication. Certainly few people trust government and industry to protect them from environmental risk. This is just as true of the passive, apparently apathetic public as it is of the activist, visibly angry public. The former is simply more fatalistic, more prone to denial, more completely drowned in undiscriminating chemophobia. The activist public, in other words, distrusts others to protect its interests and thus chooses to protect its own. The far larger passive public is passive not because it believes others will protect its interests, but because it doubts it can protect its own. Both publics listen to the reassurances of government and industry—if they listen at all—with considerable suspicion.

But to say that trust is the problem here is to assume that the goal is a passive public that doesn't mind being passive. If the goal is an actively concerned public, then the problem isn't that people are distrustful, but rather that government and industry demand to be trusted. Translate the question of trust into the underlying issue of control: Who decides what is to be done?

Any environmental risk controversy has two levels. The substantive issue is what to do; the process issue is who decides. So long as people feel disempowered on the process issue, they are understandably unbending on the substantive issue, in much the same way as a child forced to go to bed protests the injustice of bedtime coercion without considering whether he or she is sleepy. It isn't just that people oppose any decision they view as involuntary and *unfair*, regardless of its wisdom; because the equity and control issues come first, people typically never even ask themselves whether they agree on the merits. Outraged at the coercion, they simply dig in their heels. It is hardly coincidental that risks the public tends to overestimate generally raise serious issues of equity and control, while most of the widely underestimated risks (smoking, fat in the diet, insufficient exercise, driving without a seatbelt) are individual choices.

Specialists in negotiation and conflict resolution have long understood this relationship between substantive issues and the process issues of equity and control. Consider for example a community chosen by the state government to "host" a hazardous waste incinerator. Justly offended at this infringement of local autonomy, the community prepares to litigate, frantically collecting ammunition on the unacceptability of the site. Both their anger and the legal process itself encourage community members to overestimate the risk of the proposed facility, to resist any argument that some package of mitigation, compensation, and incentives might actually yield a net gain in the community's health and safety, as well as its prosperity.

In interviews with community members faced with such a situation, the control issue tends to overshadow the risk assessment. But when citizens are asked to hypothesize a de facto community veto and envision a negotiation with the site developer, they become quite creative in designing an agreement they might want to sign: emissions offsets, stipulated penalties, bonding against a decline in property values, etc. It is still too early to tell whether a negotiated hazardous waste treatment facility is feasible. But *thinking* about such a negotiation becomes possible for community members only when they feel empowered—that is, when the issue of outside coercion has been satisfactorily addressed.

On this dimension people's response to information is not much different from their response to persuasion. We tend to learn for a reason—either we're curious, or we're committed to a point of view and looking for ammunition, or we're faced with a pending decision and looking for guidance. These three motivations account for most information-seeking and most learning—and none of them exerts much influence when an *individual citizen* is offered information about, say, a Superfund clean-up plan. A few stalwart souls will read out of curiosity, though it won't take much technical detail to put a stop to that. Activists will scour the plan for evidence to support their position or for evidence that their position wasn't properly considered. (Activists know what they think and believe they can make a difference.) And those charged with litigating, funding, or implementing the plan study it in order to do their jobs.

And the general public? Why learn if you feel powerless do anything about what you have learned? On the other hand, when the public has felt it was exercising real influence on a decision—the ASARCO smelter in Tacoma comes to mind—it has shown a surprising ability to master the technical details, including risk assessment details

Not that every citizen wants to play a pivotal role in environmental decision. We have our own lives to lead, and we would prefer to trust the authorities. If the issue is unimportant enough we often decide to trust the authorities despite our reservations; if the crisis is urgent enough we

frightened or angry or exhausted, when the experts aren't sure what the answers are, when the search for a scapegoat is at hand, effective communication is a lot to expect.

In many risk communication interactions, in short, the public doesn't really want to understand (because it feels powerless and resentful) and the experts don't really want to be understood (because they prefer to hold onto their information monopoly). The public finds it convenient to blame the experts for obfuscation, and the experts find it convenient to blame the public for obtuseness. These motivational issues are probably more important than the traditional concerns of clarity in determining whether real knowledge will pass from expert to public.

Within the traditional concerns of clarity, the major issue is simplification. Even assuming a public that wants to understand and an expert who wants to be understood, risk information must still be simplified.

Insofar as possible, of course, it is wise to simplify language rather than content. That is, take the extra words to make hard ideas clear. Unfortunately, neither the expert source nor the lay audience is usually willing to dedicate the time needed to convey complex information a step at a time. So inevitably simplification becomes a matter of deciding what information to leave out. Experts are famous for their conviction that no information may be left out; unable to tell all, they often wind up telling nothing.

In fact, there are three standard rules of thumb for popularizing technical content. (1) Tell people what you have determined they ought to know—the answers to the questions they are asking, the instructions for coping with the crisis, whatever. This requires thinking through your information goals and your audience's information needs, then resolutely keeping the stress where you have decided it should be. (2) Add what people must know in order to understand and *feel* that they understand the information—whatever context or background is needed to prevent confusion or misunderstanding. The key here is to imagine where the audience is likely to go off-track, then provide the information that will prevent the error. (3) Add enough qualifiers and structural guidelines to prepare people for what you are not telling them, so additional information later will not leave them feeling unprepared or misled. Partly this is just a matter of sounding tentative; partly it is constructing a scaffolding of basic points on which people can hang the new details as they come in. Applying these three rules isn't easy, but it is a lot easier than trying to tell everything you know.

The hardest part of simplifying risk information is explaining the risk itself. This is hard not only because risk assessments are intrinsically complex and uncertain, but also because audiences cling tenaciously to their safe-or-dangerous dichotomy. One path out of dichotomous thinking is the tradeoff: especially risk benefit, but also risk-cost or risk-risk. But there is solid evidence that lay people resist this way of thinking; trading risks against benefits is especially offensive when the risks raise moral issues and the "victims" are not the ones making the choice. Another alternative to dichotomy is the risk comparison: X is more dangerous than Y and less dangerous than Z. But as we have already noted, risk means a lot more than mortality statistics, and comparing an involuntary risk like nuclear power to a voluntary one like smoking invariably irritates more than it enlightens—as does *any* risk comparison that ignores the distinctions listed at the start of this section.

The final option to dichotomy is to provide the actual data on deaths or illnesses or probability of occurrence or whatever. This must be done carefully, with explicit acknowledgement of uncertainty, of moral issues, and of non-statistical factors like voluntariness that profoundly affect our sense of risk. Graphs and charts will help; people understand pictorial representations of probability far better than quantitative ones.

Don't expect too much. People *can* understand risk tradeoffs, risk comparisons, and risk probabilities when they are carefully explained. But usually people don't really want to understand. Those who are frightened, angry, and powerless will resist the information that their risk is modest; those who are optimistic and overconfident will resist the information that their risk is substantial. Over the long haul, risk communication has more to do with fear, anger, powerlessness, optimism and overconfidence than with finding ways to simplify complex information.

7. Risk communication is easier when emotions are seen as legitimate. It follows from what we have been saying that an important aspect of risk communication is finding ways to address the feelings of the audience. Unfortunately, experts and bureaucrats find this difficult to do. Many have spent years learning to ignore feelings, their own and everyone else's; whether they are scientists interpreting data or managers setting policy, they are deeply committed to doing their jobs without emotion.

At an even deeper level, scientists and bureaucrats have had to learn to ignore the individual, to recognize that good science and good policy must deal in averages and probabilities. This becomes most obvious when a few people feel threatened by a generally desirable action, such as the siting of a hazardous waste facility. Experts wh[redacted] confident that the risk is small and the facility[redacted] may

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