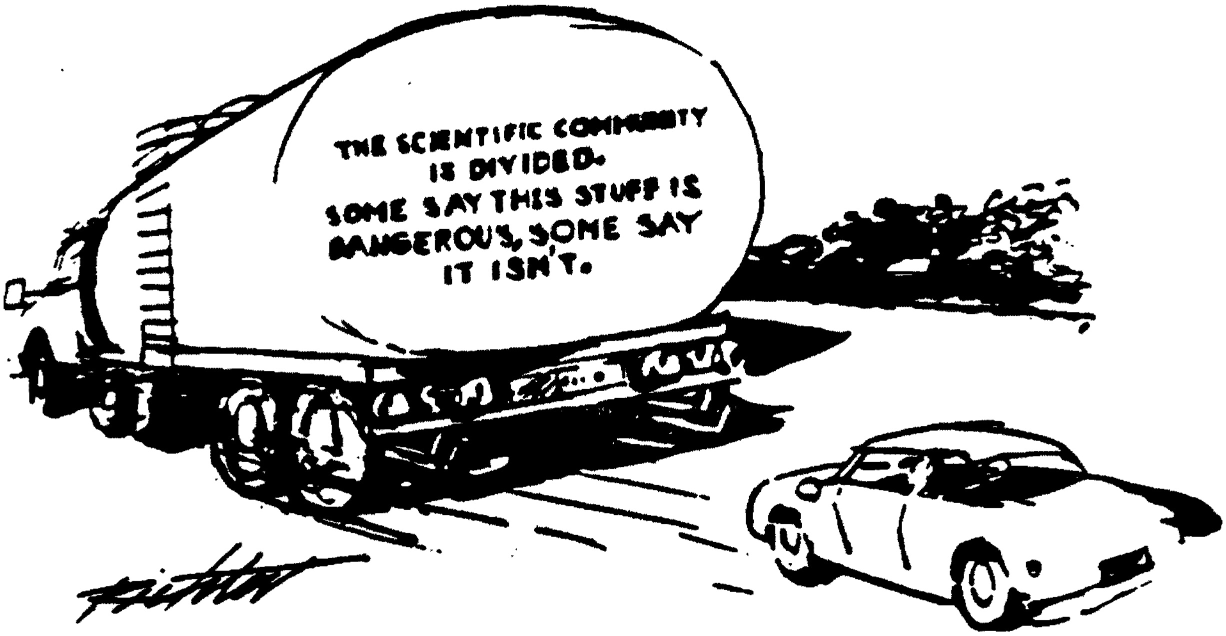
DRAFT

WORKSHOP ON RISK COMMUNICATION

U.S. EPA Risk Communication Project



SOURCE: Drawing by Richter; © 1988
The New Yorker Magazine, Inc.

ACTORS FOR ASARCO CASE STUDY ROLE PLAYING

1. EPA Regional Administrator
2. EPA Chief of Standards Development Branch at RTP
3. EPA Director of the Carcinogen Assessment Group
4. EPA Community Relations Officer
5. Mayor of Tacoma
6. ASARCO Plant Worker
7. Tacoma Resident
8. Tahomans for a Healthy Environment
9. ASARCO Plant Manger
10. Vashon Island Resident
11. Fair Share Representative
12. PSAPCA Representative
13. Tacoma Resident
14. DSHS Epidemiologist
15. ASARCO Specialist
16. Friends of the Earth Representative
17. Mayoral Candidate/Current Council Member
18. Newspaper Reporter

NOTE: We haven't provided extensive information on the perspectives of EPA personnel. You will be expected to develop these during the course of the workshop.

2. EPA Director of Standards Development Branch at RTP

As the EPA Director of the Standards Development Branch at RTP, you are familiar with the calculations related to the ASARCO smelter. You have reviewed the emission and exposure calculations and data, as well as the economic calculations. In your view, the smelter will close if any further controls are imposed.

You should be prepared for questions from individuals who don't understand the risk numbers and how they affect their own lives. They may also have questions about threshold levels and how that entered into the risk calculations. The PSAPCA representative may very well want to know why EPA's emission estimates are so much greater than PSAPCA's. Finally, people may want to know just what you mean when you say the risk estimates are conservative.

Session 9309

Risk Communication Workshop

North Conference Area, Room #3

Tuesday, September 21, 9:00 a.m. to 4:00 p.m.
Wednesday, September 22, 9:00 a.m. to 4:00 p.m.

Facilitator: Andy Schwarz

Attendees:

1. Debbie Dorman, 783-5550
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3. Karen Gibbons, PM-219
   260-7521

4. Linda Martin, OS-311
   260-0062

5. Jeff Davidson, PM-273
   260-1650

6. Donna K. Reed, EN-336
   260-9532

7. John Moses, PM-223Z
   260-6380

8. Pat Kingsley, (301) 594-0852
   Training Assistance Division HFZ-210
   Division of Consumer Affairs, Center for Devices and Radiological Health, Food and Drug Administration, Rockville, Maryland 20857

9. Cathy Backinger, (301) 443-4600
   HFZ-250

10. Jay Crowley, (301) 443-4600
    HFZ-250

11. Pete Carstensen, (301) 443-4600
    HFZ-250

12. Kristy Miller, 6604J
    233-9441

NOTE:

The manner in which the advice offered in this course book should be applied will necessarily vary from case to case. Any commentary on actual EPA cases is presented for teaching and discussion purposes only.

Agenda

Environmental Protection Agency
Risk Communication Training

Day 1

8:30-10:00	Introduction/What Do We Mean by Risk Communication?
10:00-11:00	Risk Assessment, Risk Management, and Risk Communication
11:00-11:15	BREAK
11:15-12:00	Marjol Superfund Site
12:00-1:00	LUNCH
1:00-2:30	Dealing with the Media/Handling Tough Questions
2:30-3:30	Explaining Technical Issues
3:30-4:00	Preview of Day 2

Day 2

8:30-9:30	Planning for Risk Communication
9:30-10:30	Review Materials in Case Study
10:30-10:45	BREAK
10:45-11:15	Review Materials in Case Study (cont.)
11:15-12:00	Develop Communications Strategy
12:00 -1:00	LUNCH
1:00-2:00	Prepare for Role Play
2:00-3:00	Role Play
3:00-3:30	Evaluation/Review

I. INTRODUCTION/ WHAT DO WE MEAN BY RISK COMMUNICATION?

Introduction

Development of the Workshop

The ability to communicate effectively with the public (and other government officials) on issues of risk and to involve the public meaningfully in decision making have long been EPA goals. In 1989, the Office of Policy Planning and Evaluation (OPPE) completed work on a two-day workshop designed to train Headquarters and Regional personnel in the principles of effective risk communication. The workshop was designed to complement (but not replicate) the OPPE course on risk assessment and risk management entitled "Risk and Decision-Making".

Between 1989 and 1992, the workshop and modified versions of it have been given to over 2,500 state and federal employees. Modified versions of the course have been prepared to meet the specific needs at several offices at EPA including the Toxics Integration Branch of the Office of Emergency and Remedial Response (Superfund), the Chemical Emergency Preparedness and Prevention Office, the Office of Pesticide Programs, the Office of Radiation Programs, and the Air Risk Information Center in Research Triangle Park.

The Risk Training Committee (comprised of representatives from EPA's Regional and Headquarters offices) decided to revise and update the OPPE course in 1992. Working with OPPE, the committee sought opinions on changes to be made and new material to be included in the class from personnel who have taught or taken the course, and from those involved in public affairs and other risk communication activities at Headquarters and the Regions. The committee directed OPPE to seek information concerning the elements of the course that should be eliminated or removed as well as suggestions for additions to the course and other potential improvements. This revised manual reflects many of the suggestions received during this process.

Structure of the Workbook

This workbook is designed to guide you through the two day workshop. Each section consists of a brief introduction outlining the issues to be discussed, brief descriptions of videotapes and other material that will be used during that section, related background information, potential discussion questions, and the background information necessary for the role play and communication planning exercises. The Resource Document, which is included at the back of the workbook, is a compendium of articles, brochures, pamphlets and other material that address various risk communication issues. Materials are arranged in the resource document in a structure that parallels the organization of the course. Throughout the course, the facilitator will highlight where relevant information is contained in the resource document. In addition, you should use the resource document after the course as a source of information on a variety of topics related to risk communication.

Goals and Objectives

The workshop has been designed to introduce the principles of effective risk communication and to give you the opportunity to put the principles into practice. It will consist of video clips, case studies, role playing, and some overhead presentations. You will be given a great deal of opportunity to participate actively during the workshop and for the workshop to be successful, you must take advantage of it.

The primary goals and objectives for this training are set forth below:

- Discuss the rationale for being concerned about risk communication
- Discuss the various purposes of risk communication:
  - To inform and <u>involve</u> the public productively in decision-making
  - To receive feedback regarding public concerns, questions, and pertinent information the public might have
  - To raise the level of public discussion about risks to the point where the nature and severity of the risk is generally understood and the discussion can focus on issues of values, the distribution of costs and benefits, etc.
- Discuss a number of communications options: use of news media, public meetings, focus groups, and written communications.
- Develop practical guidelines for more effective communication about environmental risks and to give participants practice in using these guidelines.

Discussion Questions - Participant Expectations

1. What are your goals/objectives for the workshop?

2. What questions do you have that you hope we can address?

Video Segment - Opening Collage

The first set of clips shows examples of a number of issues that will be discussed during the workshop. Included among these are the presence of uncertainty in risk communication, the importance of body language in communication, questions of trust and credibility, the difficulty of explaining technical questions and the role of non-technical issues in risk debates. This latter point is illustrated by the presence of Meryl Streep, who was involved in the Alar crisis.

As you watch the clips, consider the issues noted above. How are risks described? Do you like the risk comparisons you saw? What is your view of the role of the media as represented by the Donahue clip? Finally, what is your reaction to seeing Meryl Streep representing an environmental group? What is her role? Is it appropriate?

Definition of Risk Communication

The National Academy of Sciences defines risk communication as "an interactive process of exchange of information and opinion among individuals, groups and institutions." A key element of this definition is that it is an *exchange* of information among parties, <u>not</u> a one-way flow of information.

EPA recognizes the need not only to inform the public, but also to provide the public with the opportunity to become involved. The purpose of risk communication is not to allay the public's concerns or merely help them see your point of view. It is designed to empower the community to participate in the process and assist in reaching the right decision. As former Administrator Lee Thomas noted in discussing community relation efforts in Superfund,

> "We are not going to go into a community and tell people what we intend to do. We are going to listen to local concerns and ideas. It is true that many of the issues involved in a site cleanup are highly technical, but we can no longer use that as an excuse for discounting what a community has to say about risk. We must empower the community to discuss risk in a rational and technically competent way."

There is no single public. Rather, for any given problem, there are many affected parties, including, but not limited to, the regulated community, individuals living near the source, environmentalists, and elected officials who may, depending on the circumstances, have very different views on what should be done to resolve the problem.

What is Risk Communication?

Risk Communication is

- active listening
- showing compassion
- using non-technical language
- being objective, open and honest
- recognizing that the public has useful input which the Agency may not have considered
- conveying risks in a larger context
- giving clear information to the public
- practicing the Seven Cardinal Rules of Risk Communication

Risk Communication is not

- simply selling the agency decisions to the public
- patronizing the public
- co-opting the public

Adapted from Region IX's course on Risk Communication and Public Involvement

Video Segment - New Jersey Meeting

Discussion Questions - What Do We Mean By Risk Communication?

1. What is the relationship between your office and "the public"? Is the relationship as strong as it can or should be? Where does your program fit on the Ladder of Citizen Participation? **(Refer to the Ladder of Citizen Participation, developed by the Environmental Communications Research Program at Rutgers University, and included in the resource document)** Does your office deal with the "public" appropriately?

   The ladder does not imply that public involvement programs should and must always be at the 'citizen power' level of power sharing. Different environmental issues will require different levels of public participation. You have to be clear about what you mean by public participation. Don't mislead the community about the role they can play. You should try to identify the appropriate role of the public, let them know where you think that is, and work to get the public to that point.

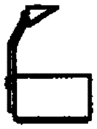
2. What are the characteristics of the ideal public? Suppose you were going to a public meeting, or an informal gathering, what are the characteristics of the people you'd like to see there?

3. What can you, as government officials, do to get people to behave the way you've said you want?

Additional Readings in Resource Section - Introduction to Risk Communication

- *The Seven Cardinal Rules of Risk Communication*
- *Risk Communication Problems and Tasks*
- *Some Do's and Don'ts of Listening*
- *Improving Dialogue with Communities: A Short Guide for Government Risk Communication*
- *Introduction for NAS document Improving Risk Communication*

II. OVERVIEW OF RISK ASSESSMENT, RISK MANAGEMENT, AND RISK COMMUNICATION



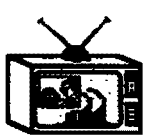
Risk Assessment, Risk Management, and Risk Communication

Introduction

The following overhead presentation will form the basis for an overview of risk communication issues and how risk communication fits in with risk assessment and risk management. We will also discuss a definition of "risk" that includes both risk assessment data and other factors that affect the way people perceive risk.

Clearly this presentation is not intended to make you risk assessors. Rather, it is designed to help you understand the assessment process that produces the "numbers" used in describing risk. By understanding what goes into these numbers you will be better able to explain what they mean to the public.

The resource document contains several articles and other sources of information that provide valuable background on what risk assessment is, and how it is used in making a risk management decision.



Video Segment - Broader Definition of Risk

The video presentation is of Dr. Peter Sandman of Rutgers discussing his notion of a broader definition of risk that includes both the technical risk assessment and numerous other factors. For more background, you should see the article he wrote for EPA and which is included in the resource document. The article is entitled "Explaining Environmental Risk: Some Notes on Environmental Risk Communication."

Additional Readings in Resource Section - Overview of Risk Communication

- *Letter from Lee Thomas to Congressman Waxman on Relative Risk*
- *Ten Ways to Lose Trust and Credibility*
- *Differences Between Expert and Public Ratings of Environmental Problems*
- *Risky Business: The Inexact Art of Hazard Assessment*
- *Guidance on Risk Characterization for Risk Managers and Risk Assessors*
- *Air Pollution and Health Risk - How do we Learn About Risks?*

RISK ASSESSMENT, RISK MANAGEMENT, AND RISK COMMUNICATION

Prepared for:

U.S. EPA

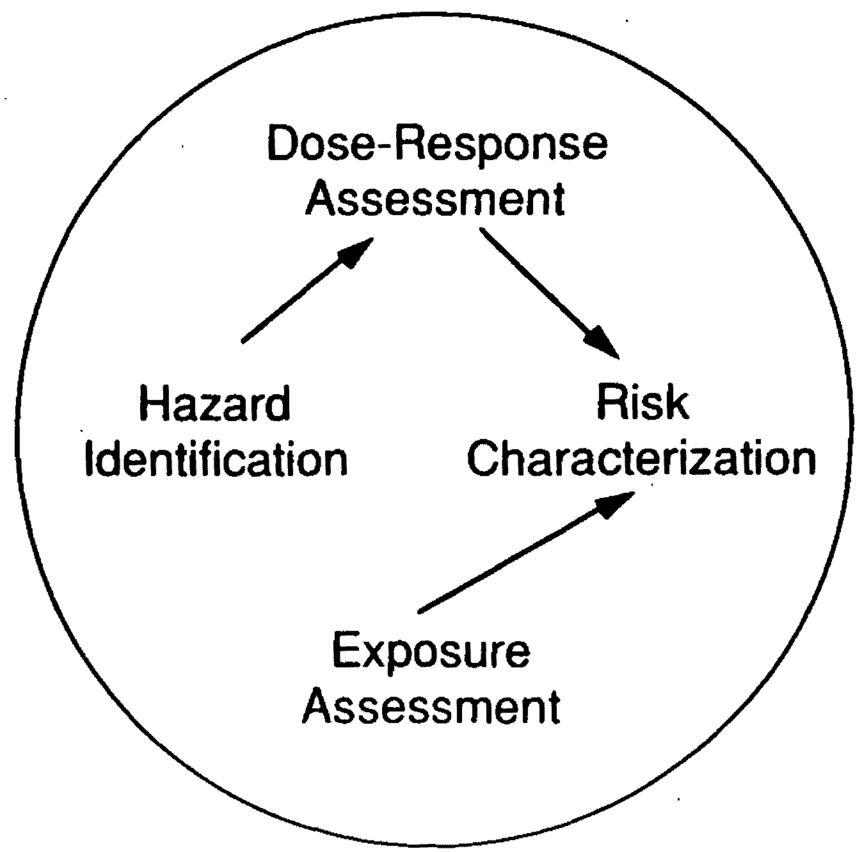
Environmental Protection Agency

HUMAN HEALTH RISK FROM ENVIRONMENTAL SOURCES

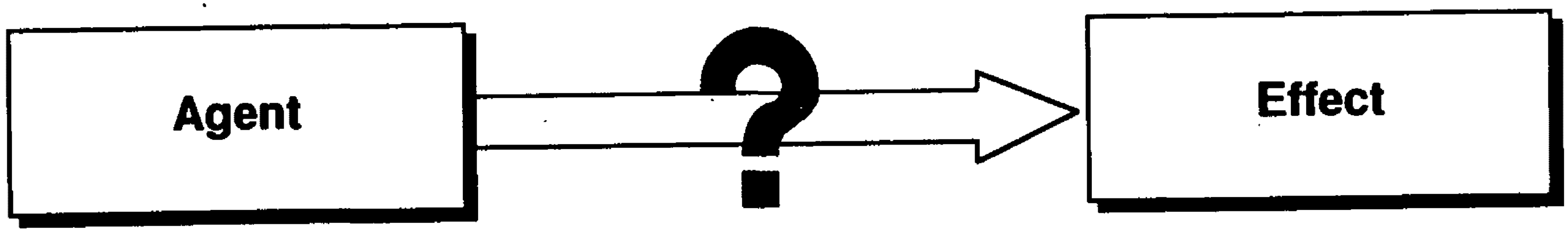
The likelihood of injury, disease, or death resulting from human exposure to a potential environmental hazard

RISK ASSESSMENT

Four steps in risk assessment as described by the National Academy of Sciences

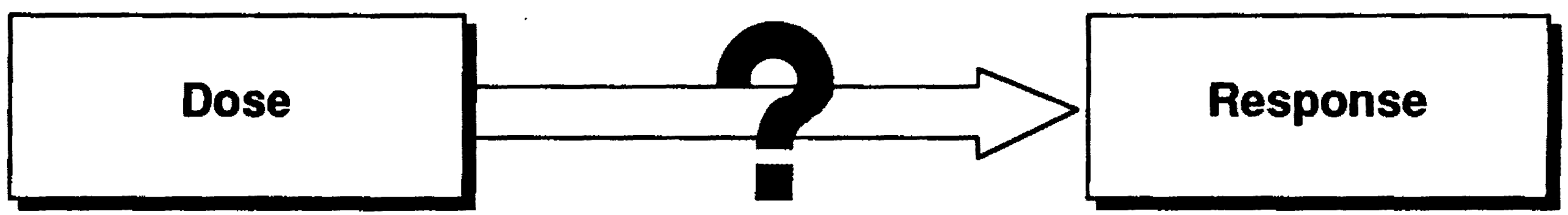


HAZARD IDENTIFICATION

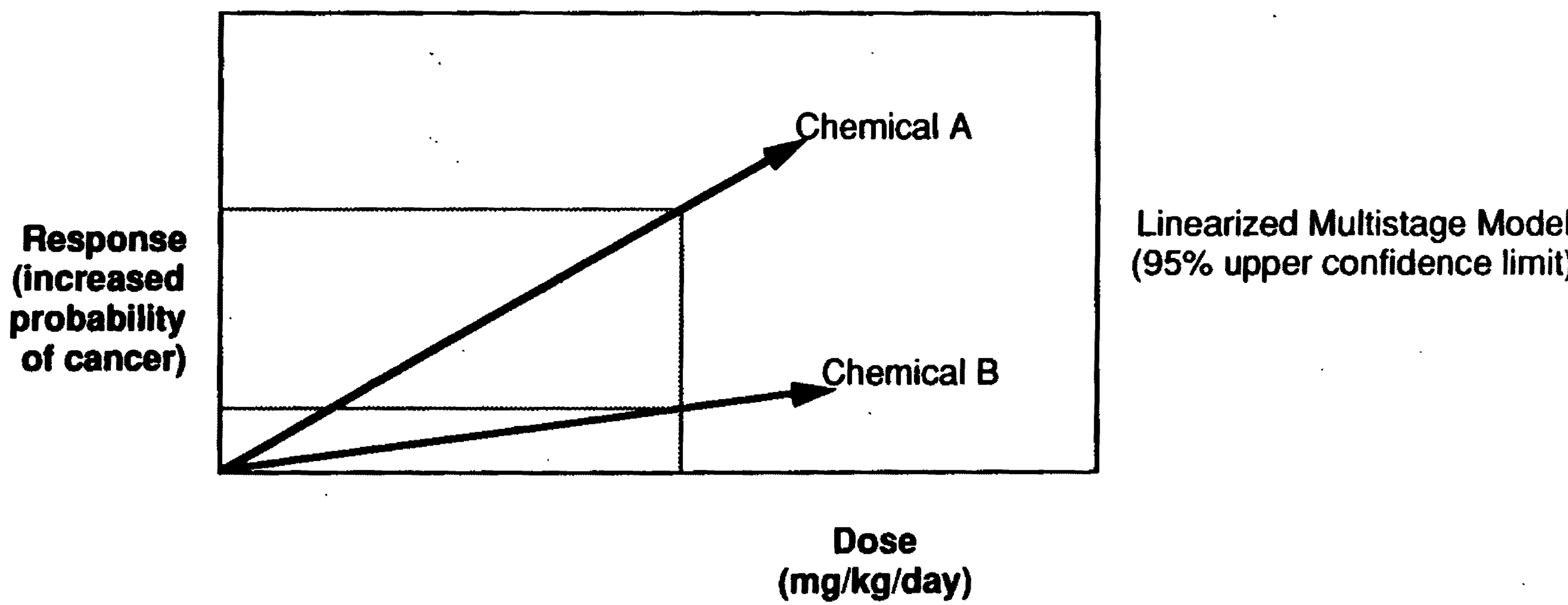


* Can this agent cause an effect? what kind of effect?

DOSE-RESPONSE ASSESSMENT

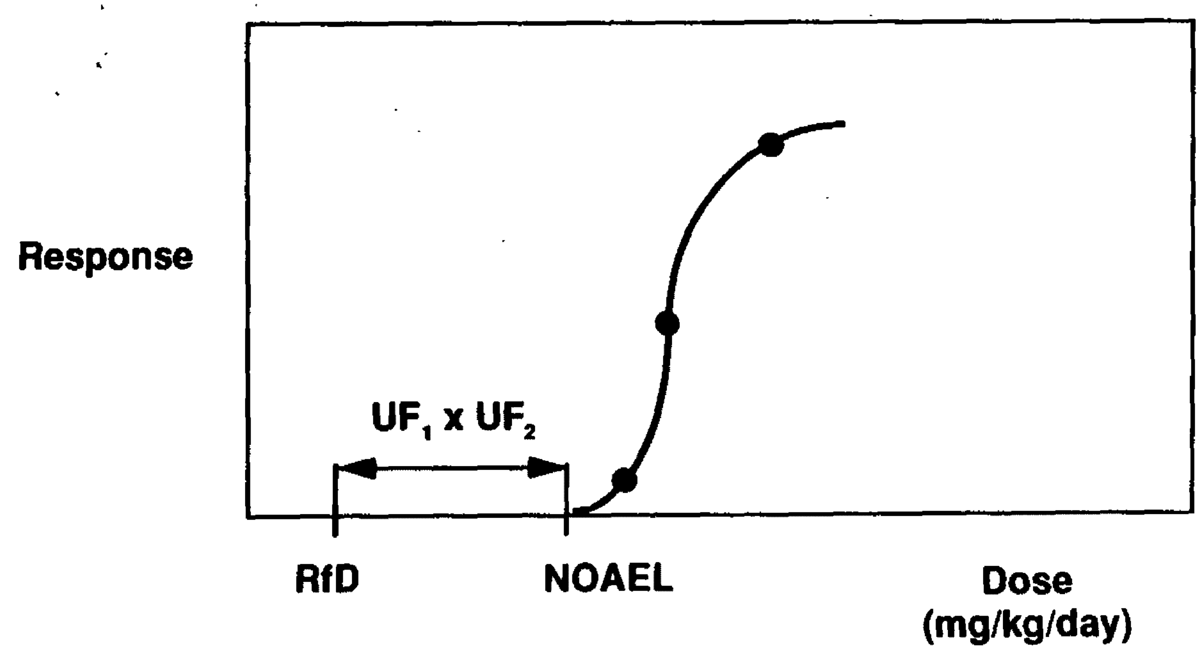


DOSE-RESPONSE ASSESSMENT CARCINOGENS



Models like the Linearized Multistage Model transform high-dose data into low-dose estimates

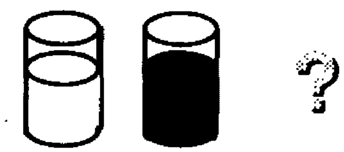
DOSE-RESPONSE ASSESSMENT NONCARCINOGENS

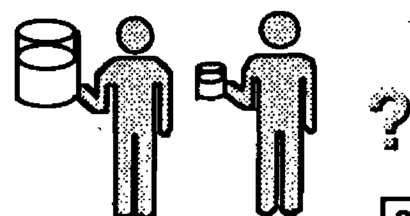


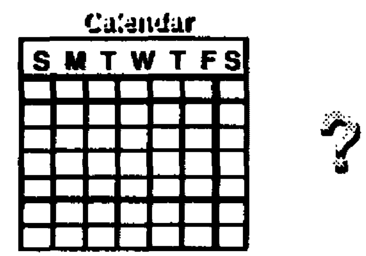
A series of decreasing doses finally elicits no adverse effects. A safety margin is applied to this adverse effects level.

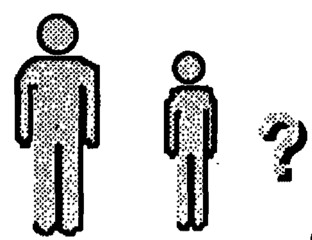
UF = Uncertainty Factor
NOAEL = No Adverse Effects Level   RfD = Reference Dose

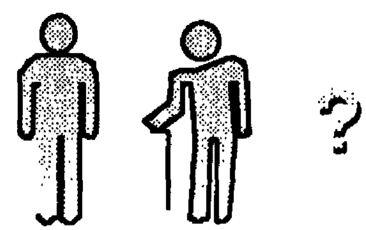
EXPOSURE VARIABLES TO ESTIMATE INTAKE

Exposure point concentrations: 

Contact rate: 

Exposure frequency/duration: 

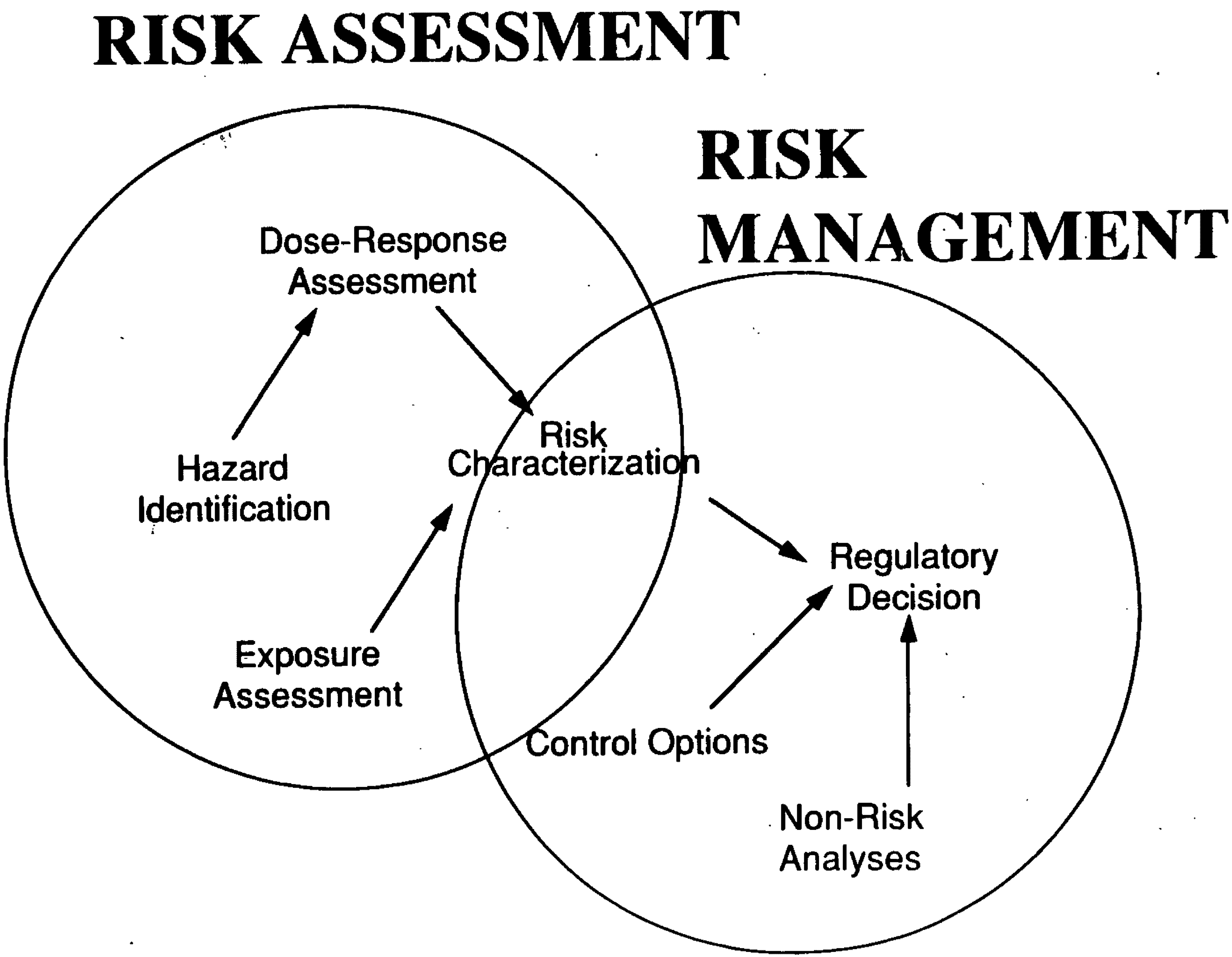
Body weight: 

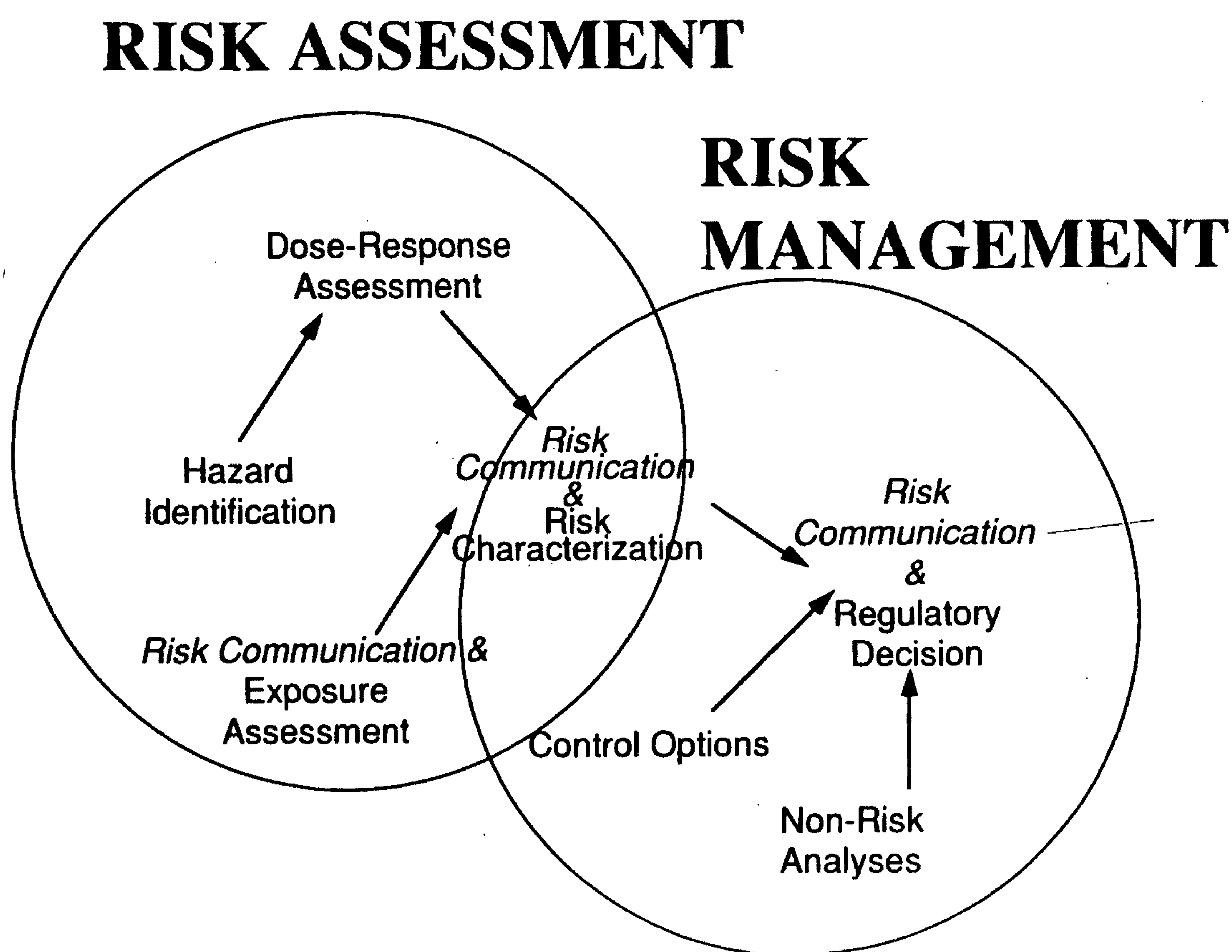
Exposure averaging time: 

THE RISK CHARACTERIZATION

In characterizing the risk, Assessor must:

- **Integrate and summarize the hazard identification, dose-response assessment, and exposure assessments**
- **Develop public health risk estimates**
- **Present assumptions, uncertainties, scientific judgements**


RISK ASSESSMENT
RISK
MANAGEMENT
Dose-Response
Assessment
Hazard
Identification
Risk
Characterization
Exposure
Assessment
Regulatory
Decision
Control Options
Non-Risk
Analyses



cleanup method

A BROADER DEFINITION OF HUMAN HEALTH RISK FROM ENVIRONMENTAL SOURCES

EPA

RISK = Technical Risk Assessment + Non-Technical Public Concerns

Peter Sandman

RISK = Hazard + Outrage

Source Adapted from Peter Sandman, Rutgers Uni ity.

REPRESENTATIVE EXAMPLES OF "NON-TECHNICAL CONCERNS"

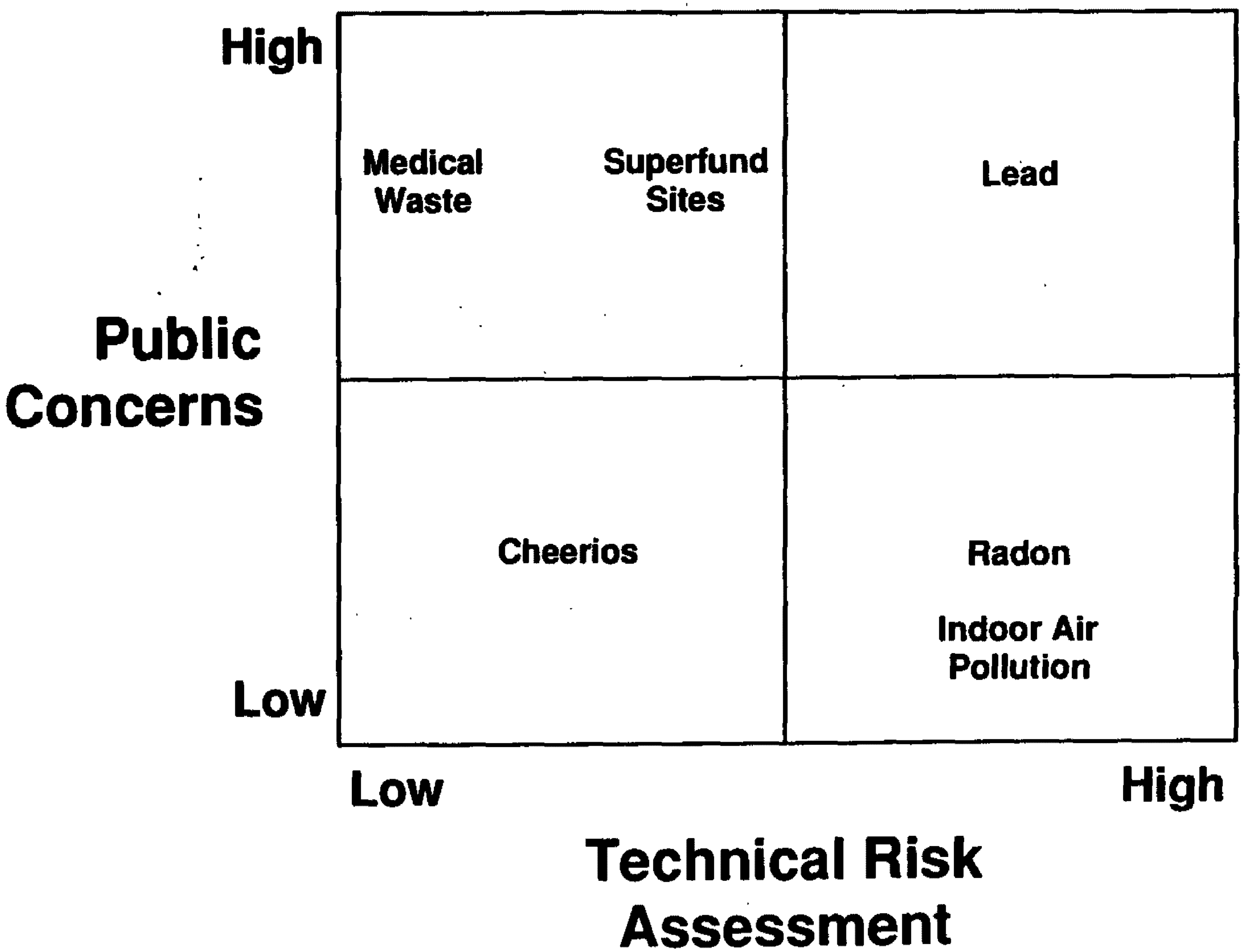
Voluntary	↔	Involuntary
Natural	↔	Man Made
Familiar	↔	Exotic
Common	↔	Dread
Chronic	↔	Catastrophic
Controlled by Individual	↔	Controlled by Others
Fair	↔	Unfair transfer control to individual
Morally Irrelevant	↔	Morally Relevant
Detectable	↔	Undetectable
Visible Benefits	↔	No Visible Benefits
Trusted Source	↔	Untrusted Source

go to a trusted source

acknowledge concerns

Source. Paul Slovic, Baruch Fishhoff, and Sarah Lichtenstein.

DOES OUTRAGE AFFECT POLICY?



EFFECTIVE RISK COMMUNICATION: SEVEN CARDINAL RULES

1. Accept and involve the public as a legitimate partner
2. Plan carefully and evaluate your efforts
3. Listen to the public's specific concerns
4. Be honest, frank, open, and respectful
5. Coordinate and collaborate with other credible sources
6. Meet the needs of the media
7. Speak clearly and with compassion

III. THE MARJOL SUPERFUND SITE

Introduction

The next section of the course deals with a public meeting held in July 1988 on the progress of clean-up activities at a Superfund site in Pennsylvania. The site is at the Marjol Battery Plant where, for many years, lead batteries had been split open (and the lead re-processed) and the broken casings – with some lead remaining – had been dumped into a landfill. As a result of activity at the plant and soil dispersion from the dump site, many homes near the site have elevated levels of lead in their soil. The high lead poses a special risk to children, who come in greater contact with the exposed soil through their play and who are more susceptible to risks posed by elevated lead levels.

The high lead levels at the site have been known since the late 1970's and recently EPA has begun remedial action. The meeting was the second one held in the area since January 1988. The site was not on the Superfund's National Priority List (NPL) at this time and was being handled by the on-scene coordinator (OSC).

Video Segment - Marjol Superfund Site

The **first** segment of the Marjol tape is from a televised "town meeting" held in September. This brief segment of tape gives some background on the situation at the site. As you watch the first piece of tape, keep in mind what "outrage factors" would be driving the citizens of the community. Since the problem has been going on for some time, there is likely to be mistrust between the community and the EPA and state Agencies involved in the clean-up activity. Also, the higher risk posed to children will increase outrage associated with the question of fairness.

The **second** part of this segment shows the Superfund OSC addressing the audience. The meeting occurred in July 1988 when it was very warm, and began with a long rather technical discussion before the site coordinator began. As you watch the tape keep the following questions in mind:

?? Discussion Questions - Marjol Superfund Site

1. The EPA Regional Administrator had, on the advice of the on-scene coordinator, recently sent a letter to the residents which included some inaccuracies concerning earlier blood levels of lead in the area. This has lead to a great deal of consternation among the citizens and town leaders. How does the OSC handle this matter and respond to concerns raised by the letter?

2. What were the EPA representative's expectations and goals for the meeting? Were they reasonable?

3. What is your reaction to his declaration that he wants to allay the citizens' concerns? Is this effective?

4. Is the EPA representative effective when he notes that he has only seen one other site, at which there turned out to be a real health risk, and now this site may make two?

5. What is your reaction to his relationship with the audience? Referring back to the Ladder of Citizen Participation, how is he dealing with the public?

Video Segment - Marjol Superfund Site

The next tape shows a heated discussion between the OSC and a woman in the audience. The woman is clearly upset about the fact that her children had high blood lead levels in the late 1970's, and she feels that not enough was done about it. One of her children has a learning disability and it is clear that in her mind the lead is responsible. Clearly, she is angry and wants to vent some of her aggression at those officials she feels are responsible. She starts in by saying that the EPA and state officials, because they are educated, would never live in the area while the remediation work is being done.

Her first question is straight forward and hard hitting - "why should we believe you now?"

Discussion Questions - Marjol Superfund Site

1. Ignoring the specifics of this case, consider how you would respond. What do you say to someone who flat out says he/she doesn't believe what you're saying?

2. What is driving this woman's outrage? Knowing that, how would you change your response to her question?

Video Segment - Marjol Superfund Site

The next and final segment of tape shows a continuation of the woman's questioning of the OSC. Are you man enough, she challenges him, to tell us the truth? As you watch his response, keep the questions on the following pages in mind.

?? Discussion Questions - Marjol Superfund Site

1. Did the site coordinator adequately address the woman's concerns? Could he have, given the confrontational manner of her questioning?

2. What guidelines can you develop to help you deal with situations in which you find yourself in confrontation with the audience?

3. What did the citizens (or at least those that we saw on the clips) hope to accomplish? How did this compare with what the EPA rep was trying to accomplish?

4. What is your reaction to the OSC's body language? The room arrangement?

5. What should you do when your expectations of what should occur differ from the public's? What can you do prior to the meeting to decrease the possibility that this will take place? What can you do at the meeting? How could you find out the public's expectations?

What are some of the key lessons that can be gained from the Marjol tapes?

- Plan carefully and be aware that what you say will be filtered through the public's own perceptions
- Know your audience and try to address their expectations
- Be sure to tailor your own agenda and objectives to meet the public's
- Be aware of your body language and the messages it sends
- <u>Listen</u> carefully to the audience! Tailor your responses to meet their concern
- If your objectives for the meeting are not the same as the audience's – do all you can (even to the point of changing the nature of the meeting) to meet the public's needs. In the long-run, you will have to address their concerns in order to get to yours.

Additional Readings in Resource Section - Marjol Superfund Site

- ***The Lethal Legacy of Lead Poisoning***
- ***Public Meeting Check List***
- ***Public meeting - Typical Questions and Sample Responses***

Perception of Information Sources*

	Amount Rec'd % A Lot	Trust % A Lot	Knowledgeable % Very
News Reporters	27	27	17
Environmental Groups	21	40	53
Friend/Relatives	7	34	9
LEPC	6	28	33
State Government	6	12	29
People You Know Who Work for a Chemical Industry	5	19	30
Local Government	5	11	22
Federal Government	4	12	36
Chemical Industry Officials	3	8	58
Doctors	3	46	27

* Comparisons of trends only; no significance tests conducted.

from Public Knowledge and Perceptions of Chemical Risks in Six Communities: Analysis of A Baseline Survey EPA 230-01-90-074 January 1990

IV. DEALING WITH THE MEDIA/ HANDLING TOUGH QUESTIONS

Introduction

During this section of the course, we will discuss the role of the media in risk communication efforts and will also review some ways to handle "tough" questions, whether you get them during a media interview, at a public meeting, or at another forum.

Our efforts here are obviously not meant to substitute for the other types of training available on how the Agency expects its personnel to deal with the media. Still, there are some lessons that can be easily reviewed concerning the way that you use the media to communicate your Agency's messages, and the way that media uses you.

You should remember that the need to meet the needs of the media is one of the seven cardinal rules (#6). Among the guidelines stressed for this rule are the following:

- Respect reporters' deadlines
- Provide information tailored to the needs of each type of media and include your messages
- Follow up on stories with criticism or praise
- Try to establish long-term relationships with reporters
- Define your message and repeat it

Video Segment - Dealing with the Media

The next video clip is of a presentation given by a San Francisco reporter (Tom Vacor) at a Risk Communication conference in 1986. Do you agree with his key points? How could the Agency do a better job with the media?

A copy of his speech is included in the resource section.

??? Discussion Questions - Dealing with the Media

1. Is the media (print or television) your ally or your adversary in trying to communicate with the public?

2. How well/poorly does your office use the media? How can you use the media to communicate with the public and advance your goals? Can EPA do what the public interest groups do in working with the media?

Handling Tough Questions

When faced with tough questions (during an interview, on the telephone, or at a public meeting), it's often helpful to try to determine the type of question that is being asked in order to avoid traps or pitfalls that may be awaiting you. It is also essential to prepare your key messages which represent the Agency's viewpoint. These messages should be included in each of your answers. You shouldn't spend *too* much time thinking about the kind of question - you do after all have to answer it. However, it might be helpful if you could identify what "underlies" the question. This is an example of "ACTIVE LISTENING", looking beyond the specifics of the question to identify the underlying theme/objective of the questioner.

In its course on Risk Communication and Public Involvement, EPA's Region IX provides a list of 8 situations in which you might find yourself and some suggested responses. These "solutions" should not be taken dogmatically but rather as suggestions.

Discussion Questions - EDB Role Play

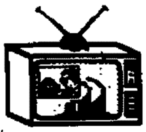
The potential interview questions noted below should help you get started in preparing for the interview.

1. How can you justify allowing the continued use of this material when it can have the drastic effects that we saw in the video clip?

2. What other problem chemicals haven't you told us about?

3. Were you protecting the public when you failed to announce publicly that you found this chemical in flour destined for the school lunch program? Why didn't you warn parents so that they could tell their children something very simple - like don't eat the bread.

4. How much EDB is safe?



Video Segment - News Broadcast on EDB

Watch the following clip from a news broadcast on the problem EDB might pose. As you watch, you should assume that you are the official spokesman for EPA on pesticide issues and that you will be interviewed by the person who put together this newscast.

The Mock Interview

After the clip is over, you will split up into small groups. In your groups you will prepare both questions and answers for an interview between the reporter who put together that piece and the EPA chief of the Special Review Branch. When we get back together, each group will ask questions of the others.

Consider that this broadcast aired in December 1983, so that the Agency has moved to suspend the use of the chemical on soil but has yet to act on its use as a grain fumigant. Keep the following list of items in mind in order to assist in your preparation for the interview:

- What will be your objectives in the interview?
- What is your strategy for achieving these objectives?
- What facts are critical?
- Who is your audience?
- What message(s) do you want to convey?
- How will you evaluate how well you have done?

Be sure to identify what you want to accomplish during the interview. Think of two to three key points and be sure to emphasize them whenever appropriate. **These are your key messages.**

EDB Background

- Ethylene DiBromide (EDB) is now classified as a B2 probable human carcinogen. It is an insecticide and fungicide that was used as a fumigant in soils, on grain and on citrus from the mid 1950's through 1984. It was an effective and widely used chemical on much of the nation's grain. The silos it was stored in were also treated with EDB

- No tolerance was set for EDB since when it was first registered it was presumed that there was no residue left on the fruit or grain by EDB application

- In the late 1970's, the EPA was aware that residues of EDB were being found on grain products and the chemical was also being found in ground-water systems

- On 9/30/83, EPA announced an emergency suspension of soil uses of EDB, thereby halting approximately 90% of the use of EDB nationwide

- In October, 1983, the Agency prepared a cancellation order for use of the chemical on citrus, but it was appealed by users

- In December 1983, Florida, after finding residues of EDB in grain products in supermarkets, set a statewide tolerance of one part per billion (1 ppb) and started removing products with levels above the tolerance from the shelves

- A number of other states also set limits: Massachusetts (10 ppb), California (300 ppb)

- Under FIFRA, the Administrator could announce an emergency suspension of EDB that would have stopped all use of the chemical. However, in order to take this step, the administrator would have to make a determination that during the time the chemical was being reviewed, it would pose an unacceptable imminent hazard

- A separate determination would have to be made as to how to handle the existing food supply that had been treated

- In late 1983, EPA was not convinced that the data supported a cancellation of the use of the chemical on grain, although the Agency had cancelled the soil use to eliminate ground water contamination.

- In late 1983, the Agency requested information from the states and other sources with regard to the establishment of a tolerance level for EDB. The Agency could only issue a guidance because of an exemption from tolerance that had been given EDB in 1956 when it was believed that the pesticide left no residue.

- In February, 1984, Administrator Ruckelshaus announced a ban on all use of EDB on grain and that a decision on citrus would be forthcoming. With regard to treated grain he established three different guidance levels:

  for raw grain (900 ppb)

  for uncooked products (150 ppb)

  for ready to eat products (30 ppb)

8. **"No comment."** "No comment" is not the same as "I don't know," "No comment" can be stated a number of ways. If you do not know the answer to a question, state that you do not know the answer.

Example: "We have heard that ABC Industries, a large employer in the area, may be required to perform extensive corrective action to keep this facility in operation."

Solution: If the answer is "no comment," it can be done smoothly. For example, "EPA has not yet made a decision about the extent of corrective action that will be required. We will be sure to inform you as soon as we have reached a decision."

Video Segment - Handling Tough Questions

The following clips show examples of people being asked and then addressing "tough questions." The first comes from a meeting held to inform citizens and answer questions about the ASARCO smelter which we'll be discussing in more detail tomorrow. The second clip comes from a Superfund meeting at a site on Long Island. As you view the clips, think of how well the respondents did.

Role Play - TV Interview on Ethylene DiBromide

For the following small role play exercise, we will be looking at a case involving a pesticide, ethylene dibromide - or EDB. The purpose of the exercise is to gain some experience in dealing with the media and handling tough questions. In addition, it's intended to illustrate the importance of planning for an interview and dealing with it in accordance with the seven cardinal rules. For preparation, review the brief background piece on EDB that follows on the next page of this section.

4. **The empty chair situation.** In this situation, the interviewer quotes an opponent or person with a different point of view who has criticized your view, but is not present.

Example: "Dr. Ralph Smith has said that this facility is a serious health hazard." Or, "Congressman X says EPA's handling of the permit application has been inadequate."

Solution: You can respond simply "I have not heard those remarks," or "I believe the facts will show..." You should make sure NOT to attack an opponent who is not present. Be willing to review the information and then comment on it.

5. **The broadside attack.** This is the "ad hominen" argument, in which you are attacked directly.

Example: "You are deliberately withholding information aren't you?"

Solution: The best advice is to deny it straight out, if it is not true, or to be candid if there is some truth in it: "We only withhold information that we consider confidential and which may adversely affect the drafting of a permit for a facility." - You should also point out the ways (meetings, fact sheets, etc.) that you are attempting to get information out.

6. **The hypothetical situation.** This technique involves the interviewer asking a hypothetical question – a "what if" question.

Example: "What if contamination is discovered in the ground water below the facility? Will EPA deny the permit application?"

Solution: The best advice is to point out that "we can't speculate on what we might do until all the facts are in." However, you should also note what you're doing to ensure that you're gathering all the information.

7. **Inconsistency.** If you or your organization has changed opinions or policies over time, you might be asked about that change.

Example: "When the facility's permit application was called in, EPA said it would notify the community of any deficiencies in the application. But you found deficiencies and did not tell us."

Solution: You should clearly explain the reasons for the change, whether it was due to a change in policy or circumstance. For example, "Our intentions remain to keep the community well-informed as the permit is developed. But the deficiencies we have found so far in the permit application are administrative and minor."

1. **The "set-up."** A long preamble precedes a question, sometimes loaded with misinformation or a "when did you stop beating your wife" question.

Example: "Considering the low regard that residents have for EPA, how do you, as part of EPA's team developing a permit for the ABC Industries facility, expect people to believe you are not selling out to ABC Industries?"

Solution: One solution is to break in politely to challenge the premise. (Do not nod your head when the question is being asked – viewers will think you agree with what is being said.) The second approach is to wait until the question is finished, then go back and knock down the preface: "Yes it may be true that some people are suspicious of EPA's negotiations with private companies, but in fact, the permit conditions for the ABC Industries facility requires extensive corrective action." Or simply, "What you've said just isn't true. Let's look at the facts." You may also want to concede that there may be cause for people to question what you were doing before, but that they should look carefully at what you're doing now.

2. **The "either...or" situation.** The interviewer poses two unacceptable alternatives.

Example: "Either you are misinformed, or you are protecting someone..." Another example: "Now were those irresponsible statements due to incorrect information or were they part of a deliberate attempt to mislead the public?"

Solution: One solution is to answer the question directly: "Neither. The real issue here is..." and move on to the points you want to make. Or you can just ignore the trap and respond the way you want.

3. **Irrelevancy**. In this situation, you are called upon to answer a question in an area unrelated to your area of expertise. As a result, you may be quoted out of context.

Example: "Ms. Jones, as the EPA regional permit writer for the U-Dump landfill, what do you think EPA should include in the permit conditions for the Brown Industries storage facility?"

Solution: You might simply remark that it is not your area of expertise, then launch into some information regarding EPA's actions at the U-Dump landfill. - You may also want to direct them to someone who knows more about the area they're questioning.

What to do when you disagree with the Agency position

Now let's look at a different question. How do you believe that one should respond when he/she disagrees with the Agency position they have to defend? Some at EPA were caught in this situation when they believed the Agency should be taking bolder action.

In "Improving Dialogue with Communities": A Short Guide for Government Risk Communication", (See Resource Document) Caron Chess, Billie Jo Hance and Peter Sandman note that: "If your personal position does not agree with agency policy, do not mislead the community. Instead, try modifying the agency position or having the task reassigned. Or find a way of acknowledging the lack of consensus within the agency. Misrepresenting the situation or dodging questions about your position will obviously reduce your and the agency's credibility."

Do you agree? Can this be done?

Video Segment - McNeil-Lehrer Interview

As you watch the next clip, which shows Paul Lapsley of the pesticides office at EPA being interviewed on McNeil-Lehrer after the Ruckelshaus press conference, keep the following in mind:

- Did he do a good job? Why? How does he do with regard to the Seven Cardinal Rules?
- Was he prepared? What were his key points or messages?
- Did he meet the concerns of the public?

In the attached resource document you have a short piece written by Paul Lapsley which describes his views on how to prepare for an interview.

Video Segment - Ruckelshaus Final Word on EDB

Additional Readings in Resource Section- Dealing with the Media / Handling Tough Questions

- *Preparing for the Interview by Paul Lapsley*
- *Presentation by Tom Vacor on the Role of the Media in Risk Communication*
- *Do's and Don'ts for Spokespersons*
- *Telling Reporters About Risk*

V. EXPLAINING TECHNICAL ISSUES

Introduction

One of the more important problems facing the risk communicator is trying to explain highly technical problems to the public. This is still what many people think defines risk communication – "can you tell me how to explain 1 in a million better or how to explain a risk estimate of 4 per million?" This is obviously very important – you have to be able to give people information they need in a way they can use. However, as we have seen, it is not all there is to risk communication. **The goal of risk communication is to provide the individuals with information in a manner that is meaningful to <u>them</u>!**

When explaining technical matters to the public, it is very important that you fashion the presentation to ensure that it meets the needs of your audience, and not just your needs. Often the public expects an answer to the question, "Is it safe?"

<u>*Uncertainty and Timing*</u>

Associated with the issue of explaining technical issues are two related issues – deciding how to address scientific uncertainties when communicating scientific results to the public and deciding when to release information to the public.

Uncertainty

As discussed earlier, the risk assessment process yields uncertain results. The use of animal data, the models used to estimate dose-response and exposure figures, all raise questions about how "hard" the results are. Uncertainties and questions about data and conclusions reached about them characterize almost all risk decision-making efforts.

At a Risk Communication Conference in 1986, Frank Press of the National Academy of Sciences discussed the ubiquitous nature of uncertainty in science, saying "It is important to understand that uncertainties are not unique to matters of risk. They are really what drives all of science. If there were certainty, there would be no science."

As a communicator, you have to acknowledge these uncertainties and explain what you are doing to try to limit them. Recognize that others will reach different conclusions, looking at the same information, and the public will often be receiving conflicting views of the same information.

Think, for example, of the situation the Agency faced with regard to alar, a chemical used on apples. Environmental groups were using the same data as EPA, but reaching different conclusions.

You must be willing (and able) to discuss the procedures used to develop information, where uncertainties lie in the process and the efforts underway to resolve them. The Agency does not have the only answer to a problem, but you have to have a defensible one. You should be prepared to discuss how you've reached your conclusions, the differing conclusions that others have reached, and why you think yours is right.

Remember – There will always be uncertainty. As one county official told researchers from Rutgers University, "Environmental epidemiology makes economics look like an exact science."

For more information on uncertainty refer to a memorandum from EPA Deputy Administrator, F. Henry Habicht II, on "Guidance for Risk Characterization for Risk Managers and Risk Assessors" in the resource document.

Timing

One of the easiest ways to lose trust and credibility with an audience is to withhold, or be perceived as withholding, information. Remember the EDB tape? One of the strongest indictments made about EPA was the implication that the Agency knew about problems but wasn't acting on them, or informing others. Whether it is true or not, being perceived as withholding information is obviously very damaging to your credibility.

If you want people involved in the process (no matter where they are on the Ladder of Citizen Participation) then you have to give them information in a timely manner, in a way that is meaningful to them. You want to get the best information out to the public as quickly as possible. Decisions on when to release information, how to do so, and who should receive it, should all be part of a risk communication plan. We will discuss the importance of these plans, and what they should include, in the next chapter.

There will obviously be circumstances when you can't release information, whether for legal reasons or concerns you have about its accuracy. Note there is a difference between recognizing uncertainties about your data and questioning the data's accuracy. Release what you can and let people know why you can't provide other data and when you might be able to. Keeping the public informed will enhance their feeling of control and, as we discussed earlier, lower the "outrage" they may be feeling.

Please refer to the Resource Document for a list of Ten Reasons to Release Information Early, developed at Rutgers.

Discussion Questions - Explaining Technical Risk

1. What do you think are the biggest problems you'll face in explaining a technical issue (such as a risk assessment) to the public? How can you plan to overcome them?

2. How can you explain that the risk estimates the Agency assigns to various chemicals or to an overall site (as in Superfund) generally exaggerate the potential risk. How does this over estimate of the potential risk affect policy?

3. What are some general guidelines that should be used in communicating technical matters to the public? What advice would you give to a colleague about preparing a presentation for an intelligent, but not scientifically trained public. **After we develop a list together in class, you'll receive a handout on general guidelines to follow in presenting technical information.**

Risk Comparisons

A well-thought comparison can be an effective tool for helping put risks into perspective and help an audience better understand technical information. However, you should be warned that it is very difficult to come up with a comparison that can really work.

In general, it is important that you carefully think through any comparison that you want to use and that whenever possible pre-test it (e.g., through informal interviews or focus groups). There are no absolute rules or guarantees about what is or is not an effective comparison. You must be as diligent in discerning the appropriateness and accuracy of a proposed comparison as in providing any sort of technical information. Be especially cognizant of your audience and their concerns and only use a comparison that addresses those concerns adequately!

In trying to determine the appropriateness of a comparison, try to see it through the perspective of your audience. Will this help them better understand the situation at hand? Remember, that should be the goal of the comparison - to help your audience understand the situation and participate in making the decision.

No risk comparison will be successful if it appears to be trying to settle the acceptability question since "acceptability" is a value question, not a technical one. Your job is to help the public reach its own decision on the "acceptability" of the situation. You can try to help put data into perspective – it is then up to the recipient to decide how he/she wants to use that information.

Be careful: An inappropriate comparison, which the audience finds "off the wall" or patronizing or otherwise wrong can turn the audience off so they will not hear your message.

Two articles in the resource document, entitled "What Do We Know About Making Risk Comparisons?" and "What Should We Know About Making Risk Comparison?" discuss whether the use of certain types of comparisons are more effective than others.

Discussion Questions - Risk Comparison

1. What makes a comparison work for you?

2. What effective examples do you have of comparison? Ineffective?

Video Segment - ICE Minus

The next segment of tape shows small portions of a press conference at which Jack Moore, EPA's Assistant Administrator for Pesticides and Toxic Substances at the time, is discussing the Agency's decision to permit on-field testing of a genetically altered bacteria (ICE minus) that will inhibit the freezing of strawberries. In addition, Steven Lindow, the lead scientist on the ICE Minus experiment is seen explaining the nature of the experiment to the public.

Consider the following questions when viewing the tapes:

What did you think of Mr. Moore's presentation, especially with regard to the seven cardinal rules?

What is your reaction to Mr. Lindow's assertion that "no deliberate introduction" of a species has led to problems? Do you agree? Did you find the statement helpful or distracting?

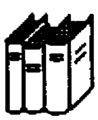
Did you like his "comparison of the genetic change to the bacteria to removing one piano key?" What about his graphics? What is your reaction to his statement that you should have faith in the scientists?

Video Segment - State of California Epidemiologist

In this next tape, a California doctor, Lynn Goldman, is shown talking to a group of individuals at a meeting concerning possible contamination of drinking water from industrial pollution. As you watch, consider whether she is an effective speaker. Why or why not?

- How does she do with regard to the seven cardinal rules? With regard to the list we've developed as guidelines for explaining technical risks?

- How does she say, "It's safe?"



Additional Readings in Resource Section - Explaining Technical Issues

- ***What Do We Know About Making Risk Comparisons?***
- ***What Should We Know About Making Risk Comparison?***
- ***Explaining Environmental Risk: Some Notes on Environmental Risk***

GENERAL GUIDELINES FOR COMMUNICATING TECHNICAL ISSUES

1. Don't underestimate the ability of the public to assimilate technical information. Remember--if you give people a reason to learn (a stake in the decision) they can do so.

2. Find out what risk information people want and in what form.

3. Anticipate and respond to people's concerns about their personal risk.

4. Take care to give adequate background when explaining risk numbers. Use language that is as down to earth as possible.

5. Provide information that helps respond to their concerns and which is neither too complex or patronizing.

6. Put data in perspective and try to express the risk in different ways.

7. Explain the process, i.e., the Agency's risk assessment procedure by which the numbers were derived.

8. Use graphics to help make your points.

9. Collaborate with other credible experts.

10. Use language consistent with the expertise of your audience and avoid the temptation to lapse into jargon.

11. Take care when comparing environmental risk to other risks.

VI. PLANNING FOR RISK COMMUNICATION

Introduction - *Why do you need a risk communications plan?*

In order to provide the public with the opportunity to participate meaningfully in agency decision-making, the public must be involved early in the process (see cardinal rule #1). This *will not* happen on its own, but the Agency must plan for and actively seek this participation.

It is important to recognize that an effective communication program is an analytical one, requiring the identification of goals and objectives, activities to reach those goals, ways to evaluate the degree to which the goals have been met, and mechanisms to allow for changes resulting from the evaluations. As we saw in the MARJOL case, communications cannot be simply left to the last minute. Rather, the Agency must recognize that the communications strategy is critical to the success of the risk management process. In the absence of effective planning and preparation, communications problems such as those seen in the MARJOL meeting can undermine all the good work that the Agency is doing at a site or in developing a rule.

The need for effective communication planning has broader implications than the preparation for and assessment of a particular communication event such as a public meeting or a media interview. That is certainly important, but we are referring to a view of communication planning that is part of the whole decision-making process. Obviously planning is necessary to ensure the effectiveness of specific events (like a public meeting), but it is also critical in a broader sense to help the Agency, other government entities, and other interested parties work together to reach the best possible management decision.

In its brochure on the Seven Cardinal Rules for Risk Communication, EPA offers the following guidelines to meet the second Rule: to Plan Carefully and Evaluate Your Efforts. Begin with clear, explicit risk communication objectives – such as building relationships, providing information to the public, motivating individuals to act, stimulating response to emergencies, or contributing to the resolution of conflict. Evaluate the information you have about the risks and know its strengths and weaknesses. Classify and segment the various groups in your audience. Aim your communications at specific subgroups in your audience. Recruit spokespeople who are good at presentation and interaction. Train your staff – including technical staff – in communication skills; reward outstanding performance. Whenever possible, pretest you messages. Carefully evaluate your efforts, learn from your mistakes, and seek the advice of risk communication experts.

Points to consider:

1. There is no such entity as "the public"; instead, there are many publics, each with its own interest, needs, concerns, priorities, preferences, and organizations.
2. Different risk communication goals, audiences, and media require different risk communication strategies.

What constitutes an effective plan?

The following list will serve as the starting point for group discussion on developing a communications strategy. It comes from work done at Rutgers University and discussed in Planning Dialogue with Communities: A Communication Workbook, which is included in its entirety in the resource section.

Determine your goals – depending on the situation

Be clear on what you hope to accomplish

How do we define success?

Identify your audiences and their specific concerns

It is important to identify all those who may be interested in your activity or who can provide you with information: set priorities among the groups, establishing a core group that will be directly involved and others that will not be so directly involved.

Design your messages to meet those concerns

Think of satisfying the audiences needs - not only yours.

Choose the best methods to reach people

For some groups, informal meetings are best. Be sure you know how you intend to reach people. What are the biggest roadblocks?

In order to ensure you reach people who might not usually be involved, you should cast as wide a net as possible. This is important to ensure equity.

Too often agencies choose the methods they want to use first, before they've identified the audience they want to reach.

Coordinate internally

Practice the same risk communication principles on others in your agency as with the public.

Plan for evaluation

How to build in procedures to evaluate how you're doing and make changes based on the results of the evaluation.

Evaluation

As we have pointed out, evaluating how your communications plan is going and making changes in your plan to help meet its goals and objectives is an integral component in a risk communication strategy.

This type of evaluation, identifying the degree to which the communication activities are successful in reaching goals and objectives, is referred to as an *outcome* evaluation. Evaluation techniques can also be used in the beginning stages or during plan development, to pre-test materials to see if they are appropriate for the targeted audience, and during the implementation of the plan to see how the planned activities are proceeding. These types of evaluations are referred to as *formative* and *process* respectively.

The type of evaluation used at any given stage in the plan development and implementation will depend to a great extent on the time and resources available. For example, in the pre-test or formative stage, techniques can range from readability tests that evaluate the clarity of a particular article to the use of focus groups, which can be used both to test the applicability of materials and presentations and to learn more about audience perceptions, beliefs, and needs. The formative evaluation should help determine the clarity, comprehensibility and completeness of the materials.

The table on the following page, adopted from "A Guide to Practical Evaluations," an EPA document prepared by Michael J. Regan and Williams Desvousges of the Research Triangle Institute, shows some of the techniques that can be used for formative, process, or outcome evaluations.

It's not important that you memorize the technical names for these different evaluation techniques, but it is important that you are aware of the kinds of evaluation options that are available so you can decide which best suit your needs.

For more information on all these types of evaluation, the reader should see "A Guide to Practical Evaluations", an EPA document prepared by Michael J. Regan and William H. Desvousges of Research Triangle Institute and also, in the Resource Document, "Evaluating Risk Communication Programs," by Mark Kline, Caron Chess and Peter Sandman.

?? Discussion Questions - Planning for Risk Communication

1. What evaluation tools have you used in your work? Which have been most successful?

2. Are there limits on your ability to do more evaluation?

Evaluation options based on available resources

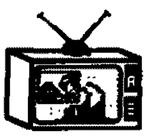
Type of Evaluation	Possible Options Based on Available Reasons		
	Minimal Resources	**Modest Resources**	**Substantial Resources**
Formative	Readability test	Central location intercept interview	Focus groups, individual in-depth interviews
Process	Spot check of key activities	Quarterly tracking of key program components	Ongoing in-depth tracking and analysis of key program components
Outcome	Internal discussions with gatekeepers Print media review	Limited surveys	Detailed assessment of target audience for knowledge gain Studies of public behavior/health risk change

Adapted from: "Focus Groups and Risk Communication: The "Science" of Listening to Data" by William H. Desvousges and V. Kerry Smith

Radon - An Example of Effective Planning and Evaluation

The Surgeon General warns that radon is the second leading cause of lung cancer in the U.S. today, behind smoking. It is estimated that radon causes between 7,000 - 30,000 deaths/year - more than from fires, airplane crashes, or firearms. Approximately six percent of the homes in the U.S. are estimated to have elevated radon levels. Radon is radioactive gas formed from the natural decay of uranium found in rock and soil. Radon enters homes through cracks and other holes in the foundation and can become trapped and accumulate to high levels. While radon is one of the nation's more serious environmental health problems, it is also one of the easiest to avoid. It is relatively easy to determine radon levels in a home, and elevated levels can be reduced simply and at a cost comparable to other minor home repairs.

In 1987, an EPA taskforce of senior managers and technical experts ranked exposure to indoor radon, along with worker exposure to chemicals, as the highest cancer risk out of 31 environmental problems examined. This scientific ranking, however, is in sharp contrast to public perception. Annual Roper polls consistently find that, in terms of perceived risk, people rank indoor radon at or near the bottom of 25 environmental problems. While people are aware of the radon problem, they do not perceive it as a serious health risk. The attached newspaper article by Diane White of the *Boston Globe*, "What a Gas!," provides a humorous look at the public's perception of radon.



Video Segment - The Radon Problem

The following video segment is from NBC nightly news and provides some background on the radon problem.

Radon Risk Communication

Educating people and encouraging them to change their behavior is a difficult task. Although public awareness of radon has been raised, about 70 percent of the U.S. population over 18 years old now say they have heard about radon, public apathy remains a major obstacle to radon risk reduction. Only about nine percent of the homes in the U.S. have been tested for radon. There are several reasons why radon poses difficult risk communication problems.

- There is no physical evidence of radon. You can't see it or smell it.
- Radon is primarily an indoor threat and people do not feel threatened in their homes.
- Radon doesn't cause symptoms. The effects of elevated radon levels are only manifest indirectly and over a long period of time.

- The public is saturated with information on cancer-causing agents and tend to ignore new warnings.
- People tend to be less concerned about risks they can control, such as radon, than risks that are imposed by others, such as living next to a hazardous waste site.
- People have no one else to blame for the problem. The individual home owner must take action to test and remediate a radon problem.

What a gas!
by Diane White
The Boston Globe, September 17, 1988

Here I sit trying to work myself into a state of alarm about radon.

Radon is dangerous, I know, even life-threatening. I've read the stories in the newspapers. I've seen the reports on TV.

Radon is an invisible, colorless gas that can seep into houses through foundation cracks. According to one expert, living with a high radon level in your home "should give people as much concern as living next door to a hazardous waste facility."

In spite of that, I'm having a problem taking the radon threat seriously. It's the name, Radon. It sounds like something our of a third-rate science fiction story.

The giant Ixmyrr raised his fist menacingly. "Here on the planet Narthex we have ways of dealing with human scum such as you," he thundered. "Earthlings, prepare to die! Open the chamber of no return! Release the deadly radon!"

Couldn't they call it something else? Radioactive gas. That's what it is, according to the reports in the newspaper. Naturally occurring radioactive gas.

The possibility that radioactive gas may be seeping into the basement, radioactive gas that may cause lung cancer, has a galvanizing effect. But radon? Radon in the cellar? Forget it. It's dumb of me, I know, but there it is, Radon. It sounds like a new fabric.

Radon. The miracle fabric for all your nuclear winter needs. All natural. Made in the U.S.A.

Some words have their own power, quite apart from what they may mean. Consider a headline that appeared in one paper this week: "Peril Seen From Radon."

Peril is a word that's difficult to take seriously. People in peril don't seem to be in real trouble. But people in danger? That's different. "Danger Seen From Radioactive Gas." Cause for alarm. But "Peril Seen From Radon"? Radon. It sounds like a high-tech company.

RADON. Where safety is our least important product.

That story, and others, reported that radon is a carcinogen. There's another word that says less than it means. It sounds like something you add to gasoline to make your car engine run more smoothly.

But "Radioactive gas causes cancer." That has a certain impact. "Radon is a carcinogen." The words seem to bubble up and float away. Radon. It sounds like a post-post-punk, prenuclear rock group.

Now here's Radon with one from their new album. "It's A Gas."

I called a friend to ask what she's doing to combat the menace of radon. She laughed. Then she said she'd had the house tested and the radon level is far too high.

She has a radon remover in the living room. There are plans to dig a tunnel under the foundation of the house to release the radon fumes. She's already spent hundreds of dollars. Her family's health is threatened. It's no joke. So why are we laughing? Radon. The word. It sounds like a cockroach spray.

I knew I had a problem the day roaches seized control of my kitchen and presented me with a list of non-negotiable demands. Then I discovered Radon.

I have no imagination. It's obvious. If I did, I wouldn't have any trouble comprehending that radon, despite its silly name, is a serious threat. But I can't help it. Radon. It sounds like Japanese movie monster.

Far beneath the city, deep in the sewers of New York, it fed on deadly radioactive gas until it was bigger than Donald Trump's ego! Radon! You've seen "Radon vs. King Kong," and "Radon vs. Rambo." Now see "Radon vs. The American Public." Coming soon to your very own home!

In an effort, to overcome these obstacles, EPA and others conducted research on potential solutions. This research produced the following findings:

- While people may disregard information about risks to themselves, they are much more likely to respond to information about the potential risks of radon to others in their households.

- Concise prescriptive recommendations are more effective in encouraging public action than longer, more general messages.

- Radon messages should personalize the risks by comparing radon risks to more familiar risks (e.g., x-rays, illnesses, accidents)

- The public will be more likely to respond to streamlined radon testing recommendations that do not require a year-long radon test.

Video Segment - Radon Public Service Announcements

Using this information, EPA initiated a program to use public service announcements (PSAs) to reach the public and encourage more testing for and fixing of radon. The goal of the program was, again, to increase the level of testing and risk reduction.

The PSA campaign was conducted in three segments with evaluation occurring after each segment. The EPA decided to use an advertising campaign since evidence from research indicated that radon had become old news and advertising could make a difference and encourage people to test for radon. In addition to the PSAs, a hotline (1-800-SOS-RADON) was established to answer questions about radon. In designing the first wave of advertising, EPA used research that indicated they should:

- relate the risk to others in the household

- personalize radon with relevant, tangible comparisons and

- use a strong and unsettling message.

The result was the "X-Ray" PSA.

<u>Campaign Wave I</u>
As you watch this PSA, think about how effectively the message is communicated. How would the public react to the ad? Is the message consistent with the research findings? Is the PSA memorable? What information is retained?

EPA did an outcome evaluation to assess the success of the "X-Ray" PSA, and determined that public awareness of the risk of radon increased by 14%. The analysis of campaigns designed to get people to take specific actions, like anti-smoking and seatbelt use, indicates that PSA campaigns must be in place for several years before large scale public behavior change will be observed. In addition, some scientists thought that the X-ray image was too graphic and disturbing, and EPA was concerned about the lack of support from these scientists for these ads.

As a result, a second set of PSAs were developed which have a more humorous tone. EPA attempted to be just as effective with a lighter approach.

Campaign Wave II

As you watch these PSAs, think about how effectively the messages are communicated. How would the public react to the ads? Are the messages consistent with the research findings? Are the PSAs memorable? What information is retained? How do these ads compare to the "X-Ray" PSA.

In an evaluation of the second wave of PSAs, it was found that they were not as persuasive as the X-Ray PSA. While these PSAs did a better job at describing the ease of testing, some public health experts believed that they were too light hearted and that the health problem posed by radon deserves more serious treatment.

Campaign Wave III

The third stage of PSAs was developed that consisted of a more dramatic message, combined with a lighter "twist." The idea was to combine the successful elements of the first 2 waves.

As you watch this PSA, think about how effectively the message is communicated. How would the public react to the ad? Are the messages consistent with the research findings? Is the PSA memorable? What information is retained? How does this ad compare to the "X-Ray", "Bird Lady", and "Mountain Goat" PSAs?

Campaign Evaluation for All PSAs

- In media tests of TV commercials, all of the Radon PSAs ranked in the top 10% in terms of recall and attention. The Gas Mask actually ranked in the top 2% of all ads tested. It is believed that having the viewers read the information at the bottom of the screen as well as well as hearing it spoken, resulted in greater recall.
- People (media outlets) use the PSAs
- The 1-800-SOS-RADON hotline has received 250,000 calls to date. This is more calls than any other EPA hotline. In addition, State Radon offices and affiliate organizations like the American Lung Association often place local numbers on the PSAs and receive thousands of calls annually. We also know that viewers may not call, but will ask for a radon test next time they buy a home or test their home directly.
- 16% of hotline callers have had their homes tested for radon.
- National surveys estimate that 70% of the population is aware of the radon problem and 9% have tested for it. Compared to other attempts to change behavior (e.g., seat belts and smoking) the radon campaign has been highly successful.

This case demonstrates the importance of planning, evaluating, and changing your message (plan) in response to what you learn during the evaluation. At each step, EPA conducted research which identified the best way to reach its objective, produced advertisements, ran them, evaluated the ad, and created a new ad in response to what they learned. The same approach should be used with any communication program.

Additional Readings in Resource Section - Planning for Risk Communication

- ***Focus Group Techniques***
- ***EPA Title III Focus Group Results***
- ***Focus Groups and Risk Communication: The Science of Listening to Data***
- ***Planning Dialogue with Communities: A Risk Communication Workbook***
- ***Evaluating Risk Communication Programs***
- ***Rhetoric and Reality: Risk Communication in Government Agencies***

VII. ASARCO CASE STUDY

Introduction

It is July 1983 and the EPA has just issued a proposed rule (including alternative approaches) for regulating the emissions of arsenic from the ASARCO copper smelter located in your region. Even though a specific approach is presented in the rule, the Administrator has made it clear in no uncertain terms that he wishes the final rule to take into account the public's desires. While the final decision will be his, he is more than willing to change the proposed rule based on public comments.

Much of the key information about the ASARCO copper smelter and the proposed regulation is included in the attached case study and appendices.

In reading the attached material we ask that you keep a few basic questions in mind:

1. What constitutes "the public"? What public is the Agency trying to involve?
2. What are the key facts from the public's perspective and from the EPA's perspective?
3. Why is EPA involving the public and what is EPA's objective?
4. What strategies should the Agency follow to achieve those objectives?
5. What particular messages is EPA trying to convey to specific individuals and how will you present them?
6. What is the specific program for involving the public?
7. How should EPA evaluate its efforts?

Development of a Communication Strategy

After the review of the case material, we will use the facts presented in the case to develop a communications strategy.

Role Play

Later in the day, we will conduct a mock public meeting during which time EPA will present the background of the proposed rule to the public and learn first hand of the public's concerns. The following material will provide the background information for the role play.

Background

The Smelter

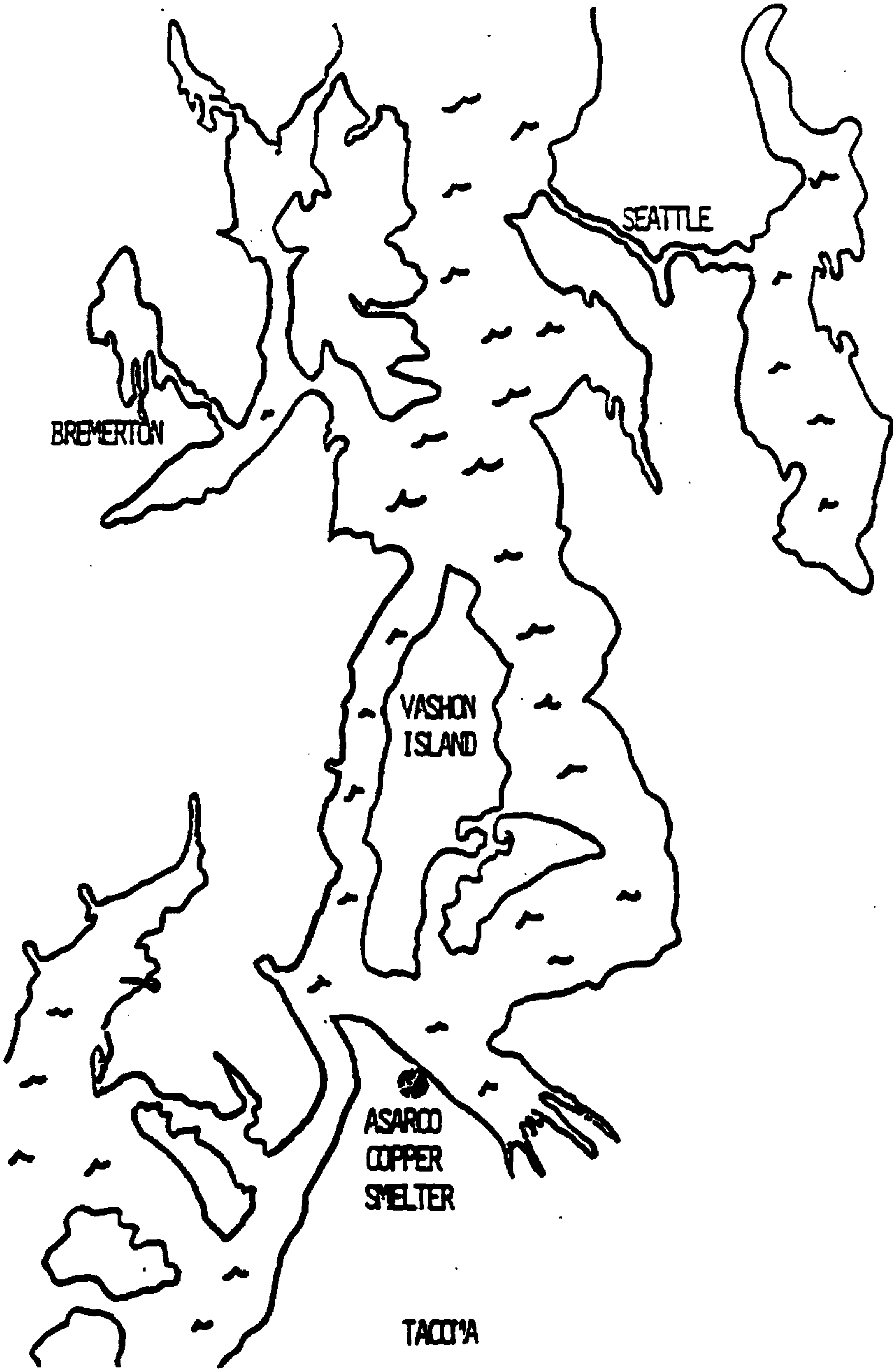
The ASARCO/Tacoma copper smelter is located in Ruston, Washington (see Figure 1). The facility is situated in an industrial area adjacent to Tacoma and bordered to the north by Puget Sound. Across Puget Sound, downwind from the smelter site, lies Vashon Island, a more rural, middle to upper-class neighborhood where many vocal citizens opposed to the smelter reside. The Tacoma/Ruston area, a more urban and blue-collar area, is where many of the smelter employees and other concerned citizens live.

The ASARCO/Tacoma facility is the only U.S. smelter to process ore with a high arsenic content. Built in 1890 as a lead smelter, the facility was bought by ASARCO in 1905 and was converted to a copper smelter in 1912. Since the conversion of the facility, the smelter has operated as a custom smelting operation, using copper feed ores with an average arsenic concentration of 4%, much higher than the typical 0.6% arsenic concentration for ore used at other U.S. copper smelters. For this reason, the facility is able to produce commercial arsenic as a by-product of its smelting operation. The ASARCO/Tacoma facility is the only U.S. producer of arsenic, accounting for one third of all the arsenic used in the United States. The facility, however, is also responsible for approximately 23% of the total national inorganic arsenic emissions, and is the only such source of airborne arsenic in the area.

Arsenic Emissions

Arsenic emissions occur at several points during the production of copper. Fugitive, or ground-level emissions occur during the transfer of copper ore between the major steps of production. Of primary concern are the fugitive emissions of arsenic that occur when the molten ore mixture is sent from the furnace to converters. Gases collected from the furnaces and the hoods enter the pollution control system, and arsenic, SO_2, and particulates are removed partially by means of a flue gas cleaning system. These pollutants, however, are still present in tall stack emissions after going through the flue gas cleaning system. The greatest risk is from the fugitive emissions because they enter the environment at a relatively low altitude and are not easily dispersed.

FIGURE 1


SEATTLE
BREMERTON
VASHON
ISLAND
ASARCO
COPPER
SMELTER
TACOMA

Pollution Control Investments

For the past fifteen years, the facility has been involved in numerous legal battles with the Puget Sound Air Pollution Control Agency (PSAPCA) over SO_2, particulate, and arsenic controls (the PSAPCA had been delegated authority from the state). These disputes began in 1968, when PSAPCA adopted enforceable ambient and stack concentration standards for SO_2. From 1968 to the present, ASARCO has implemented several environmental controls, yet all the while has petitioned for variances and extensions on meeting the standards.

In 1981, PSAPCA required ASARCO to install secondary hooding on the smelter converters. This requirement was associated primarily with SO_2 and particulate controls, although the installation of hoods would also greatly reduce fugitive arsenic emissions. The converters, where the sulfur is burned out of the molten copper mixture, account for a large proportion of the fugitive emissions of gases. Primary hoods capture most gases released, but secondary converters that would cover the primary hoods would catch additional emissions. These secondary hoods would play a particularly important role when the converters were rotated to receive and dispense the molten copper, at which point the primary hoods are less effective. While ASARCO installed one secondary hood, the company has delayed the installation of additional hoods.

ASARCO's Economic Position

As EPA develops a proposed standard for arsenic, questions have arisen as to the strength of the ASARCO/Tacoma facility's financial position. According to a 1981 assessment by Robert Coughlin (an EPA Region X Economist), the Tacoma facility has a limited economic life, probably of less than five years. This is due primarily to overcapacity within the copper industry and overcapacity within ASARCO itself. A number of copper smelters have opened overseas, including one that uses high-arsenic feed ore. This has led to a decrease in the availability and a resultant increase in price for the imported high-arsenic feed ore The increased world-wide competition contributes to the reasons why several ASARCO facilities in the U.S., including the Tacoma facility, are operating far below capacity. Along with this overcapacity within the industry and the increasing price of high arsenic feed ore, another major factor affecting the fate of the Tacoma facility has been the increasing cost of environmental compliance.

In Tacoma, the smelter plays an important economic role.

- The ASARCO smelter employs approximately 600 people and contributes $20 million in goods and services and $2 million in taxes to the area.

- An additional 500 jobs in the area are indirectly related to the smelter operation. Plant closure would therefore have a significant impact on the community.

Arsenic Regulatory Status

Arsenic was designated as a Hazardous Air Pollutant (HAP) under Section 112 of the Clean Air Act (CAA) in 1980. The National Cancer Institute and the National Academy of Sciences classify arsenic as a carcinogen based on a statistically significant link between high occupational arsenic exposures and skin and lung cancer. In addition, inorganic arsenic is well known as an acute poison to humans in high doses.

In response to a suit from the state of New Jersey objecting to arsenic emissions from a New York glass manufacturing plant, a United States District Court in New York directed EPA to propose a national arsenic standard. As part of this effort, EPA was directed to promulgate a separate standard for the ASARCO/Tacoma facility, the only copper smelter to process high-arsenic ore and the largest single source of arsenic emissions in the U.S.

According to the language of the Clean Air Act, standards for hazardous air pollutants such as arsenic must be based on an "ample margin of safety". For carcinogens, however, an "ample margin of safety" appears paradoxical. As we discussed earlier, EPA's approach assumes most carcinogens demonstrate a dose-response relationship at all doses. In other words, any exposure to arsenic may increase the likelihood of cancer, with the risk increasing as exposure increases. To reduce arsenic emissions to a zero level, therefore, would require the closure of all facilities.

EPA therefore has taken the approach of implementing the requirements of the Clean Air Act by controlling emission sources to the level that reflects the Best Available Technology (BAT). The selection of BAT is based on an assessment of the best controls available, considering the economic, energy, and environmental impacts. EPA will then decide if further controls are necessary due to unreasonable residual health risks. This approach has been embraced by William Ruckelshaus, EPA Administrator. However, EPA can impose standards that go beyond BAT if, in the language of the statute, it is necessary to "protect the public health...with an ample margin of safety."

In the case of the ASARCO/Tacoma smelter, the potential impacts of EPA's proposed standard are great.

- Stringent emission requirements would have high compliance costs and could force the plant to close, thereby cutting off a major employer and revenue source for the community.
- With moderate controls, the remaining health risks posed by the smelter are higher than risks associated with other regulated hazardous air pollutants.

For this reason, EPA is trying to gather public input to assist in the determination of whether BAT controls are acceptable, or whether more stringent controls are necessary due to potentially unreasonable residual health risks. EPA has decided to consider the costs of the various alternatives and to assess the health effects and risks to the maximum exposed individual (MEI) and the entire exposed population.

Related Superfund Activities

While EPA has been developing a proposed standard, EPA has also been conducting studies related to arsenic and cadmium concentrations in the soil, sediment, and sand of the area and arsenic in the urine of school children. The Washington Department of Ecology (DOE) and EPA agreed to an investigation of contamination in the area designated as the Commencement Bay Nearshore Tideflats Superfund Site. Parts of Ruston, Tacoma, and Vashon Island, along with the adjacent bay areas, are included in this site designation. Soils in Ruston and Vashon Island are known to contain arsenic and cadmium in amounts great enough to warrant concern about eating vegetables from contaminated soil.

Following the designation of the Commencement Bay Nearshore Tideflats as a Superfund site, the DOE planned investigations to identify sources of arsenic and cadmium contamination. Once the sources and problems are identified, remedial measures will be conducted. One investigative task is clearly related to the ASARCO smelter. The DOE, along with the Tacoma-Pierce County Health Department, is trying to determine the exposure pathways by which arsenic is appearing in the urine of children who live close to the smelter. This investigation will address the possible exposure through inhalation of arsenic in the air due to emissions and re-suspended dust as well as possible exposure through ingestion of contaminated vegetables, drinking water, and soil. Cadmium contamination is also being investigated.

Other Superfund investigations focus on the extent and risk of contamination of aquatic life and sediment in the water. An analysis of seafood is also anticipated as part of this inquiry. EPA is keeping the ASARCO smelter proposed regulations separate from the Superfund activities.

EPA Proposed Arsenic Standard

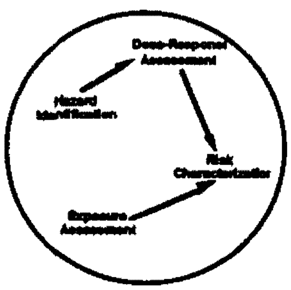
In its proposed rule EPA employed a three-step approach to determine the control requirements being proposed.

1. A determination whether BAT is in place for all emission points
2. Selection of BAT for emission points identified as needing standards
3. Investigation of alternatives

The recommended standard would require Best Available Technology (BAT) on converter fugitive emissions. All other emission sources at ASARCO are believed to be controlled to the level of BAT. The installation of two additional secondary hoods would fulfill the BAT requirements for converter fugitive emissions.

The proposal includes the following language which specifies the Agency's interest in public involvement in the standard setting process:

"As now written, this proposed regulation would leave some of the residents of Tacoma exposed to a relatively high estimated risk of lung cancer when compared to the risk around other sources of arsenic. The Administrator is especially eager to hear comments from the residents of Tacoma on whether this remaining degree of risk is appropriate and how this decision should be made."



EPA Risk Calculations

EPA's calculation of the human health risk of developing lung cancer from arsenic exposure provides the basis for the draft of the proposed standard for the ASARCO/Tacoma facility. The proposed rule focuses only on cancer risks to the population from air emissions of arsenic. Other health risks and ecological risks are not specifically addressed. In part these risks are excluded because EPA is in the process of addressing them through Superfund activities. The ASARCO site was included in the area designated as the Commencement Bay Nearshore/Tideflats Superfund Site in April 1983. Superfund studies and risk assessments are currently underway to examine the risks associated with arsenic and cadmium already present in the soil.

In conducting the risk assessment, EPA evaluates the hazard associated with arsenic, evaluates the health risks resulting from different levels of arsenic as described through dose-response estimates (the unit cancer risk factor), and estimates population exposure levels. EPA then characterizes the risk and the cost of controls, and alternatives to the proposed controls. Each of these steps is discussed in the following sections.

Brief descriptions of the results of some studies based on Tacoma data that provide more information to the risk assessment follow:

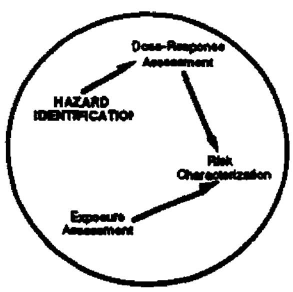
- Enterline and Marsh observed a cohort of 2802 workers at the ASARCO smelter from 1940 to 1964. Their study did not statistically confirm a dose-response relationship for lung cancer, except when all retired workers were included in the data set.

- A 1978 study of lung cancer mortality, conducted by the Fred Hutchinson Cancer Research Center, failed to document excess cancers within the Tacoma population associated with arsenic exposure from the smelter.

- A 1977 cohort study on lung cancer by Pinto et al. reflected a dose-response relationship as shown through urinary arsenic levels. This dose response relationship was also dependent on the duration and intensity of arsenic exposure.

- In the 1970s, the DSHS confirmed the presence of arsenic in the urine and hair of children living near the smelter. The concentration of arsenic declined with distance from residences to the smelter. Samuel Milham, of the DSHS, indicated that although high levels of arsenic existed in the soil and in children's urine and hair, there was no evidence of any adverse health effects associated with the presence of arsenic.

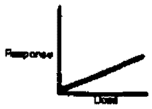
- The Puget Sound Air Pollution Control Agency indicated that the average urinary arsenic levels in Ruston and Vashon (reported at 36 and 23 micrograms/liter, respectively) were significantly higher than a control group in Olympia (with a reported level of 12 micrograms/liter).



Hazard Identification

As we discussed, during the Hazard Identification stage, the assessor wants to determine whether the chemical can, in large doses, result in a specific effect, such as an increase in the risk of cancer. Evidence from occupational exposure data from smelter workers indicates that a direct link exists between high arsenic exposures and lung cancer. The risks were shown to increase with an increase in cumulative arsenic exposures. However, the carcinogenicity of arsenic in humans is not well understood. Some animals appear to have a dietary need for arsenic although this need has not been demonstrated in humans.

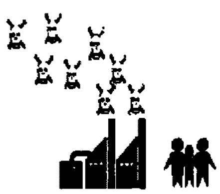
Other noncarcinogenic health effects have also been documented including nerve damage, hemoglobin synthesis impairments, and hearing loss in children.



Dose-Response Evaluation

The dose-response relationship for arsenic was identified using data from the studies of lung cancer incidence in workers exposed to high levels of arsenic. These effects found at the higher occupational exposures are mathematically extrapolated to lower concentration levels. These lower concentrations more nearly reflect the exposure of people around the ASARCO smelter.

Using a linear extrapolation, EPA calculates the expected (modelled) response at doses lower than the occupational levels. This linear extrapolation represents an "upper bound" (e.g. "conservative") estimate of the probability of developing cancer from inhalation at low doses in that the actual risk is unlikely (95% confidence) to exceed the risk estimated using the linear extrapolation.



Exposure Evaluation

Total exposure is determined by dispersion modelling estimates of the arsenic concentration in the ambient air surrounding the smelter combined with data for the distribution of the 370,000 people living within 12 1/2 miles of the smelter.

<u>Emissions:</u> Fugitive source emissions are too difficult to measure and therefore are estimated. The stack emission rate used in the analysis, however, is derived from emission tests.

<u>Dispersion:</u> EPA uses a model to calculate the dispersion of arsenic emissions within a 12 1/2 mile radius of the facility. The complex geography of the area and imprecise meteorologic data make dispersion calculations difficult. Because of these difficulties, and EPA's relatively high calculation of emission rates, the modelled results of ambient concentrations are <u>higher</u> than the actual measurements of arsenic concentrations.

<u>Population Location:</u> Census data estimates of population location within the 12 1/2 mile radius are combined with the modeled ambient concentrations of arsenic to determine the population exposure.

<u>Exposure Duration:</u> The estimated exposure level assumes that individuals are exposed to a constant average concentration of arsenic for 24 hours per day for a lifetime of

70 years. For workers at the smelter, this average concentration exposure represents an underestimate of exposure levels, yet for residents spending time outside of the Tacoma area, this exposure level represents an overestimate. This estimate of exposure is based solely on inhalation of arsenic emitted by the smelter through stack and fugitive emissions.

According to EPA estimates, the proposed standard, requiring the installation of additional secondary hoods, will significantly reduce arsenic emissions. EPA's estimates, however, are significantly different from ASARCO and PSAPCA estimates.

> EPA estimates that fugitive arsenic emissions will be reduced from 134 million grams (Mg) per year to 24 Mg per year. (Total emissions will thereby be reduced from 282 Mg to 172 Mg.)
>
> ASARCO's estimates of emissions, prior to the installation of controls, are much lower (Table 1). ASARCO calculates that total emissions, without secondary hoods, are closer to 53 Mg (59 tons).
>
> PSAPCA calculations indicate that total emissions are 93 Mg before controls.

Ambient monitoring data around the facility provide some additional indication of the concentration of arsenic in the air. These data, however, are limited in quantity and also show major differences.

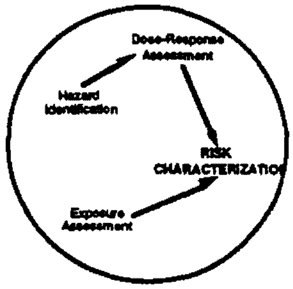
> ASARCO's monitoring stations in Ruston indicate that the concentration of arsenic in the air is approximately 0.2 to 0.9 micrograms per cubic meter. (The OSHA standard for arsenic concentrations is 10 micrograms per liter.)
>
> According to a newspaper account of ASARCO's description of the data, EPA calculates that the level of arsenic in the air near the smelter is approximately 10 to 30 micrograms per cubic meter.

This difference between the ambient data and modelled data may be attributable to the fact that EPA's model uses input based on assumptions about emissions and dispersion, and cannot precisely predict the effects of complex geography and meteorology. In addition, EPA doesn't know the location of ASARCO's monitoring stations, which may be located at more distant points.

Although EPA uses estimates of ambient concentrations ranging up to 30 micrograms per cubic meter, this highest value is used only to calculate the risk to the maximum exposed individual. In EPA's exposure model, concentration levels at which the majority of the population is exposed are less than 0.05 micrograms per cubic meter.

TABLE 1
ANNUAL ARSENIC EMISSION ESTIMATES OF THE ASARCO SMELTER

Current Emissions (million grams)		Emissions After Controls (million grams)	
EPA's Estimate:		EPA's Estimate:	
Stack:	148	Stack:	148
Fugitive:		Fugitive:	
converters	120	converters	10
others	14	others	14
Total:	282	Total	172
ASARCO's Estimate:		ASARCO's Estimate:	
Stack:	37	Not applicable	
Fugitive:		(none made)	
converters	8		
others	8		
Total:	53		
PSAPCA's Estimate:		PSAPCA's Estimate:	
Stack:	64	Not applicable	
Fugitive:		(none made)	
converters	5		
others	24		
Total:	93		



Risk Characterization

Annual cancer incidence associated with arsenic emissions from the ASARCO smelter is the product of the total population exposed around the smelter and the unit risk number, divided by 70 years (total population exposed x unit cancer risk/70 years). Based on EPA's modelling of emissions and resultant exposure estimates, and an estimate for the unit risk factor for arsenic, the health effects at levels proceeding and following installation of controls are calculated.

The maximum lifetime risk represents the probability of a person contracting cancer who has been continuously exposed during a 70 year period to the maximum (30 $\mu g/m^3$) arsenic concentrations from the smelter. The average lifetime population risk represents this probability for an individual who has been continuously exposed to an arsenic concentration of approximately 0.5 $\mu g/m^3$.

	BEFORE BAT	AFTER BAT
Total inorganic arsenic emissions	311 tons/year	189 tons/year
Average lifetime cancer risk*	2 X 10^{-4}	4 X 10^{-5}
Maximum lifetime cancer risk** (for the Maximally Exposed Individual - MEI)	A range of 2.7 - 37 per 100 with a best estimate of 9 per 100	0.58 - 9.2 per 100 with a best estimate of 2 per 100
Lung cancer incidence within 12 1/2 miles of the facility	1.1 - 17.6/year with a best estimate of 4 per year	0.2 - 3.4/year with a best estimate of 1 per year
Annual background lung cancer rate in the Tacoma area is 71 - 94		
*The mean concentration of arsenic in the air is calculated as 0.05 $\mu g/m^3$ **The maximum concentration of arsenic in the air is calculated as 30 $\mu g/m^3$		

UNCERTAINTIES IN RISK CALCULATIONS

The process of calculating these risks for the population around the smelter involves many assumptions and uncertainties. So while these estimates of risk are a useful tool in the decision-making process, MUCH CAUTION SHOULD BE EXERCISED TO AVOID RELYING TOO HEAVILY ON THE NUMBERS PRESENTED ABOVE. These numbers have considerable uncertainty for the following reasons:

1) MODELING ASSUMPTIONS - Measurement of air concentration of arsenic around the ASARCO plant have not been done thoroughly; however, the measurements that have been obtained indicate lower concentrations than those predicted by the dispersion model. Arsenic emissions data from the smelter used in the dispersion model are not precise. In many cases these emission rates were based on assumptions rather than actual emission tests. This is especially true for fugitive emissions which are very important in calculating concentration yet are very difficult to measure. Also, estimates of how these arsenic emissions mix with the ambient air are hard to determine because of the complex geography and lack of specific weather data for the area around the smelter. These problems may explain why the ambient monitoring around the smelter shows lower concentrations of arsenic than EPA's dispersion model predicts.

2) EXPOSURE ASSUMPTIONS - A principal assumption is that all persons living within the 12 mile radius of the smelter will remain in the same location for a 70 year lifetime and are exposed to a constant, average concentration of airborne arsenic. This assumption could result in large overestimates of arsenic exposure for those who spend a lot of time away from their residences and in underestimates for workers employed at the smelter. Additionally, exposure to arsenic from resuspension of arsenic bearing dusts from city streets, empty lots, and playgrounds has not been taken into consideration.

3) UNIT RISK NUMBER - Because arsenic is a carcinogen, it was assumed that a linear relationship exists between exposure and risk. Simply stated, this means that a person who inhales one microgram of arsenic per cubic meter of air is one-tenth as likely to get cancer as a person who inhales ten micrograms per cubic meter. If the relation ship between exposure and risk is not linear, a different unit risk number could result which would in turn change the lung cancer risk estimates made for the population around the smelter. It is unlikely that the actual cancer risks would be higher than those predicted by EPA, but they could be substantially lower.

EPA is now in the process of reviewing the data used in calculating risk estimates, especially those data which relate to arsenic emissions and dispersion modeling. If necessary, new data will be developed in these areas to permit EPA to better estimate risks to the smelter community.

$ $ $ Costs

EPA estimates the economic costs of the secondary hood control measures to be as follows:

- \$3.5 million in capital costs.

- \$1.5 million in annual operating costs based on increased energy use.

These costs are based on economic information provided by ASARCO. Assuming that ASARCO could pass off all of the additional cost to purchasers, these costs would translate into an increase in the price of copper of 0.8%. It is estimated that the proposed standards will not adversely affect the economic viability of the smelter or employment at the smelter.

Alternatives

As noted, EPA can do more than BAT. There are several other alternatives currently being considered by EPA:

- Baghouse controls, (a method of catching particulate matter within the emission control system, before its release from the stack) are considered to be expensive to install and ineffective against fugitive emissions.

- The use of ore with lower arsenic concentrations has also been considered, although this too would be costly for the company. EPA estimates that replacing only 15% of the total feed ore with low-arsenic material would result in a \$2.8 million reduction in net income for the facility.

- Better smelting technology could be more effective but would require a great capital investment by ASARCO.

ASARCO and Community Attitudes

The impacts of an arsenic standard for the ASARCO/Tacoma facility are of concern to many individuals and to the community as a whole. Because of the uncertainty in risk estimates, the economic impacts, and the potential health effects associated with the draft of the proposed standard, there will undoubtedly be a great deal of debate within the community over EPA's actions. As would be expected, there was a wide range of public opinion. This range is reflected in the newspaper articles included in the Appendices.

Among the potential categories into which public opinion might fall are the following:

No additional controls will be needed

A small group of people will probably feel that the facility should continue operations without installing secondary hoods. These people will primarily be employees who feel that they are adequately protected and that no additional controls will be needed.

Proposed BAT will provide adequate controls

A greater number are expected to feel that the proposed BAT controls provide the proper level of control. Included in this majority are ASARCO officials and managers, as well as a number of residents. These people believe that there is no evidence of a health risk associated with the smelter, and any possible health risk is less important than the jobs and economic benefits provided by the smelter. ASARCO employees and some nearby residents have reported in the past that no one they have known, employees or residents, has developed lung cancer. They dispute the existence of a health risk. Many employees have also expressed in the past that they feel that there is a threshold level of safety associated with arsenic exposure below which no adverse effects will be observed.

ASARCO officials have indicated since the time PSAPCA issued its own requirement for secondary hoods, that they are willing to install the proposed hoods once they receive EPA's assurance that this will represent BAT. They want assurances that no additional requirements will be placed on the operation. ASARCO has maintained, however, throughout discussions with PSAPCA, that there is no significant health risk associated with emissions. ASARCO is certain to assert that EPA's emission and exposure estimates are too high and overestimate any health risk.

The mayor of Tacoma has already indicated that the secondary hoods required by PSAPCA seem satisfactory and that closure of the plant should be avoided. "Until I've been shown specifically that there are indeed deaths being created by the emissions out of ASARCO, I don't think the plant should be closed," said the mayor. He called ASARCO a "good corporate neighbor", and indicated that it has not been a source of significant public health risk.

His view is supported by Dr. Samuel Milham, epidemiologist for the DSHS. "Unless you can demonstrate you're causing a public health problem, I think it would be irresponsible to be closing the plant, and we definitely haven't been able to demonstrate that."

Additional technical controls will be necessary

Others in the community believe that EPA should require secondary hoods but should also impose additional technically feasible controls. This opinion has been raised in the past at PSAPCA hearings by a number of local regulatory agencies and environmental groups, including Fair Share, the Tacoma City Council, and Tacomans for a Healthy Environment. Many of these people feel both jobs and health can be protected. PSAPCA supports this position, and has already indicated that it would like EPA to go beyond the secondary hood requirements it has already imposed.

The facility should radically alter or stop operations

Finally, there are individuals who will probably urge EPA to require the ASARCO smelter to use low-arsenic feed ore or stop operation. These people perceive that a significant health risk will always be associated with the smelter, even if control measures are taken. Many of these people feel that the Tacoma area would benefit from the closure of the smelter, perhaps through realizing its goal of becoming a high-tech center, rather than remaining a home to industrial hazards.

Developing a Communication Strategy

You have been placed in charge of developing a communications strategy for the region on the proposed smelter rule. We reviewed earlier the items that constitute an effective plan and they are briefly noted below. Take the next 15 minutes and fill in the following items from what you know in the ASARCO case.

1. Identify your goals for the risk communication.

2. Identify your audiences and their specific concerns. Identify the audience of most and lesser importance.

3. Design your message to meet the concerns of your audiences.

4. Identify the best methods to reach people.

5. Identify the steps necessary for internal coordination.

6. Identify your plan for evaluation of the communication strategy.

7. What would be the major roadblocks to development and implementation of a communication strategy?

??? Discussion Questions

1. What steps might be taken to encourage effective communication with outside audiences and within the Agency?

2. When should you go beyond the communication required by statute?

Role Play - Public Meeting

An informal public meeting sponsored by EPA is being held to discuss EPA's proposed rule. The meeting should be opened by the EPA representatives, who should do some basic planning using the planning framework identified earlier: decide what they hope to accomplish at the meeting; establish a format and agenda; prepare an introductory statement; and so forth. The other participants should prepare their positions and consider how they want to approach the meeting and what they hope to achieve. Note -- there is nothing that prohibits participants from talking to one another to try and workout alliances and strategies prior to the meeting. You will have been given descriptions of different people who may be at the meeting. In the real world special interest groups, whether they be environmentalists or representatives of the industry, are adept at controlling the process, and that should be part of the process here.

In the actual case the EPA held a series of informal public meetings after the proposed rule was published and prior to finalization. The EPA Administrator was willing to revise the rule in response to the public's desires if they could clearly be identified. The participants in this workshop have the opportunity to recreate one of those meetings.

The role play will be conducted in one of two ways. Either each member of the class will receive a role (or roles) or the class may be divided into two groups. In the latter case, each group will prepare to both conduct the meeting (take the role of EPA and the state agencies) and to assume the role of those attending the meeting (general public, local officials, activists, industry, etc.). Each group will be given the opportunity to run the meeting and also to attend it.

You should assume the EPA proposed rule has just been published in the Federal Register and the EPA is holding its first informal public meeting. The date is August 30, 1983. The meeting is scheduled to begin at 2:00.

Good luck ... and have some fun!

APPENDIX A

Proposed Rule

II. INORGANIC ARSENIC EMISSIONS FROM PRIMARY COPPER SMELTERS PROCESSING FEED MATERIALS CONTAINING 0.7 PERCENT OR GREATER ARSENIC

Proposed Standards

The proposed standards would regulate inorganic arsenic emissions from primary copper smelters that process feed material with an annual average inorganic arsenic content of 0.7 weight percent or more. The proposed standards would require the use of best available technology (BAT) to limit secondary inorganic arsenic emissions from copper converting operations. Secondary inorganic arsenic emissions are emissions that escape capture from the primary emission control system. The BAT for the capture of secondary inorganic arsenic emissions from converter charging, blowing, skimming, holding, and pouring operations is a secondary hood system consisting of a fixed enclosure with a horizontal air curtain. For collection of secondary inorganic arsenic emissions, BAT is a baghouse or equivalent control device. The proposed standards are expressed in terms of equipment specifications for the capture system and a maximum allowable particulate emission limit for the collection device. Particulate emissions from the collection device would not be permitted to exceed 11.6 milligrams of particulates per dry standard cubic meter of exhaust gas (mg/dscm). This limit reflects BAT for collection of secondary inorganic arsenic emissions.

To determine the applicability of the proposed standards to a primary copper smelter, the inorganic arsenic content of the feed materials would be measured using the proposed Reference Method 108A. To determine compliance with the proposed particulate emission limit, Reference Methods 1, 2, 3, and 5 in Appendix A of 40 CFR Part 60 would be used. Continuous opacity monitoring of gases exhausted from a particulate control device would be required to ensure the control device is being properly operated and maintained. Continuous monitoring of airflow would be required to ensure the secondary hood system is being properly operated and maintained.

Summary of Health, Environmental, Energy, and Economic Impacts

The proposed standards would affect primary copper smelters that process feed material having an annual average inorganic arsenic content of 0.7 weight percent or more. This category is defined as high-arsenic-throughput smelters. The only existing primary copper smelter in the high-arsenic-throughput smelter category is owned and operated by ASARCO, Incorporated (ASARCO) and located in Tacoma, Washington. The annual average inorganic arsenic content of the feed material is not expected to be increased to 0.7 percent or above at any other existing smelter, and no new smelters are projected to be built. For this reason only the ASARCO smelter located in Tacoma, Washington (hereafter referred to as the ASARCO-Tacoma smelter), has been analyzed for the purpose of calculating the health, environmental, economic, and energy impacts of the proposed standards.

As will be discussed in the next section, to facilitate regulatory analysis EPA has separated the primary copper smelting industry into two source categories based on the annual average inorganic arsenic content of the smelter feed material. Primary copper smelters which process feed material with an annual average inorganic arsenic content less than 0.7 weight percent are addressed in Part III of this preamble.

The proposed standards would reduce total inorganic arsenic emissions from the ASARCO-Tacoma smelter from the current level of 282 megagrams (Mg) (311 tons) per year to a level of 172 Mg (189 tons) per year. As a result of this reduction in inorganic arsenic emissions, it is estimated that the number of incidences of lung cancer due to inorganic arsenic exposure for the approximately 370,000 people living within about 20 kilometers (12.5 miles) of the ASARCO-Tacoma smelter would be reduced from a range of 1.1 to 17.6 incidences per year to a range of 0.2 to 3.4 incidences per year. The proposed standards would reduce the estimated maximum lifetime risk from exposure to airborne inorganic arsenic from a range of 2.3 to 37 in 100 to a range of 0.58 to 9.2 in 100. The maximum lifetime risk represents the probability of a person contracting cancer who has been exposed continuously during a 70-year period to the maximum annual inorganic arsenic concentration due to inorganic arsenic emissions from the ASARCO-Tacoma smelter. (These estimated health impacts were calculated based on a number of assumptions and contain considerable uncertainty as discussed in Part I of this preamble and in Appendix E of the background information document.)

Application of the controls required by the proposed standards would increase the amount of solid waste (i.e., collected particulate matter containing inorganic arsenic) entering the ASARCO-Tacoma smelter waste disposal system by approximately 11 gigagrams (Gg) (12,000 tons) per year. Currently, the ASARCO-Tacoma smelter generates approximately 182 Gg (200,000 tons) per year of solid waste (including slag). The additional amount of solid waste generated can be handled by the existing waste handling system at the smelter. Because the control systems expected to be used to achieve the proposed standards are dry systems, there would be no water pollution impact.

Energy impacts under the proposed standards would be increased electrical power consumption. The annual energy requirement for the ASARCO-Tacoma smelter is approximately 2.9×10^8 kilowatt-hours per year (kWh/y). Additional energy requirements at the ASARCO-Tacoma smelter due to the proposed standards are estimated to be approximately 1.5×10^7 kWh/y, representing an increase in the annual

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[AH-FRL 2378-2]

National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Inorganic Arsenic

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule and announcement of public hearing.

SUMMARY: On June 5, 1980, EPA listed inorganic arsenic as a hazardous air pollutant under Section 112 of the Clean Air Act. Pursuant to Section 112, EPA is proposing standards for the following categories of sources of emissions of inorganic arsenic: high-arsenic primary copper smelters, low-arsenic primary copper smelters, and glass manufacturing plants. EPA identified other categories of sources emitting inorganic arsenic; and, after careful study, determined that the proposal of standards for these categories of sources is not warranted at this time. These categories of sources are primary lead smelters, secondary lead smelters, primary zinc smelters, zinc oxide plants, cotton gins, and arsenic chemical manufacturing plants.

DATES: See "SUPPLEMENTARY INFORMATION" below.

ADDRESSES: See "SUPPLEMENTARY INFORMATION" below.

FOR FURTHER INFORMATION CONTACT: See "SUPPLEMENTARY INFORMATION" below.

SUPPLEMENTARY INFORMATION:

Public Hearings and Related Information

Dates

Comments. Comments must be received on or before September 30, 1983.

Public Hearing. Two public hearings will be held. The first hearing will be held in Washington, D.C., on August 23, 24, and 25, 1983, beginning at 9:00 a.m. each day. This hearing will consist of two separates sessions. The first session will be for the purpose of receiving comments on the listing of arsenic as a harzadous pollutant. The second session will be for the purpose of receiving comments on the content of the proposed regulations. The order of items on the agenda of the second session will be: (1) high-arsenic coppers smelters, (2) low-arsinic copper smelters, (3) glass manufacturing plants, and (4) others. Persons planning to attend the first hearing may call mrs. Naomi Durkee (919) 541-5578 after August 18, 1983, to obtain an estimated time and date at which each subject will be addressed.

The second hearing will be held in Tacoma, Washington, on August 30, 1983. This hearing will be for the purpose of receiving comments on the proposed standards for high-arsenic copper smelters. This hearing will be held fromm 12:00 noon to 10:00 p.m. and may be continued on August 31, 1983, if necessary to allow all persons wishing to speak an opportunity to do so.

Request to Speak at Hearing. Persons wishing to present oral testimony at the first hearing must notify Mrs. Naomi Durkee by August 15, 1983, at telephone number (919) 541-5578 or mailing address: Standards Development Branch, MD-13, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711.

Persons wishing to present oral testimony at the second hearing must notify Ms. Laurie Kral by August 23, 1983, at telephone number (206) 442-1089 or mailing address: Air Programs Branch, U.S. Environmental Protection Agency, Region X, 1200 6th Avenue, Seattle, Washington, 98101.

Addresses

Comments. Comments should be submitted (in duplicate if possible) to: Central Docket Section (LE-131), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460. Specify the following Docket Numbers:

OAQPS-79-8 Listing of arsenic as a hazardous pollutant
A-80-40 High-arsenic and low-arsenic copper smelters
A-83-8 Glass manufacturing plants
A-83-9 Secondary lead
A-83-10 Cotton gins
A-83-11 Zinc oxide plants
A-83-23 Primary zinc, primary lead, arsenic chemical manufacturing

Public Hearing. The public hearing to be held on August 23, 24 and 25, 1983, will be held at the Department of Agriculture, Thomas Jefferson Auditorium, South Building, 14th and Independence Ave., SW., Washington, D.C.

The public hearing to be held on August 30, 1983, will be held at the Tacoma Bicentennial Pavilion, Rotunda Room, 1313 Market Street, Tacoma, Washington.

Background Information Document. Background information documents (BID's) for the proposed standards may be obtained from the U.S. Environmental Protection Agency library (MD-35), Research Triangle Park, North Carolina 27711, telephone 919-541-2777. Please specify:

EPA 450/3-83-009a Inorganic Arsenic Emissions From High-Arsenic Primary Copper Smelters—Background Information for Proposed Standa[rds]

EPA 450/3-83-010a Inorganic A[rsenic] Emissions From Low-Arsenic Pri[mary] Copper Smelters—Backg[round] Information for Proposed [Standards]

EPA 450/3-83-011a Ino[rganic] A[rsenic] Emissions From Glass Manufactu[ring] Plants—Background Information [for] Proposed Standards.

EPA 450/5-82-005 Preliminary [Study] of Sources of Inorganic Arsenic.

Dockets. Dockets containing supporting information used in developing the proposed standar[ds are] available for public inspection a[nd] copying between 8:00 a.m. and 4:[00 p.m.] Monday through Friday, at EPA'[s] Central Docket Section, West To[wer] Lobby, Gallery 1, Waterside Ma[ll, 401 M] Street, SW., Washington, D.C. 2[0460. A] reasonable fee may be charged [for] copying. The following dockets [are] available:

OAQPS-79-8 Listing of arsenic as hazardous pollutant
A-80-40 High-arsenic and low-ars[enic] copper smelters
A-83-8 Glass manufacturing plant[s]
A-83-9 Secondary lead
A-83-10 Cotton gins
A-83-11 Zinc oxide plants
A-83-23 Primary zinc, primary le[ad, arsenic] chemical manufacturing

The docket A-80-40, w[hich contains] the supporting informati[on for the] proposed standards for [high-arsenic and] low-arsenic copper smelters, w[ill also be] available for inspection and co[pying at] the EPA Region X office in Sea[ttle,] Washington. Persons wishing t[o inspect] this docket should contact Ms. [Laurie] Kral at telephone number (206) [442-1089] or at mailing address: Air Prog[rams] Branch, U.S. Environmental Pr[otection] Agency, Region X, 1200 6th Av[enue,] Seattle, Washington, 98101.

smelter energy consumption of about 0.5 percent.

For the ASARCO-Tacoma smelter, capital and annualized costs required to meet the proposed standards would be approximately $3.5 million and $1.5 million, respectively. The primary economic impacts associated with the proposed standards are projected decreases in profitability for the ASARCO-Tacoma smelter. It is anticipated that the proposed standards will not adversely affect the economic viability of the smelter or employment at the smelter. In addition, it is estimated that the proposed standards could result in an increase in the price of copper of up to 0.8 percent.

Rationale

Selection of Source Category

Copper smelting involves the processing of copper-bearing ores containing varying concentrations of inorganic arsenic. EPA estimates that current controlled emissions of inorganic arsenic from primary copper smelters are 1,012 megagrams (Mg) (1,116 tons) per year.

Several studies have assessed health problems in communities where primary copper smelters are located. Increased lung cancer has been reported among male and female residents living near a primary copper smelter located in Anaconda, Montana (this smelter was permanently closed in 1981). The National Cancer Institute has released a study showing excess mortality from respiratory cancer in counties where primary copper smelters are located.(14)

EPA initiated a study in 1977 of the populations exposed to various ambient air concentrations of inorganic arsenic. This study, in summarizing 1974 data collected by EPA's National Air Sampling Network (NASN), shows that the annual average concentration of inorganic arsenic for five urban areas within 80 kilometers of selected smelters was 10 times greater than the annual average for all of the sites (in excess of 250) in the nationwide network. At a site within 16 kilometers of the ASARCO-Tacoma smelter, the annual average was more than 25 times the national average.

Based on information provided by the copper smelting industry, EPA has determined that the ASARCO-Tacoma smelter processes feed containing a higher concentration of inorganic arsenic than any other primary copper smelter in the United States. The ASARCO-Tacoma smelter is a custom smelter. ASARCO purchases ore concentrates from other mining and milling producers to process at its Tacoma smelter. Typically, feed material containing on the average 4.0 weight percent inorganic arsenic is processed at the ASARCO-Tacoma smelter at the rate of 940 kilograms of inorganic arsenic per hour (kg/h). The level of inorganic arsenic concentration in the feed materials processed at the ASARCO-Tacoma smelter is an order of magnitude greater than the level processed at the other 14 primary copper smelters. The second highest average inorganic arsenic content in the feed material processed at a domestic smelter is 0.6 weight percent. The second highest average process rate of inorganic arsenic at a domestic smelter is approximately 170 kg/h. In fact, the inorganic arsenic process rate for the ASARCO-Tacoma smelter is significantly greater than the combined inorganic arsenic process rate of 625 kg/h for the other 14 smelters.

Because of the potential for high inorganic arsenic emissions and the proximity of the population, calculated risks and cancer incidence are substantially higher for the ASARCO-Tacoma smelter than for other smelters. Consequently, the benefits associated with the application of specific control technologies to the ASARCO-Tacoma smelter versus the other smelters are significantly different when considered in terms of emission and risk reduction, costs, energy, and other impacts. For this reason, EPA believes it is reasonable for purposes of regulation to separate smelters into two source categories based on the annual average inorganic arsenic concentration in the feed.

The source category for high-arsenic-throughput smelters is primary copper smelters processing feed with an annual average inorganic arsenic content of 0.7 percent or more. The value 0.7 percent was selected based on the consideration of the inorganic arsenic content of the feed materials processed at the existing smelters other than the ASARCO-Tacoma smelter. The regulatory analysis of the 14 existing smelters which process feed material with an annual average inorganic arsenic content less than 0.7 weight percent is presented in Part III of this preamble.

EPA has, as a matter of prudent health policy, taken the position that human carcinogens must be treated as posing some risk of cancer at any non-zone level of exposure. Therefore, in conjunction with the Administrator's determination that (1) there is a high probability that inorganic arsenic is carcinogenic to humans, and (2) that there is significant public exposure to inorganic arsenic emissions from the ASARCO-Tacoma smelter, the Administrator has determined that inorganic arsenic emissions from hi[gh-]arsenic-throughput smelters are significant and should be regulated.

In making the decision to regulate high-arsenic-throughput smelters, th[e] Administrator considered whether o[ther] regulations affecting high-arsenic-throughput smelters were adequate [to] control atmospheric inorganic arsen[ic] emissions. The Administrator has concluded that existing regulations [are] not adequate to protect the public h[ealth] and welfare from sources of inorgan[ic] arsenic emissions at high-arsenic-throughput smelters with an ample margin of safety. Based on an analy[sis] of the costs and impacts of more stringent alternatives, it is the Administrator's judgment that a substantial reduction in inorganic arsenic emissions to the atmosphere from the current level is achievable [and] appropriate. Therefore, EPA has dec[ided] to proceed with the development of standards to control inorganic arsen[ic] emissions from high-arsenic-through[put] smelters under Section 112 of the Cl[ean] Air Act.

EPA expects that only the ASARC[O-]Tacoma smelter would be in the hig[h-]arsenic-throughput smelter source category. Should any other existing smelter process feed materials havi[ng] an annual average inorganic arsenic feed content above 0.7 weight perce[nt,] the smelter would become subject to [the] proposed standards. In addition, the proposed standards would also appl[y to] any new smelter processing feed materials with an annual average inorganic arsenic concentration of 0.[7] weight percent or more.

Other than the ASARCO-Tacoma smelter, no existing smelter is expec[ted] to process feed materials having an annual average inorganic arsenic fe[ed] content above 0.7 weight percent wi[thin] the next 5 years. Also, it is projected that no new domestic primary coppe[r] smelters will be built within the nex[t 5] years. This projection is based on E[PA's] conclusion that annual industry gro[wth] will be accommodated by existing smelters, which are presently not operating or are operating below capacity.

Description of Smelting Process and Emission Points

A primary copper smelter is a fac[ility] that produces copper from copper sulfide ore concentrates using pyrometallurgical techniques. These techniques are based on copper's st[rong] affinity for sulfur and its weak affin[ity] for oxygen as compared to that of ir[on] and other base metals in the ore. Th purpose of smelting is to separate the copper from the iron, sulfur, and other impurities present in the ore concentrate.

Primary copper smelting involves three basic steps. First, the copper sulfide ore concentrates are heated in a roaster to remove a portion of the sulfur contained in the concentrate. The solid material produced by a roaster is called "calcine." The calcine is loaded into small rail cars (called "larry cars"). This operation is called "calcine discharging."

The larry cars transfer the calcine to a smelting furnace. At most smelters, raw copper sulfide ore concentrate is charged directly to the smelting furnace. In the smelting furnace, the calcine or raw, unroasted ore concentrate is heated to form a molten bath containing separate layers of matte (an impure mixture of copper and iron sulfide) and slag (a mixture of nonmetallic impurities). Molten slag is skimmed from the upper layer of the bath and poured from openings in the furnace walls (called "ports") into inclined troughs (called "launders"), which empty the slag into a vessel mounted on a small rail car (called a "slag pot"). This operation is called "slag tapping." Molten matte is poured from a second set of furnace ports into launders, which empty the matte into ladles. This operation is called "matte tapping."

The ladle is transported by an overhead crane to a copper converter. The molten matte is poured from the ladle into a large opening on the top of the converter vessel. Air is blown into ... converter to first oxidize the iron sulfide in the matte. The resulting iron silicate slag is poured directly from the converter mouth into a ladle. When all of the iron is oxidized and removed, the remaining copper sulfide is oxidized to form a high-purity copper product (called "blister copper"). The blister copper is poured directly from the converter into a ladle for transfer to an anode furnace (for further refining of the copper) or directly to the anode casting area (for casting of the copper into copper anodes).

Roaster and smelting furnace offgases are produced by the combustion of fuel and the reaction of materials in the high-temperature environments. Converter offgases result from blowing air through the matte and the reaction of materials in the molten matte. Inorganic arsenic in the ore concentrates is volatized during roasting, smelting, and converting, and is exhausted from the process equipment in the offgases. Offgases discharged from roasters, smelting furnaces, and converters, in the absence of any controls, would have the highest inorganic arsenic emissions of any of the copper smelting sources at the ASARCO-Tacoma smelter. An inorganic arsenic material balance was provided by ASARCO and reviewed by EPA to inventory the inorganic arsenic inputs versus outputs from each process at the ASARCO-Tacoma smelter. The material balance shows that the inorganic arsenic emission rates in the absence of any controls would be 255 kg/h for the roasters, 608 kg/h for the smelting furnace, and 207 kg/h for the converters.

During converting, most of the remaining amount of inorganic arsenic and other impurities originally in the copper ore are removed from the copper matte to produce blister copper (98 to 99 percent pure copper). Blister copper from the converters may be further refined in anode furnaces prior to casting of copper anodes (solid slabs of blister copper). Because of the small quantity of inorganic arsenic remaining in the blister copper charged to the anode furnace, inorganic arsenic emissions from anode furnaces are very low when compared to the inorganic arsenic emissions from roasters, smelting furnaces, or converters. The material balance for teh ASARCO-Tacoma smelter shows that inorganic arsenic emissions from anode furnaces in the absence of any controls would be 0.4 kg/h.

The ASARCO-Tacoma smelter is the only primary copper smelter that recovers arsenic from collected waste materials. Dust collected in the flues and control devices at the smelter is processed to produce arsenic trioxide for sale to arsenic chemical manufacturing companies. In addition, metallic arsenic is produced at the smelter site. The material balance shows that inorganic arsenic emissions from the arsenic trioxide and metallic arsenic manufacturing processes in the absence of any controls would be 378 kg/h.

Secondary inorganic arsenic emissions from converters are those emissions that escape capture from the primary emission control system. When the converter is rolled out for chargin~ matte into the converter mouth, skimming slag formed in the converter, or pouring blister copper into a ladle, the primary hood is moved up and away from the converter mouth to provide clearance for the overhead crane and ladle. As a result, charging, skimming, and pouring operations can emit significant amounts of secondary inorganic arsenic because these operations occur outside the range of the converter's primary offgas exhaust hood. Additional secondary inorganic arsenic emissions also escape capture by the primary offgas exhaust hood during blowing and holding operation For the ASARCO-Tacoma smelter, th material balance shows that the secondary inorganic arsenic emission rate from converter operation absence of any controls woul h.

Secondary inorganic arsenic emissions also escape to the atmosph during calcine discharging at the roa and during matte tapping and slag tapping at the smelting furnace. An estimate based on the material balan for the ASARCO-Tacoma smelter sh that inorganic arsenic emissions fron matte tapping in the absence of any controls would be 4 kg/h. Inorganic arsenic emissions from calcine discharging and slag tapping are estimated to be less than 1 kg/h. Secondary inorganic arsenic emissic from anode furnace operations are l than 0.1 kg/h. Miscellaneous source secondary inorganic emissions from primary copper smelter operations include the handling and transfer of from control device storage hoppers equipment flues, and dust chambers the ASARCO-Tacoma smelter these activities are conducted at many locations throughout the plant. Alth the amount of inorganic arsenic emissions at each location is very s the cumulative total of emissions fr many locations can be a sign quantity. The material bala ASARCO-Tacoma smelter s secondary inorganic arsenic e si from miscellaneous sources would about 6 kg/h in the absense of any controls.

Policy for Determining Control Lev

For this source category, which consists of only the ASARCO-Tac smelter, a three-step approach has followed to determine the control requirements being proposed. This approach is based on the policy discussed in Part I of this preambl

The first step consists of determ whether current controls at the ASARCO-Tacoma smelter reflect application of BAT. BAT is the technology which, in the judgment EPA, is the most advanced level o control which is adequately demonstrated considering environmental, energy, and econo impacts. BAT considers economic feasibility; and, for this smelter, E does not exceed the most advanc level of control that the smelter c afford without closing.

For those emission points wher is in place, EPA determines w et NESHAP standard is need that BAT will remain in place and will be properly operated and maintained. A primary consideration is the existence of other Federally enforceable standards. If BAT is not in place on specific emission points or if there is reason to expect that BAT may not remain in operation, these emission points are identified for development of standards.

The second step involves the selection of BAT for the emission points at the ASARCO-Tacoma smelter identified for the development of standards. To select BAT, regulatory alternatives are defined based on demonstrated control technology. The environmental, economic, and energy impacts of the alternatives are determined. Based on an assessment of these impacts, one of the alternatives is selected as BAT.

The third step involves consideration of regulatory alternatives beyond BAT for all of the inorganic arsenic emission points at the ASARCO-Tacoma smelter. The risk of cancer incidence due to inorganic arsenic exposure in the population distributed around the ASARCO-Tacoma smelter is estimated. This estimated risk which remains after application of BAT is evaluated considering costs, economic impacts, risk reduction, and other impacts that would result if a more stringent alternative were selected. If the residual risk is judged not to be unreasonable considering the other impacts or beyond BAT controls, more stringent controls than BAT are not required. However, if the residual risk is judged to be unreasonable, then an alternative more stringent than BAT would be required.

Determination of the Adequacy of Current Controls

Inorganic arsenic emission sources at the ASARCO-Tacoma smelter are currently controlled using a variety of capture and collection techniques. Capture techniques are used to gather and confine secondary inorganic arsenic emissions and to transport them to a collection device. Collection techniques are used to remove inorganic arsenic from process offgases and captured gases prior to venting the gases to the atmosphere. Each inorganic arsenic emission source at the ASARCO-Tacoma smelter was examined by EPA to determine the extent to which inorganic arsenic emissions are currently controlled and whether the level of control represents BAT.

Controls currently in place at the ASARCO-Tacoma smelter collect inorganic arsenic emissions in the roaster, smelting furnace, converter, and anode furnace process offgases. During these process operations, inorganic arsenic is volatilized and emitted as a metallic oxide vapor in the process offgases. By cooling the process offgases, the inorganic arsenic vapor condenses to form inorganic arsenic particulates, which can be collected in a conventional particulate control device. Because of the high-inorganic-arsenic content of the feed materials process at the ASARCO-Tacoma smelter, the concentration of inorganic arsenic in the process offgases greatly exceeds the inorganic arsenic saturation concentration at gas temperatures less than 121° C (250°F). Consequently, for process offgases cooled to temperatures below 121° C, inorganic arsenic emission control levels can be achieved that approach the performamce capability of a control device for collecting total particulate matter.

Roaster process offgases at the ASARCO-Tacoma smelter are cooled to a temperature less than 121° C and the inorganic arsenic particulates are collected in a baghouse. The smelting furnace process offgases are cooled to a temperature of 92° C, and the inorganic arsenic particulates are collected in an electrostatic precipitator. Converter process offgases are exhausted to a liquid SO_2 plant or a single-contact sulfuric acid plant. Because the presence of solid and gaseous contaminants can cause serious difficulties in the operation of the SO_2 or acid plants, the converter process offgases are first cleaned by passing the gases through a water spray chamber, an electrostatic precipitator, scrubbers, and mist precipitators. This gas cleaning process removes over 99 percent of the contaminants, including inorganic arsenic, from the offgases prior to entering the SO_2 or acid plants. In the event that the volume of converter process offgases exceeds the capacity of the SO_2 and acid plants or when the plants are not operating, the excess converter offgases are diverted to an electrostatic precipitator. This electrostatic precipitator also serves as the full-time control device for the anode furnace process offgases. Cooling of the gases in the ducting lowers the gas temperature to less than 120° C prior to entering the electrostatic precipitator.

Controls for inorganic arsenic emissions from roaster, smelting furnace, converter, and anode furance process offgases are in place at the ASARCO-Tacoma smelter in order to comply with existing total particulate emission regulations of the Puget Sound Air Pollution Control Agency (PSAPCA). These regulations are expressed in terms of very stringent process weight particulate emission limits. The PSAPCA regulations are included as part of the Washington State implementation plan (SIP) for attaining the Federal ambient air quality standard for particulate matter and, therefore, are Federally enforceable regulations.

Roaster, smelting furnace, converter, and anode furnace process offgases are potentially significant sources of inorganic arsenic emissions. Because of the high inorganic arsenic vapor concentrations in the process offgases at a high-arsenic-throughput smelter, cooling of the offgases to below 121° C results in condensation of the vapor to form particulates. Thus, collection of the inorganic arsenic particulates in properly designed and operated particulate control devices can effectively control the emission to the atmosphere of inorganic arsenic in the process offgases. The types of control systems currently used at the ASARCO-Tacoma smelter to collect inorganic arsenic from process offgases achieve inorganic arsenic collection efficiencies greater than 98 percent.

The control systems in place at the ASARCO-Tacoma smelter to control roaster, smelting furnace, converter, and anode furnace process offgas inorganic arsenic emissions represent the best demonstrated level of control considering economic feasibility. Therefore, the roaster, smelting furnace, converter, and anode furnace process offgases are already controlled using BAT. Existing Federally enforceable regulations require the controls to remain in place and to be properly operated and maintained to reduce total particulate matter emissions. These regulations serve to assure that BAT for inorganic arsenic will remain in place. Therefore, additional standards based on BAT are not necessary at this time for smelter roaster, smelting furnace, converter, or anode furnace process offgases.

Existing controls in place at the ASARCO-Tacoma smelter significantly reduce the quantity of inorganic arsenic emissions from the arsenic trioxide and metallic arsenic manufacturing processes. Arsenic laden offgases from the Godfrey roasters pass through the arsenic kitchens where arsenic trioxide condenses on the walls of the chambers and is collected as a product. Gases passing through the kitchens are vented to a baghouse. The temperature of the gases at the inlet to the baghouse is less than 121° C. Offgases from the metallic arsenic furnaces are also vented to the same baghouse. Inorganic arsenic emission points at conveyors, charge hoppers, storage bunkers, and the barreling and carloading stations are controlled by capturing the emissions using local hoods and venting the emissions to several small baghouses. These controls are in place at the ASARCO-Tacoma smelter to comply with PSAPCA arsenic and particulate regulations and with the U.S. Occupational Safety and Health Administration (OSHA) inorganic arsenic worker exposure standard.

The composition of the total particulate matter emissions from the arsenic manufacturing processes at the ASARCO-Tacoma smelter is inorganic arsenic particulates. All inorganic arsenic emission points are controlled by collecting the particulate emissions using baghouses. The major process offgas streams are combined and vented to a new baghouse installed in 1982. The baghouse design represents the most advanced level of particulate matter collection technology demonstrated to date. Additional reduction inorganic arsenic emissions is not possible using available control technology. Therefore, EPA considers the controls at the ASARCO-Tacoma smelter arsenic manufacturing plant to be BAT. Since these controls are required by Federally enforceable regulations, EPA is not developing additional BAT standards for arsenic manufacturing processes at this time.

The major source of secondary arsenic emissions at the ASARCO-Tacoma smelter is the converter operations. ASARCO has recently installed a prototype control system on one of the three converters used at the smelter for copper converting operations. (A fourth converter is used as a holding furnace only.) A secondary hood system consisting of a fixed enclosure with a horizontal air curtain is used to capture the secondary inorganic arsenic emissions. The captured emissions are vented to an electrostatic precipitator (designated by ASARCO as the No. 2 ESP). The company is planning to install similar secondary hood systems on the other two converters and to vent the captured emissions to the No. 2 ESP. However, regulations do not exist that would specifically require the use of BAT to limit secondary inorganic arsenic emissions from converter operations. Because of the potential for converter operations to emit large quantities of secondary inorganic arsenic, and because of the demonstrated availability of controls for these emissions EPA decided to develop standards based, as a minimum, on BAT for secondary inorganic arsenic emissions from converter operations.

Smelting furnace secondary inorganic arsenic emissions from matte tapping and slag tapping are captured and collected at the ASARCO-Tacoma smelter. Copper matte or slag flows from ports in the furnace walls through a launder which directs the molten material to a point where it is transferred to a ladle or slag pot. At the ASARCO-Tacoma smelter, the matte tapping launders are enclosed by semicircular covers. Slag tapping launders are covered by fixed hoods mounted above the troughs. Local exhaust hoods are mounted about 1 meter (3 feet) above each tap port. At each launder-to-ladle transfer point for matte tapping, a retractable exhaust hood is used to capture emissions generated at the ladle. An overhead crane places the ladle on the floor in front of the launder. The hood is then lowered over the ladle prior to tapping and is raised after the tap is complete. The overhead crane returns and picks up the ladle of molten matte for transfer to the converters. At each launder-to-slag pot transfer point for slag tapping, large fixed exhaust hoods are mounted above the slag pot transfer point. The captured secondary emissions from matte tapping and slag tapping are vented to the No. 2 ESP.

At the ASARCO-Tacoma smelter, all emission points from smelting furnace matte tapping or slag tapping are enclosed or are covered by local exhaust hoods. In EPA's judgment, this capture system, if properly operated and maintained, represents BAT for capture of secondary emissions from smelting furnace matte tapping and slag tapping because no other demonstrated technology can achieve a higher level of capture efficiency. The capture system is in place to fulfill a tripartite agreement between ASARCO, OSHA, and the United Steelworkers of America (union representing workers at the ASARCO-Tacoma smelter). The agreement specifies the engineering controls and work practices to be implemented at the ASARCO-Tacoma smelter for achieving compliance with the Federal OSHA inorganic arsenic worker exposure standard and, therefore, is Federally enforceable. Although not specified in the agreement, the captured secondary inorganic arsenic emissions are vented to an electrostatic precipitator for collection. The level of performance of this control device is equivalent to the level of performance of BAT for collection of process inorganic arsenic emissions. EPA has no reason to believe that ASARCO will not continue to properly operate and maintain the electrostatic precipitator; therefore, EPA concluded that BAT is in place at the ASARCO-Tacoma smelter for capture and collection of secondary inorganic arsenic emissions from smelting furnac[e] matte tapping and slag tapping.

Roaster secondary inorganic arsenic emissions from calcine discharge are also captured and collected at th[e] ASARCO-Tacoma smelter. Cal[cine is] gravity loaded into larry cars f[rom] hoppers located at the bottom o[f each] roaster. An exhaust hood is mounted o[n] either side of each hopper. A spring-loaded top having three small openings covers each larry car. When the larry car is positioned under the hopper, the openings in the car top align with the hopper outlet and the two exhaust hoods. Because the top is spring-loaded a tight connection is achieved between the top and the hopper outlet and hood. During loading, an induced draft fan is activated to ventilate the space under the car top and to capture the emission generated by the loading operation. Th[e] captured secondary emissions are combined with the roaster offgases pri[or] to venting to the baghouse. In addition to the local hoods located at the calcin[e] discharge point, the calcine hopper ar[ea] is enclosed to form a tunnel-like structure. This area is ventilated with the exhaust air being combined with t[he] exhaust air from the local exhaust hoods.

The capture system used at the ASARCO-Tacoma smelter for capturi[ng] secondary inorganic arsenic emis[si]on[s] from roaster calcine discharge [represents the] most advanced technology demonstrated. In EPA's judgme[nt, this] system represents BAT. Similar to the controls in place at the ASARCO-Tacoma smelter for smelting furnace matte tapping and slag tapping, the calcine discharge capture system is ir[n] place to fulfill the tripartite agreemen[t to] achieve the OSHA inorganic arsenic worker exposure standard. The captu[red] secondary inorganic arsenic emission[s] are vented to the baghouse which ha[s] been determined to be BAT for collection of inorganic arsenic emissi[ons] from the roaster process offgases. Therefore, BAT is in place at the ASARCO-Tacoma smelter for captur[e] and collection of secondary inorgani[c] emissions from roaster calcine discharge.

To control secondary inorganic arsenic emissions from the handling [and] transfer of flue dust, the ASARCO-Tacoma smelter has implemented th[e] best control practices available. All [...] conveyor systems are enclosed in du[st-] tight housings. Hopper and storage b[ins] are equipped with dust level indicat[ors]. Dust-tight connections are used to transfer material from hopers and bi[ns] to vehicles. This equipment is [...] fulfill the tripartite agreement the OSHA worker exposure standard. Because BAT is already required in order to comply with existing Federal regulations, additional standards based on BAT are not necessary at this time for miscellaneous sources of secondary inorganic arsenic emissions at high-arsenic-throughput smelters.

The anode furnances in operation at the ASARCO-Tacoma smelter are of an atypical design that is not used at anyother primary copper smelter located in the United States. Secondary inorganic arsenic emissions (perhaps up to 0.1 kg/h) escape to the atmosphere from a large opening in the anode furnace wall. This opening allows the furnance operators to perform activities necessary for refining the blister copper. Secondary inorganic arsenic emissions from the anode furnace could conceivably be captured using an elaborate secondary hood system. However, the effectiveness of such a theoretical capture system is uncertain considering the design of the anode furnaces and the nature of operations required to operate the furnaces. EPA believes that any capture system designed to provide the necessary access to the anode furnaces would impose very high costs. Based on the small reduction in total smelter inorganic arsenic emissions that would be expected to result from controlling anode furnace secondary emissions, it is EPA's judgment that the costs for installing controls to capture the anode furnace secondary inorganic arsenic emissions are excessive. Therefore, EPA has determined that the existing equipment represents BAT and, as a result, no standards are being developed at this time for secondary inorganic arsenic emissions from anode furnaces.

In summary, roaster, smelting furnace, and converter process offgases as well as anode furnace, arsenic plant, and flue dust handling sources are judged to be currently controlled using BAT. Also, secondary inorganic emissions from roaster calcine discharge, and smelting furnace matte tapping and slag tapping are captured and collected using BAT. These controls are required by existing Federally enforceable regulations or are expected by EPA to remain in place and to be properly operated and maintained. With the exception of the prototype secondary hood on one converter, no controls are currently in place to limit secondary emissions from the converters. Therefore, because capture technology has been demonstrated, EPA decided to develop standards based, as a minumum, on BAT for secondary emissions from converters.

Selection of BAT for Converters

Control Technology. Primary converter hoods capture process emissions during converter blowing periods; but, during charging, skimming, holding, or pouring operations, the mouth of the converter is no longer under the primary hood, and converter emissions escape capture by the hood. There are three alternative control methods for capturing secondary emissions from converter operations: (1) fixed and retractable secondary hoods, (2) air curtain secondary hoods, and (3) building evacuation.

Four domestic smelters currently use fixed secondary hoods to capture converter secondary emissions. These hoods are attached to the upper front side of the converter primary hoods. More complex retractable secondary hood designs are used at one domestic smelter and smelters in Japan. Visual observations made at two domestic copper smelters showed that fixed and retractable secondary hoods captured a portion of the secondary emissions from converter operations. However, the capture efficiencies of existing fixed and retractable secondary hood designs are judged by EPA to be less than 90 percent.

A more advanced method for the capture of converter secondary emissions is the use of an air curtain secondary hood. Walls are erected to enclose the sides and the back of the area around the converter mouth. A portion of the enclosure back wall is formed by the primary hood. Openings at the top and in the front of the encloeure allow for movement of the overhead crane cables and block, and the ladle. Edges of the walls in contact with the primary hood or the converter vessel are sealed. A broad, horizontal airstream blows across the entire width of the open space at the top of the enclosure. This airstream is called an "air curtain." The air curtain is produced by blowing compressed air from a narrow horizontal slot extending the length of a plenum along the top of one of the side walls. The air is directed to a receiving hood along the top of the opposite side wall. An induced draft fan in the ducting behind the receiving hood pulls the airstream into the hood. When the converter is rolled out away from the primary hood for charging, skimming, or pouring, the air curtain sweeps the converter offgases and emissions which are generated by material transfer between the converter and the ladle into the receiving hood. The captured emissions are then vented to a collection device or released directly to the atmosphere through a stack.

The air curtain secondary hood has been demonstrated as an effective method for capturing converter secondary emissions. For the past 3 years, air curtain secondary hoods hav been in place to control converter secondary emissions at copper smelte in Japan. A prototype air curtain secondary hood was installed in 1982 one of the converters at the ASARCO-Tacoma smelter.

In January 1983, EPA conducted a te program designed to evaluate the effectiveness of the capture of secondary emissions by the prototype air curtain secondary hood at the ASARCO-Tacoma smelter. The captu efficiency of the system was evaluate by performing a gas tracer study and visual observations. The gas tracer study involved injecting a gas tracer inside the boundaries of the fixed enclosure and measuring the amount the gas tracer in the exhaust gases in ducting downstream of the enclosure receiving hood. The capture efficiency was then calculated by a material balance of the inlet and outlet tracer mass flow rates. Based on the results this test program, EPA believes an air curtain secondary hood is capable of achieving an overall capture efficienc of 95 percent.

Capture of converter secondary emissions by building evacuation is accomplished by controlling the airflo patterns within the building housing t converters and by maintaining a sufficient air change or ventilation ra Control of airflow in the ventilated ar is obtained by isolating it from other areas and by the proper design and placement of inlet and outlet opening Proper location and sizing of inlet and outlet openings provide effective airfl patterns so that the secondary emissi cannot escape to adjacent areas or recirculate within the area.

EPA believes that a well-designed building evacuation system should be capable of achieving at least 95 perce capture efficiency of secondary emissions. However, the building evacuation systems currently used in non-ferrous metallurgical industry ha not demonstrated this level of contro building evacuation system is being used at the ASARCO copper, lead, a zinc smelter located in El Paso, Texa to capture secondary emissions from copper converters and a zinc smeltin furnace operated inside a building. While preventing the venting of secondary emissions to the ambient outside the building, use of the build evacuation system at the ASARCO-

Paso smelter has resulted in elevated concentrations of inorganic arsenic, lead, and SO_2, inside the building in addition to excessive heat buildup. To alleviate these unacceptable working conditions, building openings have been increased and roof ventilators designed for emergency use only have been operated routinely. As a result of increasing the number of building openings, the capture efficiency of the building evacuation system has been decreased. The building evacuation system as presently operated at the ASARCO-El Paso smelter achieves a capture efficiency of less than 95 percent.

The control technology for the collection of secondary inorganic arsenic emissions is based on the cooling of the exhaust gases to condense the inorganic arsenic vapors to form particulates, and the subsequent collection of the inorganic arsenic particulates in a conventional particulate control device. Baghouse and electrostatic precipitator control devices are currently used at primary copper smelters to collect secondary inorganic arsenic emissions as well as particulate matter emissions.

To evaluate the efficiency of a conventional particulate control device, EPA tested the baghouse in place at the ASARCO-El Paso smelter used for the collection of secondary emissions from the converters. Emission measurements for inorganic arsenic and total particulates were conducted at the baghouse inlet and outlet for three test runs. At the baghouse outlet, inorganic arsenic concentrations ranged from 0.015 to 0.39 milligram per dry standard cubic meter of exhaust gas (mg/dscm). The corresponding total particulate concentrations at the baghouse outlet ranged from 1.1 to 11.6 mg/dscm. Gas temperatures at the baghouse inlet were less than 50°C (112°F). The inorganic arsenic collection efficiency was over 99 percent for two of the test runs and was greater than 94 percent for the third test run. The test results showed that the overall average inorganic arsenic collection efficiency of the baghouse for three test runs was 98 percent. EPA concluded from the tests that a properly designed, operated, and maintained baghouse or equivalent particulate control device can achieve a collection efficiency of at least 98 percent for inorganic arsenic.

Regulatory Alternatives. To determine the level of control that reflects BAT for control of converter secondary emissions, technical alternatives were identified for reducing inorganic arsenic emissions from the ASARCO-Tacoma smelter.

For the purpose of analysis, these alternatives are identified here and in the background information document as Regulatory Alternatives I and II. For Regulatory Alternative I, no national emission standard would be established for inorganic arsenic emissions from high-arsenic-throughput smelters. No additional controls beyond the controls already in place at the ASARCO-Tacoma smelter to comply with existing regulations (e.g. Washington State implementation plan, OSHA inorganic arsenic worker exposure standard) would be required. Regulatory Alternative I corresponds to the baseline level of control.

Regulatory Alternative II represents control of secondary inorganic arsenic emissions from converter opertions at the ASARCO-Tacoma smelter. This alternative is based on capture of the secondary emissions using a secondary hood consisting of a fixed enclosure with a horizontal air curtain. The captured secondary emissions would be vented to a baghouse or equivalent control device for collection.

Regulatory Alternative I (baseline case) would not change the existing air and non-air quality environmental impacts of operations at the ASARCO-Tacoma smelter. Total inorganic arsenic emissions from the ASARCO-Tacoma smelter would remain at the current level of 282 Mg (311 tons) per year. In addition, there would be no energy or economic impacts associated with this alternative.

Regulatory Alternative II would reduce total inorganic arsenic emissions from the ASARCO-Tacoma smelter by 110 Mg (121 tons) per year to a level of 172 Mg (189 tons) per year. The amount of collected particulate matter containing inorganic arsenic would be approximately 11 gigagrams (Gg) (12,000 tons) per year. This would increase the amount of solid waste generated at the ASARCO-Tacoma smelter from 182 to 193 Gg (200,000 to 213,000 tons) per year, an increase of about 6 percent. The additional solid waste can be handled by the smelter's existing solid waste disposal system. Because the alternative is based on use of an electrostatic precipitator, a dry particulate collection device, there would be no water pollution impact.

The energy impacts of Regulatory Alternative II would be increased electrical energy consumption. To operate the control system specified by the alternative, annual electrical energy consumption would be 1.5×10^7 kilowatt-hours per year (kWh/y). Total smelter energy consumption is approximately 2.9×10^9 kWh/y. Thus, Regulatory Alternative II would incre[ase] the total ASARCO-Tacoma electrical energy consumption by 0.5 percent.

The capital costs for installing the control system specified by R[egulatory] Alternative II is \$3.5 million. [This] represents a major capital ex[penditure] for ASARCO. However, ASARCO is [a] major publicly held corporation with [a] good credit rating and good access to financing. Even considering the possibility of additional capital expenditures for control equipment f[or] the two ASARCO low-arsenic-throughput smelters (the ASARCO-El Paso and Hayden primary copper smelters are addressed in Part III of t[he] preamble), it is EPA's determination [that] ASARCO would be able to obtain th[e] necessary capital to install the contr[ol] system at the ASARCO-Tacoma smelter. The annualized cost to implement Regulatory Alternative II [is] estimated to be \$1.5 million. If ASAR[CO] chooses to absorb the costs by reduc[ing] its profit margin, the profitability of [the] ASARCO-Tacoma smelter could be reduced up to 8 percent. If ASARCO chooses to maintain its normal profi[t] margin and attempts to recover the [costs] by increasing copper prices, the pric[e] increase would amount to 0.5 to 0.8 percent.

In summary, under Regulatory Alternative II, total smelter [inorganic] arsenic emissions would be [reduced] 39 percent from 282 Mg per [year to 172] Mg per year. The reduction in em[issions] would be achieved with a small inc[rease] in the amount of solid waste genera[ted] at the smelter. There would be no w[ater] pollution impact. Energy consumpti[on at] the smelter would be slightly increa[sed]. The primary economic impacts associated with this alternative are projected modest decrease in profitablity for the ASARCO-Taco[ma] smelter and a possible small increa[se in] the price of copper. In EPA's judgm[ent,] this alternative would not adversel[y] affect the economic viability of the ASARCO-Tacoma smelter or employment at the smelter. Becaus[e] significant reduction in inorganic arsenic emissions from the ASAR[CO-] Tacoma smelter is achievable wit[h] reasonable economic, energy, and air quality environmental impacts, [EPA] selected Regulatory Alternative II [as] BAT.

It should be noted that the level [of] control selected as BAT is based [on] the Administrator's best judgemen[t of] the information available at this ti[me]. As discussed later, comments and information are being request[ed] o[n] additional control measures. The final decision on BAT will reflect consideration of these comments and may, therefore, include measures (e.g., production curtailments or improved operating and housekeeping practices) which are not now included in Alternative II.

Consideration of Emission Reduction Beyond BAT and Decision on Basis for Proposed Standards.

After identifying BAT, EPA considered the estimated residual health risks and possible control alternatives that would reduce emissions to rates lower than that achievable with BAT. The health risk is expressed by the number of incidences of cancer due to inorganic arsenic exposure in the population distributed around the ASARCO-Tacoma smelter. Based on epidemiological studies, EPA derived a unit risk number for exposure to airborne inorganic arsenic. The unit risk number is a measure of potency expressed as the probability of cancer in a person exposed to 1 $\mu g/m^3$ of airborne inorganic arsenic for a lifetime (70 years). Annual cancer incidence (the number of cases per year) associated with inorganic arsenic emissions from the ASARCO-Tacoma smelter is the product of the total population exposure around the smelter and the unit risk number divided by 70 years. Total exposure is determined by dispersion modeling estimates of the inorganic arsenic concentration in the ambient air surrounding the smelter combined with data for the distribution of the estimated ??0,000 people living within about 20 kilometers (12.5 miles) of the ASARCO-Tacoma smelter. For the current level of inorganic arsenic emissions from the ASARCO-Tacoma smelter, the annual cancer incidence is estimated to range from 1.1 to 17.8 cases per year. With BAT in place at the ASARCO-Tacoma smelter for all of the significant inorganic asenic emission points it is estimated that the annual cancer incidence would be reduced to a range of 0.2 to 3.4 cases per year. Application of BAT would reduce the estimated maximum lifetime risk from exposure to airborne inorganic arsenic from a range of 2.3 to 37 in 100 to a range of 0.58 to 9.2 in 100. The maximum lifetime risk represents the probability of a person contracting cancer who has been continuously exposed during a 70-year period to the maximum annual inorganic arsenic concentration due to inorganic arsenic emissions from the ASARCO-Tacoma smelter.

All known control alternatives were examined with the particular emphasis on the further contol of secondary emissions, which on the basis of modeling results, cause the highest ambient exposure and resultant health risks. This examination, which included evaluation of controls used on smelters in both the United States and Japan as well as the possibility of technology transfer from other source categories, identified no demonstrated technological controls more efficient than those identified as BAT. Therefore, the remaining alternatives are limited to two basic categories: (1) production limitations or curtailments and (2) limitations on the smelter inorganic arsenic throughput.

Impacts of Controls Beyond BAT

Without specific and detailed knowledge of all economic information, which is known only to ASARCO, EPA cannot estimate with certainty the extent to which production curtailment or limitation on inorganic arsenic feed rate may be affordable. The smelter is currently operating under a production curtailment program designed to limit ambient sulfur dioxide (SO_2) levels. This program, which EPA believes to achieve at least a corresponding effect on ambient inorganic arsenic concentrations, currently results in production curtailment of approximately 30 percent. When converter controls are in place, the amount of curtailment needed may be less but is expected to be not less than 20 or 25 percent. Thus, while further curtailments may be possible, it is doubtful that the degree of curtailment necessary to significantly reduce risk (e.g., a 50 percent additional curtailment would reduce the estimated maximum risk from a range of 0.58 to 9.2 in 100 to a range of 0.29 to 4.6 in 100) would be affordable.

An analysis of the importance of high-inorganic-arsenic feed to the economic viability of the ASARCO-Tacoma smelter leads to the conclusion that the smelter would probably close if high-inorganic-arsenic-contact materials could not be processed. High-inorganic-arsenic-content copper ore concentrate and lead smelter by-products represent about one third of the feed material input to the ASARCO-Tacoma smelter. If forced to discontinue use of these feed materials, ASARCO would need to compete with other copper smelting companies for additional supplies of copper ore. In the face of Japanese competition and current copper ore shortages, it is questionable whether sufficient supplies of low-arsenic-content copper ore concentrate could be obtained at prices that would allow profitable operation. More importantly, the use of high-inorganic-arsenic feed allows ASARCO to produce arsenic trioxide and metallic arsenic. EPA estimates that the sale of arsenic trioxide and metallic arsenic represents about 10 to 15 percent of the ASARCO-Tacoma smelter's total revenue and could account for most of the profit. Therefore, for purposes of this analysis, EPA is concluding that any potential means for limiting inorganic arsenic emissions to the extent necessary to significantly reduce risks would result in closure of the ASARCO-Tacoma smelter.

The arsenic produced by the ASARCO-Tacoma smelter supplies about one third of the total nationwide demand for arsenic. The remaining two thirds is imported and represents over half of the world production outside the U.S. If ASARCO-Tacoma stopped production of arsenic, the world arsenic production capacity would have to increase by 25 percent to makeup the shortage. It is considered doubtful that such an increase would be possible even with substantial upward price pressure. The impact that this shortage would have on industrial products (e.g., pressure treated lumber) and agricultural uses (e.g., cotton desiccants, herbicides) has not been estimated.

Consideration of Health Risks

As detailed in Section I of this preamble, the estimated health risks cited above associated with exposure to ambient inorganic arsenic are at best only a very crude estimator of the actual health effects. The degree of uncertainty in these estimate is very large because of the many assumptions and approximations involved in their derivation. Nevertheless, the estimated risks due to emissions from the ASARCO-Tacoma smelter are high relative to other inorganic arsenic sources and to other sources of hazardous pollutants that have been regulated. These levels, therefore, provide a basis for serious question as to whether limiting emissions based on BAT would protect public health and provide an ample margin of safety. Moreover, direct ambient exposure is not the only potential health impact since the inorganic arsenic emitted into the atmosphere accumulates on land and in water resulting in other avenues of exposure. It should be noted that primarily due to arsenic, the Commencement Bay Near Shore Tide Flats area (which includes the ASARCO-Tacoma smelter) has been proposed as a National Priority List Site by EPA under the Superfund program (47 FR 58476, December 30, 1982).

Consideration of Impacts of Beyond BAT

Closure of the ASARCO-Tacoma smelter would result in severe social and economic impact on the local economy. Moreover, since the ASARCO-Tacoma smelter is the only domestic smelter capable of smelting high-impurity copper ores and production of associated by-products including arsenic, closure of the smelter would result in a total loss of this domestic production capability. Closure of the smelter would eliminate the jobs of about 500 ASARCO employees and 300 additional jobs in the Tacoma area. Closure would also mean elimination of $20 million per year in revenues to local companies and $2 million per year in State and local taxes.

Decision and Proposed Standards

As detailed in Part I of this preamble, under EPA's interpretation of Section 112, the smelter should be controlled at least to the level that reflects BAT and to a more stringent level if necessary to prevent unreasonable risks. The decision as to whether the remaining risks are unreasonable is based upon consideration of the individual and population risks and consideration of the impacts, including costs, economic, and other impacts associated with further reduction of these risks.

The primary purpose of standards promulgated under Section 112 is to protect the public health. The Administrator is concerned that the estimated residual risk after application of BAT at ASARCO-Tacoma may be unreasonable, and, as such, that additional controls beyond BAT may be warranted. As indicated earlier, EPA has not identified technological controls more efficient than BAT; therefore, in making a decision on an appropriate control level of ASARCO-Tacoma, the Administrator's consideration of beyond BAT alternatives was limited to production and arsenic throughput limitations. These control measures could further reduce emissions of inorganic arsenic and associated health risks. Arsenic throughput, for example, could be limited to a level comparable to a low-arsenic-throughput smelter (less than 0.7 percent inorganic arsenic in the total smelter charge), although estimated health risks would still be expected to be higher for ASARCO-Tacoma than for the other smelters due to its location in a highly populated area.

The Administrator believes that control beyond BAT could result in closure of the ASARCO-Tacoma smelter. This would reduce the smelter contribution to the estimated health risks to zero; but would also result in a loss of jobs, a loss of domestic production capacity in both the copper and arsenic industries, and a loss of revenues to local businesses and governments. Certainly the impacts associated with closure of the smelter would be felt directly and immediately by the local population, particularly the employees of the smelter. With these potential serious negative impacts, a decision to require beyond BAT controls must be carefully considered.

Given that the calculated health risks estimated to remain after the application of BAT would be the basis for a decision to require beyond BAT controls and, in this case, possibly cause closure of the ASARCO-Tacoma smelter, the Administrator believes it is necessary to scrutinize the basis for these calculated estimates as a part of the decision-making process. The estimated health risks were calculated by combining a unit risk estimate for inorganic arsenic with the ambient concentrations of inorganic arsenic predicted by modeling and with population data for the area surrounding the ASARCO-Tacoma smelter. As discussed in Part I of this preamble and Appendix E of the BID, there are simplifying assumptions and fundamental uncertainties inherent in each of the components of the calculation, resulting in a number of uncertainties in the risk estimates.

Uncertainties in the unit risk estimate exist due to a number of simplifying assumptions. Among these is the assumption that a linear relationship exists between cancer risks and level of exposure and this relationship is the same at the low levels of public exposure as at the high levels of occupational exposure. There is no solid scientific basis for any mathematical extrapolation model that relates carcinogen exposure to cancer risk at the extremely low concentrations that must be dealt with in evaluating environmental hazards. Because its scientific basis, although limited, is the best of any of the current mathematical extrapolation models, the linear nonthreshold model has been adopted here as the primary basis for risk extrapolation at low levels of exposure. Additional assumptions made in the determination of the unit risk estimate are that all people are equally susceptible to cancer and that persons are exposed continuously from birth throughout their lifetimes (70 years). The Administrator believes that the assumptions made in determining the unit risk estimate are reasonable for public health protection in that they lead to a rough but plausible estimate of the upper-limit of risk. That is, it is not likel[y] that the true unit risk would be much more than the estimated unit risk, but i[t] could be considerably lower.

Uncertainties in the ambient modelin[g] exist due to the limitations of th[e] dispersion model and the ass[umptions] and potential error in the data i[n] the model. Limitations in the m[odel] include its inability to account for the variable operating conditions of the smelter and variable meteorology; that is, one set of operating and meteorological conditions was assume[d] for modeling purposes. The meteorological conditions used are believed to be representative. Howeve[r,] the smelter operating conditions used i[n] the modeling do not account for the frequent curtailment of operations nov[w] required at ASARCO-Tacoma to reduc[e] emissions of sulfur dioxide, and therefore, probably result in an overestimate of ambient air concentrations of inorganic arsenic (since arsenic emissions would be reduced as well). Also, the model doe[s] not account for sources of arsenic oth[er] than the ASARCO-Tacoma smelter th[at] are in the area.

In addition, there were many input[s to] the model such as location of each emission source at the smelter and th[e] rate, temperature, and height at whic[h] those emissions are released to the atmosphere. Each of these input parameters is subject to error, perhaps the most crucial the estimate of emission rates. emission rates used by EPA were ba[sed] on actual emission test data wheneve[r] possible. However, for some sources, most notably converter secondary emissions, test data were not availab[le] at the time the estimates were made; therefore, some assumptions were m[ade] for modeling and impact analysis purposes. The EPA assumed, for instance, that converter secondary inorganic arsenic emissions were approximately 15 percent of those measured in the primary converter offgases. Preliminary results of testi[ng] conducted in January 1983 on conve[rter] No. 4 at ASARCO-Tacoma indicate emissions may be significantly less [than] this.

Additional uncertainties arise fro[m] the use of population data. The peo[ple] dealt with in the analysis are not located by actual residence. They a[re] "located" in the Bureau of Census d[ata] for 1970 (the most recent available) population centroids of census distr[icts.] The effect is that the actual locatio[n of] residences with respect to the estim[ated] ambient air concentrations is not kn[own.]

and the relative locations used in the exposure model have changed since the 1970 census. In addition, it is assumed that people remain in the same location for a lifetime (70 years), the only exposure of the population that occurs is due to the ASARCO-Tacoma smelter, and only persons within 20 kilometers of the emission source are affected.

In summary, there is a high degree of uncertainty in the estimated health risks due to the many assumptions and uncertainties associated with the components of the estimates. While the estimated risks may be meaningful in a relative sense, they should not be regarded as accurate representations of true cancer risks. Furthermore, it should be noted that: (1) ambient monitoring data available for the Tacoma area show significantly lower ambient concentrations of inorganic arsenic than those predicted by the model, and (2) data on lung cancer incidence rates for the ten largest cities in Washington for the years 1970 through 1979 show that Tacoma ranks fifth, and the lung cancer rates in Tacoma are below the national average lung cancer rate.

In light of the high degree of uncertainty in the estimated health risks, the apparent absence of further control alternatives short of closure, the serious negative impacts associated with closure, and the absence of comments from the affected public, the Administrator cannot conclude at this time that the risks remaining after the application of BAT are unreasonable. Therefore, standards are being proposed for the category of high-arsenic-throughput smelters based on the application of BAT.

Even though standards are proposed based on BAT, the Administrator remains concerned that the estimated residual health risks, although uncertain, are high relative to those estimated for other source categories regulated by NESHAPs as well as other sources of arsenic. The Administrator believes it is necessary to take extraordinary measures to ensure that his final determination of the control level that is appropriate for high-arsenic-throughput copper smelters is based on the most complete and accurate information available. Therefore, the following steps are being taken:

First, EPA is continuing to refine its estimates of emissions and associated health risks for the ASARCO-Tacoma smelter. This will include a complete, on-site emission source inventory by EPA personnel, emission testing where feasible, and improved modeling. In particular, efforts are currently underway to model the effect of ASARCO-Tacoma's production curtailment. Additionally, further evaluation of controls that could potentially be applied to reduce emissions of inorganic arsenic (particulary secondary emissions) at ASARCO-Tacoma will take place. This evaluation will not be limited to add-on control equipment but will also cover other measures such as improved operating and housekeeping practices.

Secondly, a public hearing for the proposed standards for high-arsenic-throughput copper smelters will be held in the Tacoma, Washington area. This will give those people who would be most affected by the standards the opportunity to comment in person.

Finally, the Administrator has established a special task force to be chaired by EPA's Region X office in Seattle, Washington. The task force will aid the Administrator in securing available information from the area which would be most pertinent in the development of the final standards for high-arsenic-throughput copper smelters. In addition to participating in EPA's evaluation of emission sources and applicable control technologies, the task force will consult with experts outside of EPA in the areas of health impacts analysis and innnovative control technologies for arsenic.

The Administrator is requesting comments on all aspects of the proposed standards and their associated impacts. Comments are also requested on other control measures that may be BAT and on alternatives that would reduce estimated health risks more than the alternative of applying BAT, but would not result in smelter closure. These comments should consider in particular, the means of reducing low-level secondary inorganic arsenic emissions, which result in the highest exposure. The Administrator is also specifically requesting comments on whether the estimated residual health risks associated with the BAT alternative are unreasonable, considering the uncertainty of these estimates and that the only apparent alternative for significantly reducing the risks would likely result in closure of the ASARCO-Tacoma smelter.

Selection of Format of Proposed Standards

Under the authority of Section 112 of the Clean Air Act, national emission standards must, whenever possible, take the format of a numerical emission limit. Typically, an emission limit is written in terms of an allowable mass emission rate (mass of pollutant per unit time) or an allowable concentration (mass of pollutant per volume of gas). In some instances, a process weight limit (weight of pollutant per unit of product or input) or a minimum percent emission reduction of pollutant (control system collection efficiency) is used. All of these types of standards require the direct measurement of emissions to determine compliance. As a alternative, or as a supplement to a standard involving direct measurement of emissions, an emission limit may take the form of a restriction on opacity as measured by EPA Reference Method 9 or on visible emissions as measured by EPA Reference Method 22 or other method. However, in certain instances, numerical emission limits are not possible. Section 112(e)(2) recognizes this situation by defining two conditions when it is not feasible to prescribe or enforce an emission limit. The conditions are: (1) when the pollutants cannot be emitted through a conveyance designed and constructed to emit or capture the pollutant; or (2) when the application of a measurement methodology is not practicable due to technological or economic limitations. In such instances, Section 112(e)(1) authorizes design, equipment, work practice, or operational standards.

For the development of a standard for the capture of secondary inorganic arsenic emissions from converter operations, EPA first considered establishing a numerical emission limit. However, mass rate, concentration, process weight, and percent emission reduction formats for the capture of secondary emissions from converter operations are not feasible because neither the capture efficiency nor the quantity of emissions that escape capture by the secondary hood system can be measured accurately. Visible emission data are available which describe the performance of secondary hood systems over a limited range of operating conditions. However, these data are not considered to represent a sufficient basis for establishing emission standards which must be achieved at all times. Therefore, the format selected for the proposed standards for the capture of secondary inorganic arsenic emissions from converter operations is one in which equipment and work practices are specified.

For the development of a standard for the collection of secondary inorganic arsenic emissions from converter operations, EPA concluded a numerical emission limit is feasible. EPA first considered developing an emission limit specifically for inorganic arsenic. Inorganic arsenic emissions from converter operations vary in relation to the inorganic arsenic content of the ore concentrate processed. Smelting a high-inorganic-arsenic-content ore concentrate has the potential for higher inorganic arsenic emissions than a low-inorganic-arsenic-content-ore concentrate. The ASARCO-Tacoma smelter is a custom smelter processing ore concentrates shipped from domestic and foreign copper mines. An interruption or discontinuation in shipments from one supplier could change the average inorganic arsenic content of the total smelter charge processed at the ASARCO-Tacoma smelter. Thus, the future inorganic arsenic content of secondary emissions from the ASARCO-Tacoma smelter may increase or decrease depending on the mix of suppliers selling ore concentrate to ASARCO.

The potential variability in the inorganic arsenic content of secondary emissions from the ASARCO-Tacoma smelter increases the complexity of developing numerical emission limits specifically for inorganic arsenic. Emission limits for inorganic arsenic based on a mass emission rate, process weight, or concentration format would establish an upper limit on inorganic arsenic emissions only. An inorganic arsenic emission limit based on the BAT emission control requirements specifically for the ASARCO-Tacoma smelter based on current data might not require application of BAT is other ore concentrates were processed. In contrast, a percent reduction format would require the application of BAT regardless of the level of inorganic arsenic content in the feed materials. However, high collection efficiency may not be continuously achievable for the entire range of inorganic arsenic concentrations which could occur in the captured gas streams from the secondary emission sources.

As an alternative, an emission limit for total particulates that reflects the level of control device performance necessary to achieve BAT for collection of secondary inorganic arsenic emissions can be developed. There are several advantages to using a total particulate emission limit to regulate inorganic arsenic emissions. First, total particulate emissions from primary copper smelter operations remain relatively contant regardless of the inorganic arsenic content of the ore concentrate. Thus, a total particulate emission limit would require the use of BAT for all high-arsenic ore concentrates regardless of variations in the inorganic arsenic content of the feed. The second advantage to a total particulate emission limit is that EPA Reference Method 5 can be used to determine compliance. This method is widely used; and because it captures larger quantities of particulates, it offers the potential for greater precision. Therefore, for these reasons EPA decided to develop standards for collection of inorganic arsenic emissions based on a total particulate emission limit.

Mass emission rate, percent emission reduction, process weight rate, and concentration formats were considered by EPA for setting emission limits for the collection of captured secondary emission gas streams. All four of these formats provide viable alternatives for setting total particulate emission limits.

A mass rate format would limit total particulate emissions per unit of time. However, this format would not reflect differences in production rates (e.g., amount of ore concentrate, calcine, and matte processed). The mass emission rate standard would only place an upper limit on the total amount of particulates emitted per hour or per day.

A percent reduction format would specify a minimum percent reduction of total particulate emissions across a control device. Determination of compliance with a percent reduction standard requires measurement of both uncontrolled and controlled emissions. The measurement of emissions at the inlet to control devices poses testing difficulties due to ductwork and control device configurations. The ductwork modifications necessary to perform accurate inlet testing at the ASARCO-Tacoma smelter would significantly increase the cost of the compliance determination.

A mass per unit production format would limit total particulate emissions per unit of copper produced or smelter charge. Determination of compliance with a mass per production unit standard requires the development of a material balance or production values concerning the operation of the copper smelter. Development of this information depends on the availability and reliability of process data provided by the company. Gathering these data increases the testing and recordkeeping requirements and, consequently, increases the compliance determination costs.

A concentration format would limit total particulate emissions per unit volume of exhaust gases discharged to the atmosphere. Compliance determination of concentration standards requires a minimum of data and information, decreasing the costs of testing and reducing chances of measurement errors. Furthermore, vendors of particulate control devices usually guarantee equipment performance in terms of pollutant concentration in the discharge gas stream. There is a potential for circumventing a concentration standard by diluting the exhaust gases discharged to the atmosphere with excess air, thus lowering the concentration of tot particulates emitted but not the mass emitted. However, for this application, this problem can be a ed by specifying a measurement location. Therefore, because a concentration format would involve lower resource requirements and a less complicated compliance determination procedure than the other formats, EPA selected a concentration format as the most suitable format for the proposed standards for collection of secondary emissions.

Selection of Numerical Emission Limit and Equipment Specifications

The proposed standards are based upon the application of a secondary hood system to capture converter secondary emissions and a baghouse o equivalent particulate control device to collect the captured secondary emissions from converters.

The format selected for the propose standard for capture of secondary inorganic arsenic emissions from converters consists of equipment and work practice specifications. EPA believes that the prototype secondary hood design installed on convert o at the ASARCO-Tacoma smelt capable of achieving a capture efficiency level consistent with il the system is installed and operated properly. Therefore, the design and operation of this system were the bas for the equipment and work practice specifications.

The principal components of the secondary hood system are a hood enclosure, an air curtain plenum and exhaust hood, fans, and sufficient ductwork to convey the captured emissions to a control device. Becaus each secondary hood system must be custom designed due to variations in converter configuration and space availability, EPA chose not to specify physical dimensions for the hood enclosure. Instead, EPA decided to specify the design practices that are necessary to follow in order to obtai secondary hood system capable of achieving at least a 95 percent captu efficiency. These design practices ar (1) the configuration and dimensions the hood enclosure are sized so that converter mouth, charging ladles, skimming ladles, and other material transfer vessels are housed within th confines or influence of the hood du each mode of converter operation; (2) the back of the hood enclosure is fully enclosed and sealed against the primary hood; (3) the edges of the hood enclosure side walls in contact with the converter ...sel remain sealed during each mode ... onverter operation; (4) the size of the opening at the top and front of the hood enclosure necessary for the entry and egress of ladles and crane apparatus is minimized to the fullest extent practical; and (5) the hood enclosure is fabricated in such a manner and of materials of sufficient strength to withstand incidental contact with ladles and crane apparatus with no damage.

The air curtain is produced by blowing compressed air from a narrow horizontal slot extending the length of a plenum along the top of one side wall of the hood enclosure. The dimensions of this slot and the velocity of the air blown through the slot are essential design parameters for determining the momentum of the air curtain. Sufficient air curtain momentum must be maintained to prevent emissions rising from the converter operations inside the hood enclosure from penetrating the air curtain and escaping to the ambient air.

To ensure that the owner or operator has the capability of developing sufficient momentum in the air curtain to capture secondary emissions, the proposed standards specify that the air curtain fan be sized to deliver a minimum of 22,370 watts (30 air horsepower) at the slot.

After installation of an air curtain secondary hood system, the owner or operator would be required to operate it at conditions optimum for the capture of secondary inorganic arsenic emissions (see "Optimization of Secondary Hood Air Curtain System"). In addition, the owner or operator would be required to visually inspect the components of the system at least once every month and maintain each converter and associated secondary hood system in a manner consistent with minimizing inorganic arsenic emissions.

Over a 1-week period, EPA personnel observed the ASARCO prototype secondary hood system during all converter operating modes. Based on these observations, EPA concluded that the work practices followed by the individual converter and crane operators can significantly impact the amount of secondary emissions that are captured by the secondary hood system. To assure the maximum capture of secondary emissions, the Administrator is proposing five work practices to be followed by the converter and crane operators. These work practices are (1) air curtain and exhaust flow rates shall be increased by the converter operator to optimum conditions prior to raising the primary hood and rolling the converter out for skimming; (2) once rolled out, the converter operator shall hold the converter in an idle position until fuming from the molten bath ceases prior to commencing skimming; (3) during skimming, the crane operator shall raise the receiving ladle off the ground and position the ladle as close as possible to the converter to minimize the drop distance between the converter mouth and receiving ladle; (4) the rate of flow into the receiving ladle shall be controlled by the converter operator to the extent practicable to mimimize fuming; and (5) upon completion of a charge, the crane operator shall withdraw the charging ladle from the confines of the hood enclosure in a slow and deliberate manner.

The Administrator believes that it may be appropriate to specify minimum time periods to be associated with some of these work practices, such as with (1), (2), and (4) above. The public is invited to comment on the need to specify minimum times to be associated with the proposed work practice standards ans on what times may be appropriate.

ASARCO has stated it intends to install air curtain secondary hood systems (similar to the system already in place on converter No. 4) on its converters that will remain in service at the Tacoma smelter. EPA therefore expects that ASARCO would meet NESHAP requirements for controlling secondary inorganic arsenic emissions from converters at Tacoma by installing air curtain secondary hood systems. However, the proposed equipment specification is not intended to preclude the use of other secondary inorganic arsenic capture systems which may be as effective as an air curtain secondary hood. Upon written application to EPA, the use of an alternative secondary inorganic arsenic capture system which has been demonstrated to EPA's satisfaction to be equivalent in terms of capture efficiency for inorganic arsenic may be approved (see "Equivalent Systems for the Capture of Secondary Emissions from Converter Operations" in Part III of this preamble).

To reflect the level of control device performance necessary to achieve BAT for collection of secondary inorganic arsenic emissions, EPA selected a format specifying a maximum allowable total particulate emissions limit. For selecting the numerical value of the limit, EPA reviewed the particulate emission source test results for the control devices judged to represent BAT. The test results were discussed in the Control Technology section of this part of the preamble. These results consist of a series of three consecutive sampl... runs for which the measured total particulate matter emissions at the control device outlet ranged from 1... 11.6 mg/dscm. The average value f... three runs was 5.1 mg/dscm. The r... show that a control level of at leas... mg/dscm can be achieved; and, mo... likely, control devices will achieve significantly lower emission levels. Therefore, EPA selected 11.6 mg/d... as the proposed emission limit.

Selection of Emission Test Metho...

The use of EPA Reference Metho... "Determination of Particulate Emis... from Stationary Sources" in Appen... of 40 CFR Part 60 would be require... determine compliance with the concentration standard for total particulate matter emissions. Calculations applicable under Met... necessitate the use of data obtaine... from three other EPA test methods conducted before the performance ... Method 5. Method 1—"Sample and Velocity Traverse for Stationary Sources" must be conducted in ord... obtain reprensentative measureme... pollutant emissions. The average g... velocity in the exhaust stack is measured by conducting Method 2... "Determination of Stack Gas Veloc... and Volumetric Flow Rate—(Type ... Pitot Tube)." The analysis of gas composition is measured by condu... Method 3—"Gas Analysis for Car... Dioxide, Oxygen, Excess Air and D... Molecular Weight." These three te... provide data necessary in Method ... converting volumetric flow rate to ... flow rate. In addition, Method 4— "Determination of Moisture Conte... Stack Gases" is suggested as an accurate mode of predetermination moisture content.

Selection of Monitoring Requireme...

Section 114 of the Clean Air Act authorizes EPA to establish monito... requirements for the purpose of determining violations of standard... proposed under the Clean Air Act. ... monitoring data must be maintaine... such a manner so as to be accessi... EPA.

The performance of the equipme... used to capture the secondary emi... from the coverter operations is hig... dependent on flow rate. If the flow is not measured, it is not possible ... either the operator or EPA to dete... whether the equipment is properly operated and maintained. Therefo... proposed standards require contin... monitoring of the time and air flow through the air curtain systems, an... keeping a log of times for each of ...

converter operations. This would allow the correlation of recorded gas flow rates with the corresponding converter operation.

To help the Administrator determine whether each secondary hood system is being properly operated and maintained, measured airflow rates would be compared to source specific reference values established during the optimization of each system for each converter operating mode. (See "Optimization of Secondary Hood System".) To establish source specific airflow reference values, the owner or operator would determine the flow rates that correspond to each converter operating mode while the secondary hood system is operating under optimum conditions.

The proposed standards for the collection of secondary inorganic arsenic emissions are based upon a total particulate concentration limit. One alternative to monitoring the performance of the collection device is to periodically test the collection device using Method 5. However, this alternative is costly and is not considered reasonable. Continuous monitoring of opacity or an operating parameter of the collection device may be used to indirectly monitor performance by indicating whether or not the collection device is operating in the same manner as when it demonstrated compliance during the emission test. Of these two alternatives, monitoring opacity is simpler to apply. Therefore, the monitoring requirement selected for the collection of secondary arsenic emissions is to continuously monitor opacity using a transmissometer.

To implement this monitoring requirement, it would be necessary to establish a reference opacity level against which future performance of the control system could be compared. To establish the source specific reference opacity level, the owner or operator of the source would be required to conduct continuous opacity monitoring during the emission test. The opacity monitoring results would be reduced to 6-minute averages, and the opacity level would be established at the 97–5 percent upper confidence level of a normal or log normal (whichever is more representative) distribution of the 6-minute average opacity values. This opacity value would be the basis for determining whether the collection device is continuously performing effectively. Any monitored opacity reading above the emission test opacity reading would indicate that the collection device may no longer be meeting the proposed total particulate emission limit. A Method 5 test could then be performed to determine compliance.

Optimization Of Air Curtain Secondary Hood System

It is intended that the installation of equipment specified in the proposed standards for the capture of converter secondary emissions will give the owner or operator of each affected converter the capability of reducing emissions to a level consistent with the application of BAT. In developing the equipment specifications, the Administrator has been specific for some requirements as in the case of fan horsepower capacity, and more general for others, such as the dimensions of the secondary hood. Some of the requirements are general because unless there are any new smelters, which is considered unlikely, each installation will be a retrofit: that is, each air curtain secondary hood system will have to be custom designed to fit each existing converter. Due to space limitations, existing pollution control equipment already in place and other considerations, the exact configuration of each secondary hood with air curtain system installed will vary from smelter to smelter.

Beyond hood configuration, the performance of each air curtain secondary hood system will depend on a balance of several other parameters, including the dimensions of the air curtain slot, the velocity of air through the slot, and the distance from the slot to the offtake. These parameters are adjustable in the sense that they can be altered in a relatively short time and at relatively small cost. It is expected that after the initial installation of each air curtain secondary hood system, there will be a "shakedown" or optimization period during which the proper balance of system parameters will be determined for each particular installation.

For every air curtain secondary hood installation, there will be an optimum set of operating conditions, beyond which further "fine tuning" of the system will not result in increased capture efficiency. Section 112(e)(1) of the Clean Air Act states, in part, that if the Administrator promulgates a design or equipment standard, "he shall include as part of such standard such requirements as will assure the proper operation and maintenance of any such element of design or equipment." "Proper operation" of an air curtain secondary hood system includes operating the system as close to optimum conditions as possible, and the owner or operator would be required to do so under the proposed standards. It is not the Administrator's intent, however, to require the owner or operator to opera a system beyond optimum conditions (i.e., at flow rates and power requirements that do not achieve additional capture) or to prevent operational changes that may e the capture efficiency of the

Authority for determination optimum conditions for each air i secondary hood system installed to m the proposed standards would rest wi the Administrator. Due to the variable involved, and the fact each installatio will be site specific, it is not possible the Administrator to prescribe in advance what will constitute optimum operating conditions for each air curt secondary hood installation. Objectiv techniques, such as the tracer study used to evaluate the air curtain secondary hood system on the No. 4 converter at the ASARCO-Tacoma smelter, are available to help determi capture effeiciency. However, a final determination of whether a system h truly been optimized, or if not, what steps should (or could) be taken to improve it, will largely be a matter of judgment.

One approach the Administrator is considering as a method for determin optimum conditions for each air curt secondary hood installation would b have each system evaluated by a pa of persons with expertise in assessin visible emissions of air pollutan T panel could be comprised of 3 persons, including representa industry, EPA and local air po control agencies.

The panel would evaluate each ai curtain secondary hood as follows: (the panel would review the plans an specifications of the system prior to installation; (2) the panel would agr on initial operating conditions for th system; (3) the panel would observe operation of the system during each mode of converter operation under t initial operating conditions. Estimat the capture effectiveness achieved, based on visual observations, woul recorded by each panel member for each mode of operation. In addition, comments on the minimum and maximum capture effectiveness achieved, the duration, location and density of visible emissions observ and a qualitative assessment of the volume of the emissions escaping capture (e.g., light, moderate, heavy etc.) would be recorded; (4) based o this initial evaluation, the panel wo agree on what modifications would needed to further optimize the oper of the air curtain secondary hood; a (5) the panel would again view the system (as in 3) after modification to compare its performance to pre-modification performance. After this, steps 4 and 5 would be repeated as needed until there was agreement among the panel members that the system had been optimized. The panel would then recommend a set of optimum operating conditions for that system to the Administrator along with documentation of their evaluation. In the event of disputes, panel members would submit separate recommendations. The Administrator would make a final determination of the optimum conditions based on the panel's recommendation and supporting documentation.

If, subsequent to a determination that a system has been optimized, an owner of operator proposes to make an additional modification to the system, the panel would again be convened and would observe the system both before and after the change as prescribed in (3) above. The modification could be approved by the Administrator if the panel found it did not reduce capture efficiency.

The Administrator believes this approach would assure that the air curtain secondary hood system is designed and operating conditions established which will minimize secondary inorganic arsenic emissions to the greatest extent possible, but would also allow the owner or operator to make modifications to the system that would not reduce capture efficiency. The public is invited to comment on the need to evaluate the optimization of each air curtain secondary hood system and on the panel approach being considered by the Administrator.

Reporting and Recordkeeping Requirement

Owners or operators of sources covered by the proposed standards would be subject to the reporting and recordkeeping requirements of the proposed standards, as well as those prescribed in the General Provisions (Subpart A) of 40 CFR Part 61. Under § 61.10 of the General Provisions, an initial report from each existing source is required to be submitted within 90 days of the effective date. For purposes of determining initial applicability, the proposed standards for high-arsenic-throughput smelters specify that the initial report required in § 61.10(a) will include information on the weight percent inorganic arsenic in the total smelter charge. The proposed standards further require that each month the computation of a rolling annual average of the inorganic arsenic content of the total smelter charge be made and that the monthly computation of a rolling annual average of the inorganic arsenic content of the total smelter charge be made and that the monthly computations be recorded and dept on site for at least 2 years: The monthly computations would have to be reported to EPA on an annual basis to ensure that applicability with respect to the standards had not changed.

Under Section 114, EPA is authorized to establish reporting requirements to determine whether there is a violation of standards proposed under the Clean Air Act. Concern as to whether the systems for the control of inorganic arsenic emissions are continuing to meet the proposed standards would primarily arise when monitoring showed opacity levels in excess of those determined during the compliance demonstration or airflow rates that vary significantly from those established during the optimization procedure. Therefore, in determining the necessary reporting requirements, it was considered reasonable to require reporting only when such "excess emission" conditions exist. Reporting of these excess emission conditions would be required on a semiannual basis. Currently, only the copper smelting companies collect any of this information. In addition, there are no reporting requirements by other governmental agencies for this type of information which would result in overlapping data requirements. The types of information to be included in the reports are discussed below.

For the converter secondary hood system, each semiannual report would indicate: (1) the reference airflow rates established for each converter operational mode, and (2) a record of airflow rates for each day when the airflow rates are less than 20 percent of the corresponding reference values.

For the collection devices for secondary emissions, each semiannual report would provide: (1) a record of transmissometer readings for each day on which the opacity exceeded the reference opacity limit determined at the time the collection device demonstrated compliance, and (2) the values of the emission test opacity limits.

Impacts of Reporting and Recordkeeping Requirements

EPA believes that these reporting and recordkeeping requirements are necessary to assist the Agency in (1) identifying sources, (2) observing the compliance testing and demonstration of monitoring devices, (3) determining initial compliance, and (4) enforcing the standard after the initial compliance determination.

The Paperwork Reduction Act (PRA) [illegible]0 (Pub. L. 96-511) requires that the Office of Management and Budget (OMB) approve reporting and recordkeeping requirements that quali as an "information collection request" (ICR). For the purposes of accommodating OMB's review, EPA uses 2-year periods in its impact analysis procedures for estimating the labor-hour burden of reporting and recordkeeping requirements.

The average annual burden on high-arsenic-throughput copper smelters to comply with the reporting and recordkeeping requirements of the proposed standards over the first 2 years after the effective date is estimated to be 1,310 person-hours.

Regulatory Flexibility Analysis

The Regulatory Flexibility Act of 19 (RFA) requires that differential impact of Federal regulations upon small businesses be identified and analyzed The RFA stipulates that an analysis is required if a substantial number of sm businesses will experience significant impacts. Both measures must be met: that is, a substantial number of small businesses must be affected and they must experience significant impacts, t require an analysis. Twenty percent o more of the small businesses in an affected industry is considered a substantial number. The EPA definitio of significant impact involves three tests, as follows: (1) prices of product produced by small entities rise 5 perc or more, assuming costs are passed or to consumers; (2) annualized investme costs for pollution control are greater than 20 percent of total capital spendi or (3) costs as a percent of sales for small entities are 10 percent greater th costs as a percent of sales for large entities.

The Small Business Administration (SBA) definition of a small business fo Standard Industrial Classification (SI Code 3331, Primary Smelting and Refining of Copper, is 1,000 employee The ASARCO-Tacoma smelter is own by a company that has more than 1,00 employees. Therefore ASARCO does not meet the SBA definition of a smal business and thus no regulatory flexibility analysis is required.

APPENDIX B

Newspaper Articles

Smelter battle

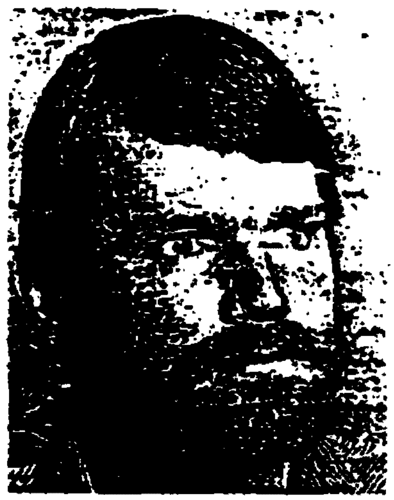
Politics, economics and environmental issues are whirling around the Asarco controversy

By JEFF WEATHERSBY

'Let me try to dance a few angels on the head of a pin," began beleaguered Environmental Protection Agency northwest administrator Ernesta Barnes.

She was trying to answer yet another difficult question about the dangers posed by Asarco arsenic to area residents.

Much about this novel controversy — in which the federal government has asked a community to help decide how much of a cancer risk it wants to assume — has that ring about it of the medieval argument over the number of angels that could pirouette on a pinhead.



'It's time for Tacoma to change its image. Instead of covering for these guys like Asarco, it should try to bring in new industries.'

— Environmentalist Brian Baird

The EPA has proposed regulations that would require Asarco to spend $4.5 million to install more air pollution equipment. But the EPA also has told citizens the air pollution equipment is not expected to end the arsenic emissions from the Ruston smelter. The EPA says that for all it knows, any amount of arsenic is harmful to health.

The equipment will reduce only low-level (not emitted from the smoke stack) arsenic emissions from 310 tons per year to 189 tons per year, EPA estimated. Asarco said it doesn't know where EPA got those numbers.

The federal agency also has gone out on a statistical limb and predicted that instead of losing four persons per year to lung cancer as the area ostensibly does at present, the new control equipment would mean only one lung cancer death a year. Asarco, on the other hand, claims its arsenic emissions are safe for humans, and the EPA has admitted its mathematics for its cancer death statistical model may be wrong.

Barnes explained the cancer statistical model tries to account for such variables as weather and emission data and the poorly understood relationship of arsenic to cancer in humans. The model assumes a person lives in the area for 70 years, an assumption obviously complicated by the fact that people move in and out, take vacations and so on.

Wayne Grotheer, an environmental engineer for the EPA, said the agency is not confused by all the numbers being thrown around, but admits there is some uncertainty about such issues as the relationship of arsenic to cancer. He said the agency is attempting to "simplify" the issue for the public.

Beyond the issue of which, if any, numbers are correct, there is the bigger question of how much arsenic area residents want to consume.

"The question is, 'Is 189 tons little enough to constitute an ample margin of safety for the public in the vicinity of or downwind of the smelter?' " Barnes said last week.

It isn't an issue the EPA even wanted to face, at least not yet.

"EPA didn't come forward with (an arsenic) standard because of the complexity of the issue. The complexity simply overwhelmed the staff. We would have gotten there eventually," Barnes told *The News Tribune* editorial board.

As it is, the arsenic problem in Tacoma is being faced because of the order of a federal judge sitting in New York deciding a case involving arsenic being blown from New Jersey to Staten Island.

But now that issue is being addressed, what a time Tacoma is in for.

Last week, Ruston and Tacoma made news on the front page of *The New York Times* and on national television. Reporters from major newspapers around the country are coming to Tacoma.

Organized groups are marshaling their forces for an Aug. 30 showdown before an EPA board in the Bicentennial Pavilion.

EPA Administrator William Ruckelshaus is expected to review the record of the Aug. 30 public hearing before making his final decision on an arsenic standard in January.

Before then, expect demonstrations at the smelter by environmental groups. If history is instructive, expect another major public relations and technical extravaganza by Asarco of the kind it prepared for a variance hearing before the Puget Sound Air Pollution Control Agency in 1981.

"I expect we will be there and will testify. To what extent, I am not certain," said Larry Lindquist, smelter manager.

(Continued on next page)

Smelter battle

(Continued from preceding page)

He said Asarco officials are scheduled to discuss this week what presentations the company will present to the EPA.

As in the past, the theme, buttressed by testimony from doctors and university researchers, is expected to be that smelter emissions do not harm people. At the 1981 variance hearing, Asarco hired the Seattle public relations firm of Hill and Knowlton to handle publicity.

Additionally, Asarco is likely to emphasize the good the smelter does in the area. It employs some 570 people, has a multi-million payroll, pays taxes and makes large purchases on the local market.

There are some more exotic benefits too. Asarco is the only manufacturer of arsenic in the United States.

Pesticide manufacturers and others who use arsenic in their products would incur higher costs if they had to purchase the metal in foreign countries which don't have to pay for expensive pollution controls, Lindquist said.

Brian Baird, a member of Tahomans for a Healthy Environment (THE), said he is already worried about the kind of campaign Asarco may wage.

"Tacoma is setting a precedent (in EPA policy) and it is quite conceivable Asarco would launch a publicity campaign, and publicize distorting facts or information that suits their desires . . .," said Baird.

He said he is concerned that the issue could become an economic or public relations controversy rather than a health and scientific one.

Lindquist, the smelter manager, has a similar concern.

"I hope it will be decided on the scientific merits of the case," he said. "I think emotional appeals 'll be made, based on emotion alone. This is inevitable in something like this."

He said smelter employees have already heard one person call a radio talk show and complain it smelled as though Asarco was "frying dogs."

On the other side, Baird commented, "I am concerned about the way in which public opinion is shaped often by the party with the greatest amount of money."

> "I hope it will be decided on the scientific merits of the case. I think emotional appeals will be made, based on emotion alone. This is inevitable in something like this."
>
> — Larry Lindquist
> Asarco smelter manager

Environmentalists don't have the money the industrial giants can tap, he said. What money they "scrape" together is diffused into a number of issues, such as preserving wilderness, he said.

Baird said the environmentalist will try to counter Asarco's financial might by forming coalitions with groups like the Washington Lung Association and others to "inform the public and get proper representation at the hearing."

"We may have demonstrations to highlight the issue," Baird said.

He added the environmental community will also be reviewing arsenic and EPA cost-risk benefit studies to prepare for the hearing.

The EPA is expected to provide five boxes containing studies and other data on the issue to the Tacoma Public Library so residents can prepare for the hearing, according to Bob Jacobson, a spokesman for the EPA.

Another tactic of the environmental community: approach labor and try to recruit an ally. Smelter workers, members of the United Steelworkers of America, have traditionally stood solidly behind the smelter management on the environmental issues. The smeltermen have been supported in the past by some other unions.

"For too long, the industrial community has been playing the two groups (environmentalists and labor) against each other," said Baird.

An effort likely will be made to convince labor leaders that "the net effect of pollution controls is the creation of jobs," Baird said.

Perhaps in an effort to recruit allies, Asarco critics are cautious about calling for a shutting down of the smelter.

"I don't believe anyone is seeking total closure of the mill," said Doug Jackman, of the Washington Lung Association.

Baird said, "We will stand for very tight health protection, and it does not appear Asarco will be able to meet that.

"It's time for Tacoma to change its image. Instead of covering for these guys like Asarco, it should try to bring in new industries to take the place of the polluters.

"We want Tacoma to be able to employ people without killing people."

Baird also suggested that the smelter and the publicity it has been receiving could hurt convention and entertainment business the city hopes the Tacoma Dome will attract.

Conversely, Baird said his organization doesn't want the word to go out that Tacoma residents are willing to take risks with their health.

"If every company learns Tacomans are willing to die for employment, the the aggregate effect can be unacceptably large," he said.

Baird also hopes national clean-air groups will become involved in the Tacoma smelter case.

"This is a precedent-setting case," he said. "It has never been put in the lap of the community before to say how much risk it is willing to take. So it is very important for national groups to get together," Baird said.

Dale Jones, director of field offices for the Seattle Office of

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Asarco From Page A-14

Friends of the Earth, guessed that environmental experts won't be brought in from New York and Washington, D.C., to testify in Tacoma.

He said Ruckelshaus' proposal that the public help define the arsenic risk it will accept is a "trial balloon that has already burst."

Jones said that if Ruckelshaus' decision was in any way based on a "public opinion poll, it wouldn't stand up in the courts."

Barnes, the regional EPA administrator in Seattle, has said public imput will be "extremely important" in the decision-making process.

Jones said that if Ruckelshaus' proposal was valid, it would mean that people in the industrial Ohio Valley would be helping to make decisions about acid rain caused by their industrial plants that falls in New England.

The law requires that the decision be based on the EPA's providing a "margin of (public) safety," he said.

"If (Ruckelshaus) wants to change the law, he has to go to Congress," Jones said.

Other groups are also warning that the EPA must be careful of the grounds on which it makes its decision on Asarco's emissions.

"The Clean Air Act does not include cost as a criterion for development of hazardous air pollutants (controls)," said Jackman, of the Washington Lung Association.

Ruth Weiner, chairwoman of the Cascades Chapter of the Sierra Club, said she thought Ruckelshaus was attempting to make it "an environment-versus-jobs issue" without really trying to explore what new technology is available to control the arsenic emissions and allow the plant to stay open.

But Joe Stortini, the Pierce County councilman who sits on the Puget Sound Air Pollution Control Board, said he thinks it is "super" that the federal government is asking local residents what they want.

Some groups have not decided what to do.

Arthur Dammkoehler, air pollution control officer for the Puget Sound Air Pollution Control Agency, said that agency first has to evaluate the EPA proposal and its back-up information.

He said the PSAPCA board is scheduled to vote on its formal position at its Aug. 11 meeting.

Stortini said he hopes the PSAPCA board will vote to continue its position of requiring the air pollution equipment to be installed. The proposed EPA position is an endorsement of the PSAPCA order issued in 1981.

The League of Women Voters is expected to develop its position on the arsenic issue next week, according to a league spokeswoman.

While arsenic has been attracting all the attention this week, other smelter-related issues are awaiting their turns.

For example:

- The EPA, state Department of Ecology and Tacoma-Pierce County Health Department are attempting to deal with a wide range of pollution issues that are affecting the land, ground water and Commencement Bay. The Commencement Bay area has been identified as one of the 10 areas most polluted by chemicals and metals in the country by the EPA. One of the metals involved is arsenic, presumably from the smelter.
- PSAPCA has given the smelter until 1987 to put into effect a way to remove 90 percent of the sulfur dioxide from its emissions. The smelter says it can remove only about 45 percent, and warns it would have to rebuild the whole plant to do better. Meanwhile, the smelter is likely to remain a target for its suspected role in creating acid rain that may be harming mountain lakes and creating respiratory problems for people with lung diseases.
- A group of Vashon Island residents is planning a law suit against Asarco because smelter emissions from the stack rain on the island.

Baird, of Tahomans for a Healthy Environment, explained the issue is more than the statistical possibility that the Tacoma area would have to "sacrifice" one person a year to arsenic-induced lung cancer if the EPA proposal is endorsed by Ruckelshaus.

"We must add . . . their sulfur dioxide, plus cadmium and lead. That one arsenic death excludes everything else Asarco puts out," Baird said.

Ironically, economics may resolve the smelter issue.

"The entire copper industry is not doing well financially," said Lindquist. He claimed that while the smelter had a "modest profit" in the first quarter of 1983, it had a large loss last year.

"Foreign competition is bring more and more (copper) material into the U.S. every year," Lindquist said.

PRO: Many Rustonites cite smelter's benefits

By JOHN GILLIE

RUSTON — "Baloney."

This epithet spoken politely but firmly was Owen T. Gallagher's considered opinion of the Environmental Protection Agency's warnings this week about the hazards of living in the shadow of the Asarco smelter's smokestack.

All of this half-mile-square town of 600 residents lies within the 1-mile radius of the smelter — the area where the EPA said the chances of contracting incurable lung cancer are 33 percent higher than elsewhere.

Owen Gallagher scoffs at the EPA's warnings and the call by some environmentalists for the agency to tighten its restrictions on cancer-causing arsenic smelter emissions to levels that could force the smelter to shut down.

"They're going to kill the goose that laid the golden egg," said Gallagher, seated in his neat brick home just five blocks from the elter gate.

The smelter, the town and its residents, he said, have enjoyed a mutually comfortable relationship for more than 90 years.

Gallagher well knows how the three are intimately connected. The lives of Gallagher, the Asarco smelter and this town near Point Defiance Park are intricately intertwined.

Gallagher was born here on North Winnifred Street, four blocks from the smelter gate, more than 70 years ago. He worked for Asarco for 43 years, starting as a laborer in the copper smelter and retiring five years ago as personnel manager.

Gallagher is a legend in town politics. He founded the volunteer fire department. He served on the Town Council for 15 years. He was mayor for 20 years before stepping down two years ago.

During his years of public service, said Gallagher, Asarco was good for Ruston and its people. The smelter provided as much as 70 percent of the town's budget, furnished steam to heat the Rus-n Elementary School and hand-.mely paying jobs to support a number of its residents.

Environmental restrictions that could threaten the smelter's very existence, said the former mayor, are "just a bunch of foolishness."

Living by the smelter does pose some minor inconveniences, he said, but the benefits far outweigh them.

Owen Gallagher

Just recently, he said, after the smelter restarted its furnaces that were shut down because of the threat of a strike that didn't materialize, the area was hit with a sooty fallout. It landed on cars in Ruston and on boats at the nearby Tacoma Yacht Club.

"All you've got to do is go out and give your car a quick wash," he said. "If you leave it on, it might eat into the paint."

But the smelter has been good about taking care of any damage. "The smelter has painted a lot of cars over the years," he said.

The payoff for the "inconveniences," he said, are lower taxes and better city services than in neighboring Tacoma.

Twice-weekly garbage service here is free, he said. With the exception of a single street, all of the town's alleys and streets are paved without the need for local residents to pay for them directly. The town employs a seven-member (two full-time and five part-time) police force, a relatively large force for a town of Ruston's size, he said.

More threatening than the soot, the EPA said, is the 310 tons of airborne arsenic the smelter emits each year.

Gallagher dismisses arsenic emissions, too.

"When you're in a bakery, you expect to get some flour on you," he said.

While the smelter's chief arsenic-containing byproduct, arsenic trioxide, bears an uncanny resemblance to cake flour, its effects are not nearly so benign, said the EPA.

The arsenic emitted by the smelter, the EPA estimated, causes an additional four cancer deaths yearly in the Tacoma metropolitan area.

If EPA Administrator William Ruckelshaus adopts his proposed arsenic limitation rules, those arsenic-related cancer deaths in the Tacoma area are expected to drop to one.

But Ruckelshaus, in the first test of his new regime at the embattled agency, has asked those touched by the smelter's arsenic emissions to tell him if his proposed standards represent an acceptable risk level.

A hearing is set for Aug. 30 in Tacoma.

If Gallagher and other Ruston town officials are typical, then many may speak out against even further restrictions that could close the 570-employee smelter and cut off its annual $23 million payroll.

Mary Joyce and her husband have raised their six children figuratively in the smelter's backyard.

Her home's picture window neatly frames the smelter's 580-foot smokestack, a structure just 29 feet shorter than Seattle's Space Needle.

Her home's elevated front yard is landscaped with chunks of the black, obsidian-like slag from the smelter.

Joyce, a town councilwoman, said she knows of only one family among Ruston's population that has made any strong protest about smelter emissions.

Those who are bothered by the smelter's emissions, she said, either don't buy in Ruston or they move away.

"I think that if anyone felt that strongly about it, they would move. A person shouldn't have to live in a community if they're not happy with it," she said.

Ruston Mayor Peter Brudevold believes the populace here would agree with him that the smelter's

(Continued on next page)

The News Tribune, Tacoma, Wash., Thursday, July

PRO: Many Rustonites cite smelter's benefits

(Cont'd from preceding page)

emissions pose no major problems.

"I think the greater majority would have to agree with me that there are no problems," he said.

Deputy Clerk Norma Doucette said she's unaware of any adverse effects of the smelter.

"We have pretty lawns, and none of us have died from it (the emissions) yet that I know."

"A lot of people blame the smelter for any problems that they have," said Ruston Clerk-Treasurer Loretta Prettyman.

Not all the people of Ruston have the same high opinion of the smelter and its emissions.

Larry and Jean Wingard stirred the displeasure of some of the town hierarchy by filing suit against the smelter for damage to their car and their organic vegetable garden.

The couple lost the trial of their suit, but they now have pledged to carry the fight against the smelter pollution onward.

"As long as there's a danger," she said, "we'll be there to fight it."

Jean Wingard said many of those who welcome the smelter are unaware of the level or the dangers of the pollution. They have been blinded, she said, by the monetary rewards of working at the smelter or by the services the smelter's taxes buy.

"They're getting paid down there to live and work in it," she said. "I'm not getting paid to breathe it."

Staff photo by BRUCE LARSON

Healthful coexistence?

Seven-year-old Tonia Gibson is among dozens of school-age children living in the path of emissions from the Asarco smelter who will be tested in a Tacoma-Pierce County Health Department study during the next six weeks to determine the levels of arsenic in their bodies and its effects on their health.

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CON: Vashon residents: Fallout 'won't let us enjoy our land'

By JEFF WEATHERSBY

VASHON ISLAND — "We are common people, not rabble-rousers," said Michael Bradley, a Vashon Island construction worker leading a group threatening to take Asarco Inc. to court over its toxic emissions.

"I'm not for the loss of jobs," Bradley was careful to explain. "I'm a construction worker. I appreciate industry and trades."

But Bradley said he and others want the smelter to stop spewing arsenic and other chemicals.

Bradley is chairman of a group tentatively named Island Residents Against Toxic Emissions — IRATE for short — that is preparing to battle on several fronts the corporate bastion symbolized by the smelter across Commencement Bay.

The major concern of the group is the toxic arsenic and cadmium deposited on the island, apparently from the smelter.

"Numerous people who staked their life savings on a place and a some are finding they can't enjoy the land because of the emissions of the Asarco plant," Bradley said.

Many residents bought acreage on rural Vashon Island so they could raise their own vegetables, hogs and turkeys, Bradley said. And, he said, they purchased the land long before anyone knew Asarco may be responsible for an

Michael Bradley

island pollution problem.

Bradley and other members of the group now cite a recent Tacoma-Pierce County Health Department study of areas around the smelter which found that soil on Vashon and Maury islands has the second-highest levels of cadmium and arsenic. The highest level was found in Tacoma's North End.

Vashon residents also are awaiting results of tests to determine the level of arsenic in the urine of their children.

Smelter Manager Larry Lindquist denied the smelter emissions were harming residents of Vashon.

"Until they have analyzed the vegetables they have grown, it seems to me they worry themselves needlessly," Lindquist said.

"In all the years we've here and have taken soil and vegetable samples and taken urinary arsenic levels in people, I never have seen values high enough to worry about," Lindquist added.

"The studies don't support the contention there are harmful health effects," he said.

Bill Tobin, an attorney living on Vashon, said the group must decide whether to file a class-action suit or individual civil suits against the smelter.

Because of the high smokestack and prevailing wind directions, Tobin explained, "We are the dumping ground for these pollutants without any benefits (such as jobs or Asarco tax payments)."

The attorney said he is not discouraged by a recent Pierce County Superior Court case in which Ruston residents Larry and Jean Wingard failed to convince a jury that smelter emissions had poisoned their garden.

Tobin said the case had "several technical defects" in its presentation.

He said the Vashon case would be filed in King County instead, where he believes a jury may be more sympathetic.

The attorney also noted that the Wingards moved into Ruston, where they knew the smelter was already operating.

"This (Vashon) is a rural community, not heavily populated, where a lot of people rely heavily on gardens for food," Tobin said.

Tobin also said preliminary results of a computer study indicate property values on the southern part of Vashon may be adversely affected by the smelter's toxic reputation.

Some real estate agents also have said some prospective buyers will not look at property on the southern part of the island because of the smelter emissions, Tobin said.

Commenting on a new Environmental Protection Agency proposal that would order Asarco to install new air-pollution control equipment, Tobin said he is both encouraged and disturbed by the EPA.

Tobin said he is happy the public will have an opportunity to comment on the proposal. But he said pollution equipment designed to capture arsenic escaping into the Ruston area may mean more toxic metals may escape through the stack and end up on Vashon.

Bart Klein, another attorney living on Vashon who is active in IRATE, said he thinks Asarco is simply "milking" the situation in the Tacoma area as much as it can while it prepares to shift its operations to other parts of the world.

Klein said the smelter has been allowed to violate air pollution regulations for years.

"How many times," he asked, "can you go past go without stopping?"

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MT VERNON SKAGIT VALLEY HERALD 8/11/83

Tacoma mayor wants to keep smelter open

TACOMA (AP) — The mayor of Tacoma says he favors keeping the Asarco copper smelter open until he is shown evidence that arsenic emissions are causing cancer deaths in the city.

"Until I've been able to be shown specifically that there is indeed deaths being created by the emissions out of Asarco, I don't think it should be closed," Mayor Doug Sutherland said Wednesday on ABC's nationally televised "Good Morning, America."

Sutherland said that while the link between cancer and arsenic has been proven, there is doubt whether the concentrations present in Tacoma are enough to cause cancer.

National media attention has been focused on Tacoma since the Environmental Protection Agency decided to hold public hearings regarding proposed arsenic emission standards.

The EPA has proposed making Asarco install $4.5 million worth of hoods over its copper converters to trap part of the arsenic that escapes into the air near the smelter.

But the EPA has predicted the hoods will not eliminate arsenic-induced lung cancer.

Both Asarco and EPA have said enacting stiffer arsenic emission standards could force the plant to shut down to comply.

E.P.A. proposal isn't ample margin of safety

Note: In my nearly 10 years of news reporting, I have studiously avoided first person articles and have attempted to leave out my own personal opinions. However, after the August 10 Environmental Protection Agency workshop here concerning arsenic standards for ASARCO, Jay Becker asked me to write a piece concerning my personal reactions and feelings:

Background

I have lived on Vashon five years. I have grown a large garden four years and I freeze most of my produce, eating my own garden vegetables throughout the year. I have also reported on developments regarding ASARCO for the *Beachcomber* for four years. In talking to Islanders, collecting data on soil samples from Island gardens, and questioning officials about what it all means, I have become increasingly concerned about living in ASARCO's shadow.

Nevertheless, I went along happily growing my garden and eating my vegetables. Then I became pregnant. My baby is due in September.

Recent information disseminated by Tacoma-Pierce County Health Department warns against eating leafy vegetables from gardens contaminated with cadmium. I also learned that fetuses, infants, and children are the most susceptible populations. I decided it might be alright for me to eat these vegetables, but I shouldn't expose my unborn child to this risk. I didn't even plant lettuce, Swiss chard, or spinach. It was only after I planted a big crop of potatoes, some carrots, and beets that I learned these vegetables too are suspect. I haven't eaten any.

So ASARCO has really come home to roost, affecting my life in a real, tangible way. And likely to do more so as in the course of my research I have heard officials tell me that it might be dangerous for a child to play in the dirt on Vashon because of elevated arsenic levels. I think about what it means for a child to live 18 years here, exposed to the levels of arsenic and cadmium and sulfur dioxide which have accumulated and/or continue to contaminate the environment in which I live. I have become seriously concerned.

The Proposal

When the EPA proposal regarding standards for arsenic emissions at ASARCO was released, I became more concerned. For the past six months, officials indicated (off the record) that I could expect stringent measures to curb ASARCO pollution. Something must have happened because what EPA proposes is nothing more than what has already been ordered by the local air pollution control agency. In fact, what EPA proposes is exactly what ASARCO suggested be used as a standard for its arsenic emissions.

And I have become more cynical because it seems that once these things are proposed, they take on a life of their own. It is hard to change tacks, certainly hard to move a compromise toward any kind of radical change. The EPA proposal did not seem to address my fears.

The Meeting

And the August 10 EPA workshop here confirmed my worst fears and made me feel even more concerned about what is going on here. The proposal does truly seem to have a life of its own. Its lifeblood appears to be a mathematical computer model which all agree has very questionable assumptions built into it and very large gaps of real data. While we on Vashon have in our hands real data that tells us that our vegetables are dangerous to eat, our children's urinary arsenic levels are elevated way beyond normal, and our honeybees are dying because of arsenic pollution, EPA officials tell us they lack the data to determine whether there is a real problem.

While every official I have talked to in the past four years indicated Vashon's main problem lies with emissions from the main stack (with the new hoods proposed by EPA, main stack arsenic emissions would increase thus increasing our risk of cancer), EPA officials said their model shows that Vashon is affected mainly by fugitive emissions escaping at low levels from leaks in the building.

While soil data shows that Vashon-Maury Island is the second highest scene of ASARCO pollution, next only to the immediate vicinity of Ruston, EPA officials claimed that their model shows our population is not within the 100,000 most exposed people.

And then EPA, ostensibly because the Clean Air Act doesn't permit taking a look at the whole situation (past and present effects of all pollution including cadmium, arsenic and sulfur dioxide) refuses to acknowledge that our present risk is elevated because of past pollution. You just can't make me believe that my risk and my child's risk of getting sick from ASARCO's present pollution isn't greater by the fact that I live in an environment that is already contaminated by ASARCO's past pollution.

It was also depressing to find that EPA is basing its whole decision on this computer model of probability of excess cancer deaths in our population. Mere quality of life doesn't seem to be part of protecting the public's health when it doesn't involve the big demon cancer. What about skin diseases, kidney failures, liver failures, asthma? Why are 575 jobs in Tacoma more important than the more than 500 Vashon families who grow gardens which they live on, raise livestock (which eat leafy greens) for slaughter, fish to supplement their diet?

Conclusion

I heard EPA officials again and again sidestep Islanders' questions by saying "Superfund is structured to deal with that problem." It's a lot of problem for a program with a $100,000 budget to deal with! Why clean it up if it keeps coming down?

While I am the daughter of two lawyers and the sister of three and savvy enough to realize EPA is reluctant to get taken to court for exceeding its jurisdiction, it makes no logical sense why the agency doesn't find some way to take a comprehensive look at the whole ASARCO problem. The issues are narrowed to the tiniest focus, dealt with piecemeal, and the result is nothing really changes.

In proposing a standard for arsenic emission at the Tacoma plant, I think EPA should immediately require ASARCO to use only low-arsenic grade ore (as is required at every other copper smelter in the U.S.), the secondary hoods should be installed by 1984, and EPA should move quickly to prove that it is providing an ample margin of safety for our health. If I cannot eat my garden vegetables, EPA is not providing me with an ample margin of safety.

Otherwise, I can only conclude that Vashon Island is not a very healthy place to live.

—Mary G.L. Shackelford

You become immune to arsenic

To The Editor: According to recent headlines in the Tacoma News Tribune, I should have died 20 years ago. I retired from the Tacoma Smelter four years ago, after working there for 30 years. The first 20 years I worked there, I ate so much arsenic that when I perspired my white undershirt would turn green from the arsenic that came out of my body. No, the aresenic did not kill me; and I don't believe I will die from cancer. The human body builds up a resistance to arsenic so that after awhile you become immune to it.

The last 10 years that I worked, the smelter had cleaned up the air so that I no longer had green streaks in my underwear. The main reason I retired early was because of a regulation saying we had to wear a respirator the whole eight-hour shift.

You do-gooders don't know what you are talking about most of the time. Sure, some people are allergic to arsenic. The same as some people are allergic to their wife or husband. Heart disease causes 51 percent of the U.S. deaths. Cancer causes 21 percent of the deaths in the U.S. Accidents cause 5 percent of the deaths. Other causes account for the final 23 percent.

So what part of the 21 percent cancer deaths is the Tacoma Smelter responsible for?

8-8-83 JOHN C. LARSEN,
4501 So. Warner

Smelter closure opposed

Health hazards have not been proven, state scientist says

By JAN GILDENHAR

Health hazards resulting from Tacoma smelter emissions have never been proven, says a state scientist who has studied the effects of the smelter's arsenic emissions.

Therefore the smelter should not be shut down nor should stricter clean-air standards necessarily be imposed, said Dr. Samuel Milham, an epidemiologist with the state Department of Social and Health Services.

"Unless you can demonstrate you're causing a public health problem, I think it would be irresponsible to be closing the plant," Milham said. "And we definitely haven't been able to demonstrate that."

Milham addressed a study session of the Tacoma City Council yesterday at the invitation of Mayor Doug Sutherland. The city is to host a daylong forum on the Environmental Protection Agency's proposed tougher arsenic emissions standards on Oct. 6. Asarco officials and a variety of environmental and public health organizations are being invited to participate.

Dr. Samuel Milham

"My recommendation is that we should make the air as clean as possible within the limits of existing technology," Milham said.

Studies have indicated that the exposure of Asarco workers to toxic arsenic is 20 to 100 times greater than that among the general population, and their lung cancer rate is 2 to 3 times that of the general population, he said. But studies have not established any arsenic threshold, Milham said — that is, the degree of exposure at which arsenic emissions may actually cause cancer.

The EPA has estimated that four cancer deaths a year can be attributed to the smelter and the proposed stricter standards would reduce that to one. But Milham said the EPA's figures "don't match reality."

"The critical question is whether long-term low-level exposure (to arsenic emissions) is dangerous," Milham said. "There's no doubt that workers demonstrate a higher cancer rate, but their exposure is at high levels also."

Milham said he conducted extensive studies in 1972 of pupils at Ruston Elementary School across the street from the smelter and of pupils at Fern Hill Elementary several miles away (the control group). The studies showed "the only thing different about those (Ruston) kids is that they don't get bee stings, 'cause arsenic kills the bees," he said.

"They haven't had a bee sting there in 25 years."

Although children in Ruston showed higher levels of arsenic in their urine, fingernails and hair than the other children, they did not seem to suffer any health problems as a result, Milham noted. Levels of absenteeism and academic achievement were quite similar at both schools, he said.

Fern Hill was chosen as a control group because its students' social and economic backgrounds were similar to those of Ruston pupils.

Milham said in 1978 he searched out men who attended Ruston Elementary in 1919, when the smelter began processing arsenic-rich copper. He traced 80 percent of them and found that only 1 in 20 had died of lung cancer, although at least half had worked at the smelter at one time or another and many of them lived in the Ruston area all their lives.

While there is no doubt that arsenic can be dangerous, how much arsenic exposure is harmful has not been demonstrated, he said.

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RESOURCE DOCUMENT

WORKSHOP ON RISK COMMUNICATION

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RESOURCE DOCUMENT FOR WORKSHOP ON RISK COMMUNICATION

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VI. PLANNING FOR RISK COMMUNICATION

United States
Environmental Protection Agency
Washington DC 20460

April
1988
OPA-87-020

EPA

Seven Cardinal Rules of Risk Communication

There are no easy prescriptions for successful risk communication. However, those who have studied and participated in recent debates about risk generally agree on seven cardinal rules. These rules apply equally well to the public and private sectors.

Although many of the rules may seem obvious, they are continually and consistently violated in practice. Thus, a useful way to read these rules is to focus on why they are frequently not followed.

Accept and involve the public as a legitimate partner

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.

Guidelines: Demonstrate your respect for the public and underscore the sincerity of your effort by involving the community early, before important decisions are made. Involve all parties that have an interest or a stake in the issue under consideration. If you are a government employee, remember that you work for the public. If you do not work for the government, the public still holds you accountable.

Point to Consider:

- The goal of risk communication in a democracy should be to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative; it should not be to diffuse public concerns or replace action.

Plan carefully and evaluate your efforts

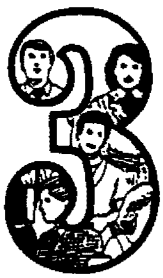
Risk communication will be successful only if carefully planned.

Guidelines: Begin with clear, explicit risk communication objectives—such as providing information to the public, motivating individuals to act, stimulating response to emergencies, or contributing to the resolution of conflict. Evaluate the information you have about the risks and know its strengths and weaknesses. Classify and segment the various groups in your audience. Aim your communications at specific subgroups in your audience. Recruit spokespeople who are good at presentation and interaction. Train your staff—including technical staff—in communication skills; reward outstanding performance. Whenever possible, pretest your messages. Carefully evaluate your efforts and learn from your mistakes.

Points to Consider:

- There is no such entity as "the public"; instead, there are many publics, each with its own interests, needs, concerns, priorities, preferences, and organizations.

- Different risk communication goals, audiences, and media require different risk communication strategies.



Listen to the public's specific concerns

If you do not listen to people, you cannot expect them to listen to you. Communication is a two-way activity.

Guidelines: Do not make assumptions about what people know, think, or want done about risks. Take the time to find out what people are thinking: use techniques such as interviews, focus groups, and surveys. Let all parties that have an interest or a stake in the issue be heard. Identify with your audience and try to put yourself in their place. Recognize people's emotions. Let people know that you understand what they said, addressing their concerns as well as yours. Recognize the "hidden agendas," symbolic meanings, and broader economic or political considerations that often underlie and complicate the task of risk communication.

Point to Consider:

- People in the community are often more concerned about such issues as trust, credibility, competence, control, voluntariness, fairness, caring, and compassion than about mortality statistics and the details of quantitative risk assessment.

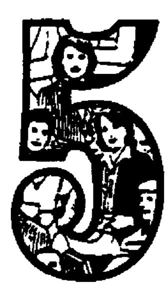
Be honest, frank, and open

In communicating risk information, trust and credibility are your most precious assets.

Guidelines: State your credentials; but do not ask or expect to be trusted by the public. If you do not know an answer or are uncertain, say so. Get back to people with answers. Admit mistakes. Disclose risk information as soon as possible (emphasizing any reservations about reliability). Do not minimize or exaggerate the level of risk. Speculate only with great caution. If in doubt, lean toward sharing more information, not less—or people may think you are hiding something. Discuss data uncertainties, strengths and weaknesses — including the ones identified by other credible sources. Identify worst-case estimates as such, and cite ranges of risk estimates when appropriate.

Point to Consider:

- Trust and credibility are difficult to obtain. Once lost they are almost impossible to regain completely.



Coordinate and collaborate with other credible sources

Allies can be effective in helping you communicate risk information.

Guidelines: Take time to coordinate all inter-organizational and intra-organizational communications. Devote effort and resources to the slow, hard work of building bridges with other organizations. Use credible and authoritative intermediaries. Consult with others to determine who is best able to answer questions about risk. Try to issue communications jointly with other trustworthy sources (for example, credible university scientists, physicians, or trusted local officials).

Point to Consider:

• Few things make risk communication more difficult than conflicts or public disagreements with other credible sources.

Meet the needs of the media

The media are a prime transmitter of information on risks; they play a critical role in setting agendas and in determining outcomes.

Guidelines: Be open with and accessible to reporters. Respect their deadlines. Provide risk information tailored to the needs of each type of media (for example, graphics and other visual aids for television). Prepare in advance and provide background material on complex risk issues. Do not hesitate to follow up on stories with praise or criticism, as warranted. Try to establish long-term relationships of trust with specific editors and reporters.

Point to Consider:

• The media are frequently more interested in politics than in risk; more interested in simplicity than in complexity; more interested in danger than in safety.

Speak clearly and with compassion

Technical language and jargon are useful as professional shorthand. But they are barriers to successful communication with the public.

Guidelines: Use simple, non-technical language. Be sensitive to local norms, such as speech and dress. Use vivid, concrete images that communicate on a personal level. Use examples and anecdotes that make technical risk data come alive. Avoid distant, abstract, unfeeling language about deaths, injuries, and illnesses. Acknowledge and respond (both in words and with actions) to emotions that people express—anxiety, fear, anger, outrage, helplessness. Acknowledge and respond to the distinctions that the public views as important in evaluating risks, e.g., voluntariness, controllability, familiarity, dread, origin (natural or man-made), benefits, fairness, and catastrophic potential. Use risk comparisons to help put risks in perspective; but avoid comparisons that ignore distinctions that people consider important. Always try to include a discussion of actions that are under way or can be taken. Tell people what you cannot do. Promise only what you can do, and be sure to do what you promise.

Points to Consider:

• Regardless of how well you communicate risk information, some people will not be satisfied.

• Never let your efforts to inform people about risks prevent you from acknowledging—and saying—that any illness, injury, or death is a tragedy.

- If people are sufficiently motivated, they are quite capable of understanding complex risk information, even if they may not agree with you.

This pamphlet was drafted by Vincent T. Covello and Frederick W. Allen, with the assistance and review of numerous colleagues in and out of government. Covello is Director of the Center for Risk Communication at Columbia University and is currently President of the Society for Risk Analysis (SRA). The views expressed here do not necessarily represent the views of Columbia University or the SRA. Allen is Associate Director of the Office of Policy Analysis at the Environmental Protection Agency (EPA). The EPA has published this pamphlet as a non-binding reference document, recognizing that the manner in which the guidance should be applied will necessarily vary from case to case. The authors invite your comments.

Risk Communication Problems and Tasks

Problems

Risk communication problems arise from (1) message problems (e.g., limitations of scientific risk assessments); (2) source problems (e.g., limitations of risk communicators and risk experts); (3) channel problems (e.g., limitations in the means or media by which scientific information about health or environmental risks is transmitted); and (4) receiver problems (e.g., characteristics of the intended recipients of the communication).

Message problems include:

- deficiencies in scientific understanding, data, models, and methods resulting in large uncertainties in risk estimates;
- highly technical analyses that are often unintelligible to lay persons;
- sheer amount of complexity of the analysis.

Source problems include:

- lack of trust and credibility;
- disagreements among scientific experts;
- limited authority and resources for addressing risk problems;
- lack of data addressing the specific fears and concerns of individuals and communities;
- failure to disclose limitations of risk assessments and resulting uncertainties;
- limited understanding of the interests, concerns, fears, values, priorities, and preferences of individual citizens and public groups;
- use of bureaucratic, legalistic, and technical language.

Adapted from *Risk Communication—A Review of the Literature*, a report prepared for the Environmental Protection Agency, August 1987, by Vincent T. Covello, Paul Slovic, and Detlof Von Winterfeldt.

Channel problems include:

- ❑ selective and biased media reporting that emphasizes drama, wrongdoing, disagreements, and conflict;
- ❑ premature disclosure of scientific information;
- ❑ over implications, distortions, and inaccuracies in interpreting technical risk information.

Receiver problems include:

- ❑ inaccurate perceptions of levels of risk;
- ❑ lack of interest in risk problems and technical complexities;
- ❑ overconfidence in one's ability to avoid harm;
- ❑ strong beliefs and opinions that are resistant to change;
- ❑ exaggerated expectations about the effectiveness of regulatory actions;
- ❑ desire and demands for scientific certainty;
- ❑ a reluctance to make trade-offs between risks, costs, and benefits;
- ❑ difficulties in understanding probabilistic information related to unfamiliar technologies.

Adapted from *Risk Communication—A Review of the Literature*, a report prepared for the Environmental Protection Agency, August 1987, by Vincent T. Covello, Paul Slovic, and Detlof Von Winterfeldt.

Some Dos and Don'ts of Listening

by Eastwood Atwater

In a crisis situation, you will be faced with several different audiences requiring your attention and ability to really "hear" what they are saying.

Here are some suggestions for improving your listening skills, but be reminded that mastery of these skills requires repeated practice.

When listening, try to <u>do</u> the following:

1. **Become aware of your own listening habits.**

   What are your strong points? What are your faults? Do you judge people too quickly? Do you interrupt too often? A better awareness of your listening habits is the first stage in changing them.

2. **Share responsibility for the communication.**

   Remember that it takes two to communicate—one to talk and one to listen—with each person alternating as the listener. Whenever you are unclear about what a speaker is saying, it is your responsibility to let the speaker know this, either by asking for clarification or actively reflecting what you heard and asking to be corrected.

3. **Be physically attentive.**

   Face the speaker. Maintain appropriate eye contact. Make certain your posture and gestures show you are listening. Sit or stand at a distance which puts you and the speaker at ease. Remember that the one who is speaking wants an attentive, animated listener, not a stone wall.

4. **Concentrate on what the speaker is saying.**

   Be alert for wandering thoughts. Being physically and verbally responsive will probably help you concentrate on what the speaker is saying.

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5. **Listen for the total meaning, including feelings as well as information.**

Remember that people communicate their attitudes and feelings "coded" in socially acceptable ways. Listen for the feelings as well as the content.

6. **Observe the speaker's non-verbal signals.**

Watch the speaker's facial expressions, and how much he or she gazes and makes eye contact with you. Listen to the speaker's tone of voice and rate of speech. Does the speaker's body language reinforce or contradict the spoken words?

7. **Adopt an accepting attitude toward the speaker.**

An accepting attitude on the listener's part creates a favorable atmosphere for communication. The more speakers feel accepted, the more they can let down their guard and express what they really want to say. Any negative attitude on the listener's part tends to make a speaker feel defensive, insecure, and more guarded in communication.

8. **Express empathetic understanding.**

Use active, reflective listening skills to discover how other people feel, and what they are really trying to say in terms of their own frame of reference.

9. **Listen to yourself.**

When you recognize the feelings stimulated in you by another's message, and can express those feelings, this clears the air and helps you to listen better.

10. **"Close the loop" of listening by taking appropriate action.**

Remember that people often speak with the purpose of getting something tangible done—to obtain information, to change your opinion, to get you to do something. The acid test of listening is how well you respond to the speaker's message with an appropriate action. In listening, actions speak louder than words.

"Some Dos and Don'ts of Listening" from *I Hear You*, copyright 1986 by Eastwood Atwater, Prentice Hall, Englewood Cliffs, NJ. 1981

While emphasis should be on positive suggestions for improving listening habits, it is helpful to keep in mind some of the pitfalls of listening.

Consequently, in listening, <u>don't</u> do the following:

1. **Don't mistake not talking for listening.**

   People who remain silent aren't necessarily listening. They may be preoccupied with their own thoughts. On the other hand, people can talk a lot and still process information and listen quite well.

2. **Don't fake listening.**

   Whenever you try to fake listening, your disinterest or boredom inevitably shows up in your facial expressions or body language. More often than not, fake listening comes across as an insult to the speaker.

3. **Don't interrupt needlessly.**

   People in positions of power tend to interrupt more often than those not in power without realizing it. If you must interrupt someone in a serious conversation, try to follow with a retrieval—helping the speaker to re-establish the train of thought.

4. **Don't pass judgment too quickly.**

   Judgmental remarks invariably put others on the defensive, serving as barriers to effective communication.

5. **Don't make arguing an "ego-trip."**

   Even if you argue only "mentally" with what the speaker is saying, you tend to stop listening and look forward to your turn to talk. When you begin to argue verbally, you become so preoccupied with justifying your own views that you often fail to hear the other's viewpoint. When you honestly disagree, you need to listen carefully in order to understand what you are disagreeing with. Then state your point of view.

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6. **Don't ask too many questions.**

Closed questions that require a definite answer should be kept to a minimum. Even open questions that encourage a speaker to elaborate on a point should be used with caution. Too many questions have a way of shifting control of the conversation to the listener, putting the speaker on the defensive.

7. **Don't ever tell a speaker "I know exactly how you feel."**

This remark serves more to justify your own efforts than to convince someone you are really listening. In the first place, it is difficult to know just how another person feels. Then too, such a generalized remark is likely to distract the speaker from further efforts at self-expression, as well as cast doubt on your own credibility as a listener. It is usually more effective to demonstrate you have heard with a reflective, empathetic response such as "I sense that you are feeling disappointed," or "I get the impression you are angry about this."

8. **Don't overreact to emotional words.**

Be careful not to let yourself get so caught up in the speaker's outburst of feelings that you miss the content of his or her message. Be alert for loaded words and expressions, but listen also for the message that comes with them. Your own feelings can block your understanding of something you may really need to hear.

9. **Don't give advice unless it is requested.**

Even when someone asks your advice, it is better to use reflective listening skills to determine what that person wants to know.

10. **Don't use listening as a way of hiding yourself.**

People may use the appearance of listening as a way of avoiding emotional involvement and real communication. The "listener" who uses silence as a personal retreat is inadvertently preventing effective communication, rather than furthering it.

IMPROVING DIALOGUE WITH COMMUNITIES:
A SHORT GUIDE FOR GOVERNMENT RISK COMMUNICATION

Submitted to:

New Jersey Department of Environmental Protection
Division of Science and Research
Contract #C29444
December 14, 1987

(This report accompanies two related volumes: *Improving Dialogue with Communities: A Risk Communication Manual for Government,* and "Encouraging Effective Risk Communication In Government: Suggestions for Agency Management.")

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"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

INTRODUCTION

Agency representatives who deal with environmental health issues often feel frustrated with communities that don't seem to listen and many times seem frightened of the "wrong" risks. In response, agency policy-makers and staff can choose to ignore communities (and in all likelihood face increased hostility). Or they can choose to interact more effectively with the public. This guide was written for those who understand that they must deal with communities but need some help in doing so.

Risk communication can help agencies to:

- understand public perception and more easily anticipate community response to agency actions;
- increase the effectiveness of risk management decisions by involving concerned publics;
- improve dialogue and reduce unwarranted tension between communities and agencies;
- explain risks more effectively; and
- alert communities to risk in constructive ways.

Communicating about environmental problems, however, cannot replace effective risk management. This guide will not provide techniques to make environmental problems disappear. Although it might seem possible to sell "bad" policy with "good" communication, we doubt that communities will buy the result.

DEVELOPMENT OF THIS GUIDE

"Improving Dialogue with Communities" was made possible by a contract from the Division of Science and Research (under the Spill Research Fund Program), New Jersey Department of Environmental Protection. Not only did DSR fund this project, but it also contributed substantive input and cooperated in setting up an advisory committee with staff of NJDEP and the New Jersey Department of Health.

Because the research literature lags significantly behind the wisdom of many practitioners, who have been "experimenting" for years, the suggestions in this guide are based largely on interviews with more than 50 academic experts, industry representatives, citizen leaders, and agency staff throughout the country. These suggestions have undergone a review process involving both an advisory committee and those we interviewed. The authors are grateful to all the people who agreed to be interviewed; they are listed in the longer version of this guide, *Improving Dialogue with Communities: A Risk Communication Manual for Government.*

Although based on extensive interviewing and a review of the research literature, this guide does not purport to be derived from quantitative analysis or entirely free of bias. We attempted to distill the wisdom, judgments, values, and intuitions of those whom we interviewed in ways that would be helpful to practitioners.

USING THIS GUIDE

This guide, which is an abbreviated version of a longer manual, is useful to those who wish a quick overview of how the public sees risk and how to improve inter-

"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

actions with the public. As such, this guide may help orient new staff or those unfamiliar with strategies for dealing with communities. It may also serve as a reference for more seasoned practitioners.

Because most risk communication issues are so interrelated, we suggest you read the entire guide first. Pay particular attention to Chapter I, which lays the groundwork for much of the guide. When you are dealing with a particular communication problem, you may wish to consult the longer manual for more in-depth guidance. If the suggestions here strike you as a bit too "cut and dried," also consider consulting the longer manual for more substantiation. Although the guide you are reading contains nearly all the "guidelines" in the longer version and sections entitled "Yes, But...." to deal with the most likely concerns, we have omitted a variety of features: (a) in-depth explanations of the rationale for each suggestion; (b) extensive quotations from those we interviewed concerning the suggestions; and (c) anecdotes and examples that illustrate the suggestions. (The complete manual is available from NJDEP's Division of Science and Research, 401 East State Street, CN 409, Trenton, 08625.)

Finally, some of the suggestions may seem difficult to implement without support from agency policy-makers. This issue is discussed in a separate report, "Encouraging Risk Communication in Government: Suggestions for Agency Management," also available from the Division of Science and Research.

A FINAL NOTE

Many of the suggestions in this guide may seem common sense. Unfortunately, these common-sense guidelines are routinely violated in agency practice, leading to the all-too-common battles between agencies and communities. We hope this guide will help common sense become more common than the battles.

I. HOW COMMUNITIES SEE RISK

Agency scientists and policy-makers are particularly confused and frustrated by public reactions to environmental risk. Tempers flare at a public meeting concerning a risk that the agency estimates might cause considerably fewer than one-in-a-million increased cancer deaths. Yet people will smoke during the break and drive home without seat belts—risks far greater than those discussed at the public meeting. When agency scientists point out this apparent contradiction (ignoring the fact that smoking and driving without a seat belt are risks that people choose, not an environmental risk that chooses them), people become even angrier. Conversely, risks that the agency sees as serious—naturally occurring radon gas in homes, for example—can be met with relative indifference by the public.

In order to reduce the level of hostility between agencies and the public, those who work within agencies need to understand better how communities perceive risk. Agencies sometimes respond to unexpected community reactions by dismissing them as irrational and concluding that the public is unable to understand the scientific aspects of risk. But when agencies make decisions that affect communities without involving those communities, they often elicit even angrier responses.

In order to break this cycle, agencies might begin by recognizing that communities are quite capable of understanding the scientific aspects of risk assessment. "The public" includes doctors, chemists, and teachers, as well as persons with less scientific background, who understand many of the technical intricacies of risk. In fact, while government personnel may change over the course of an environmental problem, residents of affected communities often remember studies, reports, and agency actions with an impressive amount of recall. Too often government assumes that because communities don't agree with an agency action, they don't understand it.

Because outbursts of citizen anger make agencies understandably uncomfortable, they also tend to forget that public outrage can be extremely positive. In fact, most environmental agencies and a significant number of the laws they enforce are the results of citizen campaigns, fueled by anger over environmental degradation. Funding for these laws, and consequently for agency staff, also depends in some cases on tough legislative battles fought by citizens. In addition, most agencies can admit to a number of environmental problems that wouldn't have been uncovered were it not for community action.

On the other hand, agencies particularly resent anger directed at them rather than at the environmental problem. Unfortunately, agencies tend to act (often unwittingly) in ways that provoke such anger.

FACTORS IN COMMUNITY OUTRAGE

Admittedly, public fears are often not well-correlated with agency assessments. While agencies focus on data gathered from hazard evaluations, monitoring, and risk assessments, the public takes into account many other factors besides scientific data. Collectively, it is helpful to think of these non-technical factors as the "outrage" dimension of risk, as opposed to the "hazard" dimension more familiar to agency professionals. Because the public pays more attention to outrage than the experts do, public risk assessments are likely to be very different from agency risk assessments. Ignoring the

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variables that influence public perception—or worse, labeling them irrational and then discounting them—is guaranteed to raise the level of hostility between community members and agency representatives and will ultimately stand in the way of a successful resolution of the problem.

Merely hammering away at the scientific information will rarely help. Most agency representatives can recall instances when explaining the science made little difference—or made people even angrier. While it may be tempting to conclude from this that laypeople cannot understand risk assessment data, research in the field of risk perception, backed by much anecdotal evidence, strongly suggests that other factors are at work. Below are some of the key variables that underlie community perception of risk:[1]

a. *Voluntary risks are accepted more readily than those that are imposed.* When people don't have choices, they become angry. Similarly, when communities feel coerced into accepting risks, they tend to feel furious about the coercion. As a result, they focus on government's process and pay far less attention to substantive risk issues; ultimately, they come to see the risk as more risky.

b. *Risks under individual control are accepted more readily than those under government control.* Most people feel safer with risks under their own control. For example, most of us feel safer driving than riding as a passenger. Our feeling has nothing to do with the data—our driving record versus the driving record of others. Similarly, people tend to feel more comfortable with environmental risks they can do something about themselves, rather than having to rely on government to protect them.

c. *Risks that seem fair are more acceptable than those that seem unfair.* A coerced risk will always seem unfair. In addition, a community that feels stuck with the risk and little of the benefit will find the risk unfair—and thus more serious. This factor explains, in part, why communities that depend on a particular industry for jobs sometimes see pollution from that industry as less risky.

d. *Risk information that comes from trustworthy sources is more readily believed than information from untrustworthy sources.* If a mechanic with whom you have quarrelled in the past suggests he can't find a problem with a car that seems faulty to you, you will respond quite differently than if a friend delivers the same news. You are more apt to demand justification, rather than ask neutral questions, of the mechanic. Unfortunately, on-going battles with communities erode trust and make the agency message far less believable.

While the above factors are those most frequently stumbled over by government agencies, social scientists have identified additional variables that are also likely to be relevant to agencies dealing with the public about environmental health issues:

e. *Risks that seem ethically objectionable will seem more risky than those that don't.* To many people, pollution is morally wrong. As former EPA Assistant Administrator Milton Russell put it, speaking to some people about an acceptable level of pollution is like talking about an acceptable number of child molesters.

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[1] Baruch Fischhoff, Paul Slovic, and Sarah Lichtenstein conducted much of the ground-breaking research that developed an understanding of risk perception variables.

"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

f. *Natural risks seem more acceptable than artificial risks.* Natural risks provide no focus for anger; a risk caused by God is more acceptable than one caused by people. For example, consider the difference between the reactions to naturally occurring radon in homes and the reactions to high radon levels caused by uranium mine tailings or industrial sources.

g. *Exotic risks seem more risky than familiar risks.* A cabinet full of household cleansers, for example, seems much less risky than a high-tech chemical facility that makes the cleansers.

h. *Risks that are associated with other, memorable events are considered more risky.* Risks that bring to mind Bhopal or Love Canal, for example, are more likely to be feared than those that lack such associations.

The greater the number and seriousness of these factors, the greater the likelihood of public concern about the risk, regardless of the scientific data. As government agencies have seen many times, the risks that elicit public concern may not be the same ones that scientists have identified as most dangerous to health. When officials dismiss the public's concern as misguided, moreover, the result is controversy, anger, distrust, and still greater concern. None of this is meant to suggest that people disregard scientific information and make decisions based only on the other variables—the outrage factors. It does suggest, however, that outrage *also* matters, and that by ignoring the outrage factors, agencies skew the balance and cause people to become still more outraged. This is the logic that leads to the guideline that follows.

Pay as much attention to outrage factors, and to the community's concerns, as to scientific variables. At the same time, don't underestimate the public's ability to understand the science.

Agencies too often focus on the scientific data and ignore the outrage factors. They pay the price for doing so. Insistence on dealing with the "right" risks, the "right" way, may seem to many outside the agency as arrogant at best. If you fail to attend to the outrage factors and people's concerns from the outset, you will often be forced to attend to them later, after you have angered the public—a far more difficult situation.

For example, communities which were not consulted during the decision-making process more readily fight agency decisions. Similarly, agency representatives have sometimes been shouted down when trying to present data because communities have felt their concerns were not acknowledged, much less addressed.

Nonetheless, there are examples of agency successes. The New York Department of Health asked office workers their concerns and gave them opportunities for input following a fire that contaminated their office building with dioxin. Trust was built in the process. NJDEP listened to—and responded to—community concerns in Clinton where extremely high radon levels were found, leading to a community response to NJDEP that seemed far more positive than in many other instances. In Virginia, a developer involved the community in the risk assessment process, building sufficient credibility that when the risk assessment showed negligible risks, the results were believed. In most of these instances of success, communities that were consulted about their concerns were also helped to understand the science, and their understanding seemed to increase.

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In short, response to risk is more complex than a linear response to "the facts." This does not mean that people don't need to know—or want to know—the facts. It means rather that agencies need to take into account other factors as well.

§§§

YES, BUT...

• ***Our job is to protect public health. That means relying on data, not dealing with outrage factors.***

There are basically three responses to this point:

First, if you merely run with scientific information and ignore the outrage factors, you will outrage the public. As a result, risks the agency deems minimal will become battlegrounds. Agencies will have less time for serious risks. In short, one way or another agencies will have to deal with these factors.

Second, in a democracy controversial issues are not merely determined by those with technical expertise. For example, the experts in the Pentagon have great technical expertise in weaponry, but few people, regardless of their political beliefs, feel that American defense policy should be determined solely by the Pentagon.

Third, data are not always complete, and management options are rarely perfect. The public's raising other concerns can lead to better technical solutions.

• ***If it were not for activist groups, there would be no outrage.***

As anyone who has tried to organize a community can attest, it is hard to create outrage when none exists. Advocacy groups can focus or direct the community's anger, but rarely create it. In fact, most environmental activists count on government to create the outrage. In many cases where environmental officials blame public-interest groups for blocking solutions, the blame needs to be shared by the officials themselves, who unwittingly goaded the outrage by neglecting from the outset to listen to community concerns. Instead of blaming citizens for not understanding risk, in short, agencies might spend more time trying to understand citizen concerns.

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II. EARNING TRUST AND CREDIBILITY

Agencies achieve trust, in large part, by being consistently competent, caring, and honest. If you communicate with honesty and fairness, your audience will often respond in kind. On the other hand, slick packaging with a veneer of honesty is easy to see through and more likely to undermine trust than to build it. Jim Callaghan, who spent many years advising industry as senior vice president of the public relations firm of Hill and Knowlton, puts it this way: The only way to achieve credibility is to "be credible."

Of course, acting trustworthy is no guarantee that people will ultimately trust you. But if you fail to "be credible," you will virtually guarantee community opposition, in the form of both disagreement with the science and resentment of the agency.

> Bruce Bentley, citizen participation specialist at the New York State Department of Environmental Conservation, points out that a key to building trust can be involving people in decision-making. A controversy over what to do with PCBs in the Hudson River was fueled by the lack of trust resulting from the agency's failure to ask people about disposal of the PCBs. Bentley says, "We failed to involve people in determining what the criteria for a site should be and then went ahead and selected the site.... By that time, people were not willing to buy into the criteria and certainly, therefore, not willing to buy into the site."
>
> Conversely, trust can be built by dealing with the public forthrightly. When a fire contaminated a Binghamton office building with dioxin, the New York State Department of Health decided to make all working sessions of the technical risk assessment committee open to the public and the media. The committee, which consisted of people from the city, union members, and technical people unaffiliated with the health department, struggled with difficult questions openly. Although the meetings were not public information meetings, there was time allotted for questions at the end of each session. As Faith Schottenfeld, community relations specialist at the department, pointed out, "It was really helpful for people to see the kind of interchange that went on between these experts when it came to making difficult decisions."

The guidelines in this chapter provide a framework for the more specific recommendations in other chapters.

1. **Be aware of the factors which inspire trust.** Trust in an agency depends, in large part, on whether the agency: (a) seems competent; (b) seems caring; (c) encourages meaningful public involvement; (d) seems honorable and honest; and (e) takes into account the "outrage factors" which influence perception of risk. (See Chapter 1.) In essence, instead of pushing the public to trust them, agencies should strive toward acting consistently trustworthy.

2. **Pay attention to process.** In many cases citizen opposition focuses not only on agency action (or inaction), but also on the manner in which the agency proceeded toward that action. Try, whenever possible, to involve affected communities in agency action.

3. **Explain agency procedures.** Communities need to understand government's internal workings, and agencies need to show that they operate in some logical manner. Indicate how public input fits into the process.

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"People read the agencies and their actions more carefully than they read the details of the studies.... That's what we have generalized skill at." Baruch Fischhoff, leading researcher on risk perception, Carnegie-Mellon University.

4. **Be forthcoming with information and involve the public from the outset.** If you fail to disclose information or involve people early, the public is apt to mistrust the agency. The agency will then be put on the defensive. (See Chapter III.)

5. **Focus on building trust as well as generating good scientific data.** As explained in Chapter I, people's risk judgments are seldom based solely on scientific information, but rather on a combination of the data, their perception of the risk due to other variables, and their feelings about the agency.

6. **Follow up.** When your promises fall through the cracks, you might not notice, but those to whom you made the promises usually do. Make every effort to get back to people and check to see if your promises are becoming reality. In particular, consider making sure that notes are taken at public meetings regarding commitments. Then write follow-up memos and take follow-up actions to make the promises happen.

7. **Make only promises you are sure you can keep.** It is often tempting to make unrealistic promises when pressed by the public, or to promise something you genuinely expect to deliver, only to find out later you can't. Consider explaining goals and the process leading to them rather than promising firm dates. Providing regular progress reports, even when progress is slow, can be very helpful. If you find you can't follow through on a promise you have made, explain fully as soon as possible rather than hoping people will forget. They probably won't.

8. **Provide information that meets people's needs.** Anticipate what people want to know—and what they will need to know even if they don't ask for it. Take some time to develop a list of problems, issues, and needs people might have, and prepare responses that address them. Keep in mind that different organizations and types of people will have different needs—a pregnant woman may have different concerns than the Chamber of Commerce. (See Chapter V.)

9. **Get the facts straight.** Although agency representatives work hard to provide accurate information, sometimes facts get jumbled or key information is left out so people later feel misled. Try to spot areas in advance where confusion might occur and make an extra effort to be clear. If the effort fails, correct the misimpression as quickly as possible.

10. **Try to coordinate with other agencies.** When communities get mixed messages, they are apt to feel confused and distrustful. To the extent possible, coordinate agency messages. When agencies have honest differences, acknowledge them.

11. **Make sure to coordinate within your agency.** Lack of coordination within the agency creates confusion and an impression of agency ineptness. Responses to various issues should be consistent from one division to another, or the differences should be acknowledged and explained.

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12. Don't give mixed messages. Risk issues are sufficiently confusing that any inconsistencies—or seeming inconsistencies—can make matters worse. For example, if you tell a community that risks are minimal and then take samples wearing protective gear, to reduce confusion, explain the seeming contradiction *before* you take the action.

13. *Listen* to what various groups are telling you. Try to foster mutual respect and consideration with all stakeholders in an issue. Avoid offending any group, including activists. Agencies tend to overestimate the power of activist groups. These groups can't create outrage; they can only nurture existing outrage.

14. Enlist the help of organizations that have credibility with communities. Groups that have local credibility (not merely organizations which agencies believe *should* have credibility) can be involved in helping explain risks. However, this approach can't replace forthrightness or more extensive community involvement.

15. Avoid "closed" meetings. While casual meetings—the routine turning of government wheels—are rarely suspect, private meetings—those closed to the public—are more likely to cause distrust. The meetings agencies feel they can't afford for the public to know about are the very ones the public will probably eventually hear about. You may avoid many problems by keeping meetings open.

16. If you are dealing with a situation in which trust is low, consider taking the following steps:

a. Review the outrage factors in Chapter I and the guidelines in this chapter. Consider which ones may have been violated.

b. Acknowledge the lack of trust: "I know you may feel I can't be trusted because the person who handled this case before me delayed in giving you the information..."

c. Indicate what steps you plan to take to prevent the trust-eroding actions from happening again: "In order to make sure you get information as quickly as possible, I am going to send you bi-weekly updates about the status of the situation. These updates will include all new data."

d. Ask those who distrust you what *they* feel would make them more likely to trust you. To the extent possible, implement their suggestions.

e. Respond on a personal level, when appropriate (see Chapter IV).

f. Try to reduce reasons for distrust by sharing information and involving the public in developing solutions (see Chapter IV).

g. Be patient. Don't expect all the people to trust you all the time, even if you feel you are totally trustworthy.

Because it may take a lot of effort to recoup trust, expect to go out of your way for people. If you are the person who aroused the distrust, acknowledge your mistakes.

> *"Because communities don't trust us they forget what is logical. The reason they don't trust us is that we didn't involve them in the decisions."* Bruce Bentley, Citizen Participation Specialist, New York Department of Environmental Conservation.

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- ***It seems that no matter what we do, some people will never trust us.***

True. However, the fact that you can't earn the trust of all the people all the time does not imply that you should forgo the effort. Check to make sure that—despite a basic commitment to trustworthiness—you have not violated some of the basic principles in this guide. The agency may also be confusing trust with agreement; people can trust each other's integrity and still disagree on fundamental matters.

TEN WAYS TO LOSE TRUST AND CREDIBILITY

Take a good look at most risk communication "horror stories" and you'll probably find a major breakdown in trust between government representatives and the public they are supposed to serve. The next time someone comes to you with a sob story about communicating with the public, you might want to hand them this tongue-in-cheek list. Or better yet, hand it out before the damage is done.

1. ***Don't involve people in decisions that directly affect their lives.*** Then act defensive when your policies are challenged.

2. ***Hold onto information until people are screaming for it.*** While they are waiting, don't tell them when they will get it. Just say, "These things take time," or "It's going through quality assurance."

3. ***Ignore peoples' feelings.*** Better yet, say they are irrelevant and irrational. It helps to add that you can't understand why they are overreacting to such a small risk.

4. ***Don't follow up.*** Place returning phone calls from citizens at the bottom of your "to do" list. Delay sending out the information you promised people at the public meeting.

5. ***If you make a mistake, deny it.*** Never admit you were wrong.

6. ***If you don't know the answers, fake it.*** Never say "I don't know."

7. ***Don't speak plain English.*** When explaining technical information, use professional jargon. Or simplify so completely that you leave out important information. Better yet, throw up your hands and say, "You people could not possibly understand this stuff."

8. ***Present yourself like a bureaucrat.*** Wear a three-piece suit to a town meeting at the local grange, and sit up on stage with seven of your colleagues who are dressed similarly.

9. ***Delay talking to other agencies involved***—or other people involved within your agency—so the message the public gets can be as confusing as possible.

10. ***If one of your scientists has trouble relating to people, hates to do it, and has begged not to, send him or her out anyway.*** It's good experience.

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III. DECIDING WHEN TO RELEASE INFORMATION

Perhaps no other aspect of agency communication of environmental risk is so closely related to the agency's credibility as its decision about when to share information with the public. Agencies fear that releasing information early may lead to undue alarm or lead to disclosure of incorrect or misinterpreted data. Agencies also hold onto information while developing risk management options rather than going to the public empty-handed.

But what agencies view as responsible caution, communities are apt to see as a "cover-up" or as bureaucratic intransigence. When health risks are involved, regardless of the level of risk, communities find it difficult to accept any justification for withholding information. Therefore, community anger over agency process may block possibilities for constructive dialogue over the risk itself. Moreover, waiting to release information until the agency has made its management choices reduces the chances for community participation in the risk management process, and thus lessens the chances of a solution acceptable to the agency and the community.

> For example, Susan Santos, formerly with the Superfund program in EPA Region I and currently manager of the Risk Assessment Group at E.C. Jordan Company, was once in a position where the release of test results was delayed for three months while the agency analyzed an additional round of samples, interpreted the data, and decided whether EPA or state government should take the lead. By the time the agency let the community know the level of contaminants in their wells, residents were so upset with the agency that communication was extremely difficult, if not impossible.
>
> On the other hand, Bruce Bentley, citizen participation specialist with the New York Department of Environmental Conservation, tells of a county health department going door-to-door sampling wells for TCE and explaining the potential risk as soon as there was any reason for suspicion of contamination of private wells. Results of the tests were sent by mail, informing residents of times for "availability sessions" with state and county representatives to answer questions. People were alerted to each step of the process before it happened, and as a result discussion with the community centered on the risk itself, not on the way people were treated.

The following suggestions provide guidance about deciding when to communicate and steps to take if you decide to delay release.

1. If people are at risk, do not wait to communicate—and to act on—risk information. If a hazard is putting people at immediate risk, the agency should follow its mandate to protect public health without hesitation.

2. If the agency is investigating a potential risk that people aren't aware of, the agency should seriously consider making known what it is doing and why. When an agency announces findings from an investigation people have not been aware

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of, the agency is forced to defend its delay in announcing the investigation, and to justify the possibility that people were exposed to a risk longer than necessary. The public, in its anger over not being told, is more likely to overestimate the risk and far less likely to trust any recommendations that the agency makes concerning the risk itself.

3. **If it seems likely that the media or someone else may release the information before you are ready, release it yourself.** When information is leaked, agencies lose the ability to shape the issues and are instead engaged in playing "catch up" at the expense of their credibility and the accurate portrayal of information.

4. **If it is likely that the media will "fill in" with information concerning an on-going story while they are waiting for you to speak, speak first.** When you wait to communicate about an issue that is already news, the press will shape the issue without you. You may spend more time defending your views or your credibility.

5. **If you really don't trust your data, talk to the public about your procedures but don't release the data.** Obviously, hold onto data for which your preliminary review shows serious quality control or methodological flaws. However, be up-front and tell citizens what has happened and when they will be able to get some results.

6. **If the preliminary results do show a problem—and you are fairly confident of the results—release them and explain the tentativeness of the data.** If you are fairly confident that the data show a problem, then holding onto data for any length of time for any reason is likely to be considered unconscionable. You will leave the agency vulnerable to charges of cover-up later on and risk creating a great deal of anger.

7. **Before deciding to wait to communicate—especially if the news is bad—consider the effect on the credibility of the agency representative dealing with the public.** Because credibility can be a scarce commodity, difficult to replace, you might make it a major variable in your decision about timing the release of information. In particular, take into account the effect of your decision on those staff who are dealing with the community.

8. **Release information while the risk management options are tentative, rather than waiting to develop solutions.** If they are not consulted during the decision-making process, people are likely to resent decisions that affect their lives. Consider, instead, giving people risk management options, not decisions, when you release the data. Then work with them to develop risk management decisions. (See Chapter IV.)

9. **If you feel the information will not make sense unless released with other relevant information—and you don't have all the information yet—wait to release**

> *"When you're designing an investigation or a regulatory strategy, the communication should begin just as soon as you sit down to design it if you are going to be successful and build credibility."* **Thomas Burke, Deputy Commissioner, New Jersey Department of Health.**

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> *"We get a great deal of criticism because people don't know what we're doing.... There's always going to be delay; there's always going to be problems. But at least we can tell them what we're doing."* Gary Sondermeyer, Acting Bureau Chief, Bureau of Solid Waste & Resource Recovery Planning, NJDEP.

it all at once. But explain to the public why you are waiting, and get the information as soon as you can. If piecemeal release of information would seriously disrupt the agency's program or the public's understanding, then consider delay. But take a hard look at whether explanations really need to wait or, in fact, need to be handled better. If you wait, be sure to be clear about your reasons, and say when the information will be available.

10. If you wait until the data are quality-assured to release them, use the time—and the preliminary data—to develop management options and advise the community on interim actions, if necessary. While the agency may choose not to release data until it is fully confident, it can still use those preliminary results to guide discussions about the risk and possible mitigation efforts.

11. If you are waiting to communicate data or information for some other reason, don't say you are waiting for data to undergo quality assurance. Use this rationale only when it is the real reason. Agencies lose credibility when they tell half-truths or remain silent and let others fill in the information gaps—often incorrectly. If you need to delay release of information, you will generally do better by being forthright and not using quality control as an excuse.

12. If you have decided that you can't communicate right away about the risk, talk to the public about the process you are going through to get the information, etc. *Don't merely remain silent.* In the absence of information from the agency, people may fill in the blanks of missing information themselves, or they may become more fearful thinking that the truth is too awful to be told.

§§§

YES, BUT....

- ***Releasing information early, while data are still preliminary and we don't have a clear game plan, leaves the agency vulnerable to criticism.***

This guide is not suggesting releasing information without forethought and planning. We are suggesting that you consider releasing the data if you trust them, and if you have developed some management options or a process leading to development of options. Although the agency is obviously vulnerable to criticism, you may be more vulnerable if you hold onto information. You will be taking a gamble with your credibility.

- ***By releasing information early, we may cause undue alarm.***

You may cause greater alarm, compounded by resentment and hostility, if you hold onto information. When people are not given information, they may think that the truth is too awful to be told, or they may consider the agency uncaring. Instead, consider releasing information in context and with caveats, if necessary.

- ***We run the risk of legal liability if we release information early.***

The number of cases in which liability is a primary concern—rather than a convenient rationale is questionable. "Can we do this?" will probably elicit a different response from a lawyer than "We want to do this, so can you help us deal with any legal concerns?" If, in fact, there might be a liability problem, vulnerability to legal action should be weighed against the ten reasons given below for considering early release of information.

TEN REASONS TO RELEASE INFORMATION EARLY

Decisions about when to release information depend, in large part, on the situation. However, agencies should seriously examine the implications of holding onto information. The next time you contemplate whether to make information public, consider some of the reasons to release information early:

1. **People are entitled to information that affects their lives.**
2. **Early release of information sets the pace for resolution of the problem.**
3. **If you wait, the story may leak anyway. When it does, you are apt to lose trust and credibility.**
4. **You can better control the accuracy of information if you are the first to present it.**
5. **There is more likely to be time for meaningful public involvement in decision-making if the information is released promptly.**
6. **Prompt release of information about one situation may prevent similar situations elsewhere.**
7. **Less work is required to release information early than to respond to inquiries, attacks, etc. that might result from delayed release.**
8. **You are more apt to earn public trust if you release information promptly.**
9. **If you wait, people may feel angry and resentful about not learning of the information earlier.**
10. **People are more likely to overestimate the risk if you hold onto information.**

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IV. INTERACTING WITH THE COMMUNITY

Agency staff and members of the public are apt to feel equally frustrated by stormy interactions. Both get weary of arguments that revolve around "who said what to whom when," rather than issues that contribute substantively to solving environmental health problems.

In response, some agency representatives feel that the best interaction with the public is no interaction. They fervently hope that risk communication techniques will make the public go away and leave the agency to make decisions in peace. However, there is a strong consensus among experienced practitioners that the solution to the problems described above is more, rather than less interaction.

Two cases illustrate this point and contrast markedly with the battles that sometimes characterize agency interactions with the public:

> In Tacoma, Washington EPA was confronted with a difficult policy question: How should the agency regulate an arsenic-emitting smelter that provided a substantial economic base for the community? The problem involved (as environmental health problems often do) issues of equity, economics, and community values in addition to technical concerns. EPA decided to open the process to the public, enabling the community to grapple with some of the uncertainties and judgment calls that often face agencies. While making clear that the final decision rested with the agency, EPA demonstrated by word and by action genuine interest in the community's concerns and values. For example, EPA staff who lived in the area by the smelter critiqued presentations so that the agency better addressed community needs. To demonstrate EPA's commitment to soliciting input, informational presentations were followed by question-and-answer sessions in small groups, facilitated by people from outside the agency. Because the smelter closed, a decision was never required. But the experiment in Tacoma is an example of an agency respecting community values and attempting to involve people outside the agency meaningfully in the decision-making process.
>
> Lois Gibbs of the Citizen's Clearinghouse for Hazardous Wastes (and previously a key citizen leader at Love Canal) relates a story in which a private developer was confronted with high levels of arsenic in groundwater. In the interests of selling homes and avoiding litigation, he provided potential homeowners with funds to hire a technical consultant agreeable to both sides. The consultant or the community members themselves were involved in every step of the risk assessment process, including developing sampling plans and determining the assumptions on which the assessment was based. When the risk assessment showed negligible risk, people trusted the results sufficiently to purchase homes.

When interacting with the public, consider the following guidelines.

1. **Recognize the importance of community input.** Citizen involvement is important because: (a) People are entitled to make decisions about issues that directly affect their lives; (b) Input from the community can help the agency make better decisions; (c) Involvement in the process leads to greater understanding of—and more appropriate reaction to—a particular risk; (d) Those who are affected by a problem bring

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"The community is the expert about possible routes of exposure and what they are most concerned about." Raymond Neutra, Chief, Epidemiological Studies and Surveillance Section, California Department of Health Services.

different variables to the problem-solving equation; and (e) Cooperation increases credibility. Finally, without community input, battles that erode public confidence and agency resources are more likely.

2. **To the extent possible, involve the community in the decision-making process.** Agencies typically spend considerable effort developing a risk management strategy, announce it to the community, and then defend the strategy against the onslaught of opinion— often a reaction to the agency's failure to involve those affected. Instead, particularly with issues which are apt to provoke controversy, consider involving the public in risk management decisions. Some practitioners and academic experts also suggest public involvement in the risk assessment process, as illustrated by the story at the beginning of this chapter.

As illustrated by the "Citizen Participation Ladder" on the following page, citizen involvement takes a variety of forms from fairly minimal participation ("Government Power") to citizens taking the lead ("Citizen Power"). Consider placing agency interactions with the community at a higher rung on the ladder. Propose a higher level of involvement from the outset rather than being pushed by the community to the next rung. Increasing the level of public participation is particularly important when: (a) controversy exists; (b) feelings run high; (c) the agency genuinely needs input; or (d) citizens request it.

- **Involve the community at the earliest stage possible.** Meaningful input is easier before agency staff feel committed to a course of action. Communities are also more likely to be responsive to agency ideas when they are involved early.

- **Clarify the public's role from the outset.** In other words, clearly define your position on the Citizen Participation Ladder. For example, don't promise the public input and then essentially ask for ratification of agency decisions.

- **Acknowledge situations where the agency can give the community only limited power in the decision-making.** Present legal or other constraints (resources, time, staffing, regulatory limitations, etc.) from the outset, but avoid using them as false excuses. Consider community suggestions for ways to deal with these constraints.

- **Find out from communities what type of involvement they prefer.** Different communities will want different types of interaction and should be consulted about these preferences.

3. **Identify and respond to the needs of different audiences.** Although the term "the public" is used throughout this guide, in fact there are many publics, each affected differently by an issue. Depending on the issue, the agency may need to communicate with industry representatives, environmental groups, civic organizations, sporting or recreational associations, local government agencies, local elected officials, local businesses, property owners, realtors, etc. These interests should be identified and spoken with about *their* concerns.

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LADDER of CITIZEN PARTICIPATION

Citizen Power	**Citizens act without communicating with government**	• volunteer fire department; • citizen investigation; • citizen development and implementation of programs
Power-Sharing	**Citizens and government solve problems together**	• funding of citizen groups to hire technical consultants and/or implement projects; • citizen oversight and monitoring; • meetings called jointly by government and citizen groups
Consult 2	**Government asks citizens for meaningful input and intends to listen**	• citizen advisory committees; • informal meetings; • on-going dialogue; • some public hearings
Consult 1	**Government asks citizens for limited input and would prefer not to listen**	• most public hearings; • most requests for responses to formal proposals; • pro-forma meetings and advisory committees
Inform	**Government talks; citizens listen**	• some public meetings; • press releases and other informational strategies: newsletters, brochures, etc.
Government Power	**Government acts without communicating with citizens**	• some investigations; • legal and enforcement actions

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"People have to identify with people as human beings.... Rapport is the key." Vincent Covello, Director, Risk Assessment Program, National Science Foundation

- **Try to identify the various interests in a situation at the beginning and meet with them informally.** This involves a networking process: (a) Make a list of the aspects of the issue and types of organizations that might be interested; (b) Contact groups with which you are familiar; and (c) Ask those groups for the names of others. Then contact the affected groups. Keep working to expand the range of constituencies to ensure that you have consulted those affected by the issue.

- **Recognize the strengths and weaknesses of citizen advisory groups. Define the role of the group from the outset.** Such groups work most effectively if they represent the affected public and involve people in meaningful ways, rather than distance the agency from concerned citizens. Before developing a citizen advisory group, consult the full-length version of this manual (see Introduction).

- **Deal with everybody equally and fairly.** For example, don't give one group information that you refuse another. Be especially careful not to favor industry or local government over environmental organizations.

4. **When appropriate, develop alternatives to public hearings. In particular, hold smaller, more informal meetings.** Large public meetings often lead to posturing on both sides rather than problem-solving or meaningful dialogue. Instead of waiting until a formal meeting is necessary, consider other options for exchanging information, such as drop-in hours at the local library for questions, newsletters, telephone hot lines, information booths, advisory committees, etc. Most importantly, attempt to hold informal meetings with interested parties and maintain contact on a routine basis. The more controversial the issue, the wiser it is to meet with the affected groups frequently, separately, and informally.

- **If you cannot avoid a large public meeting, the logistics should be developed so that both the agency and the community are treated fairly.** For example, structure a meeting so that people do not feel upset by having to wait a long time to speak.

- **Consider breaking larger groups into smaller ones.** This approach can be helpful for question-and-answer sessions or discussion groups.

- **Be clear about the goals for the meeting. If you cannot adequately fulfill a citizen request for a meeting, propose alternatives.** Prepare so that you can attain the goals of the meeting and meet citizen concerns. If you do not know or cannot address those concerns, meet informally to discuss community needs and to develop a meaningful process to address those needs.

- **In certain situations one-to-one communication may be best.** When sampling, it is critical to prepare technicians to respond to people's questions, or provide them with literature to hand out and a phone number for residents to call. Also, leave time after meetings to respond to personal concerns.

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5. Recognize that people's values and feelings are a legitimate aspect o. environmental health issues, and that such concerns may convey valuable information. Feelings are not only an inevitable part of environmental health issues, they often contain valuable information about: (a) what is important to people; (b) technical aspects of the problem, such as the frequency and duration of an odor; and (c) creative approaches to solving the problem.

- **Provide a forum for people to air their feelings.** People will become more frustrated when an agency attempts to squelch their saying how they feel. Provide mechanisms for expression of feeling, such as telephone hotlines, small meetings, and one-to-one communication.

- **Listen to people when they express their values and feelings.** When people do not feel they are being heard, often they will express their concerns more loudly.

- **Acknowledge people's feelings about an issue.** Try restating what people have said so that they know you have heard them: "I can tell that you are angry about this proposal because...."

- **When people are speaking emotionally, respond to their emotions. Do not merely follow with data.** Do not use scientific data in an attempt to refute feelings or concerns. Instead, acknowledge the feelings and respond to the concerns in addition to providing information.

- **Show respect by developing a system to respond promptly to calls from community residents.** Put calls from community residents toward the top of the priority list and develop mechanisms for your program to handle them efficiently.

- **Recognize and be honest about the values incorporated in agency decisions.** Communities sense when there is more going on than science, and the agency loses credibility unless it acknowledges those issues.

- **Be aware of your own values and feelings about an issue and the effect they have on you.** Agency representatives also become invested in positions or feel strongly about issues. Recognize when your own feelings cause you to resist modifications of a project or to react strongly to a community group.

6. Prepare responses to personal questions about risk. Agencies develop policies to protect public health generally, but individuals are usually most interested in how a risk or policy specifically affects them and their families. Anticipate and prepare honest responses to such individual-level questions, including those asking you what you would do in a similar situation: "Would you drink the water?" Personal responses are particularly important when the situation is not clear-cut and people need some context for their own decisions.

- **When you speak at a public meeting, tell people who you are, what your background is, and why you are there.** Give people a sense of why you are qualified to discuss a topic and what you can and can't do for them.

> *"You realize that people need a forum to get those emotions and questions out and that if you can do that outside a large meeting which is impersonal ... it can be much more effective."* Susan Santos, Manager, Risk Assessment Group, E.C. Jordan Company, formerly with EPA Region I Superfund program.

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- **Let people see you are human.** People will treat you as a person if you act like one. If you act like a bureaucrat, you will be treated accordingly.

- **When speaking personally, put your views into the context of your own values, and urge your audience to do the same.** If you tell people how you might handle a situation, put your response into context (such as whether you smoke, exercise, etc.) so they can do the same.

- **If your personal position does not agree with agency policy, do not mislead the community.** Instead, try modifying the agency position or having the task reassigned. Or find a way of acknowledging the lack of consensus within the agency. Misrepresenting the situation or dodging questions about your position will obviously reduce your and the agency's credibility.

- **If speaking personally makes you uncomfortable, work on it until it gets easier.** If you just don't think it's appropriate, don't do it.

7. **Use community relations staff to amplify community concerns within the agency.** Instead of acting as buffers between the public and agency technical staff, community relations people should make community concerns heard before the public feels a need to shout.

8. **Choose carefully those who represent the agency and provide appropriate support.** Because agency representatives can give an impression of the entire agency, they should be carefully chosen and given the time and training to do the job adequately. People who cannot cope with communication tasks should not be required to do so.

- **Technically qualified people should have a major role in communicating with the public about risk.** Communities usually want to talk to people who are directly involved in problem-solving.

- **Make sure that representatives are appropriate to the situation.** Send people who have the expertise and authority to respond to people's concerns.

- **The agency representative should be consistent throughout the life of the project or situation, if possible.** Trust takes time to build.

- **In some situations a non-agency communicator may be more useful than someone from inside the agency.** Consider using academic experts, local community people, and representatives of civic organizations (such as the League of Women Voters) to present information. This needs to be done with care so that such groups are not perceived as "agency fronts."

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"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

YES, BUT....

- ***As an agency, we are supposed to protect health—not deal with feelings.***

As explained in Chapter I, protecting health will be quite difficult if you do not take into account community concerns. Ignoring such concerns will not only lead to stress on the part of the community, but ultimately will also undermine the agency's ability to implement risk management decisions.

- ***Communities worry about the "wrong" risks. Involving them in decision-making will lead to poor policy.***

Public response to risk is not merely a function of the numbers but also involves other considerations, explained in Chapter I, such as equity. In many cases agency risk management decisions are also based on values, not merely technical factors. Agencies' values are no more legitimate than communities'. Furthermore, in many cases if you do not involve the public, the subsequent outrage may lead to even less logical policy decisions. Just as important, communities often provide valuable insight into problems and creative approaches to solutions.

- ***We don't have the time or resources to do the type of outreach recommended in this guide.***

Some changes suggested in this guide do not take more time and money—merely a shift in attitude. For example, it takes no more time to listen to people's feelings than to argue with them. Although involving the public in decision-making can be labor-intensive, in some cases it is far more efficient than the alternative. Finally, the quality of projects can increase as a result of a diversity of input, thus reducing the likelihood of having to back up and rectify oversights.

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V. EXPLAINING RISK

Agency representatives sometimes believe that if they could only find a way to explain the data more clearly, communities would accept the risks scientists define as minimal and take seriously the risks scientists see as serious. However, simply finding ways to explain the numbers more clearly is not the panacea practitioners might hope for. While searching for the magic formula that will help people calm down about the small risks and wake up about the big ones, agencies may overlook key variables that influence public perception of risk. (See Chapter I.)

> For example, NJDEP Assistant Commissioner Donald Deieso tells the story of attempting to explain the additional risk of a resource recovery facility to a community that had little chance for input before the permit was granted. Instead of responding to information about the minimal risk posed by the facility, the members of the audience jeered. Although scientists felt the increased risk was negligible, the agency's process spoke louder than the risk numbers. It was unlikely that any magic combination of words explaining the risk would have reduced the hostility caused, in part, by the community's lack of power.
>
> On the other hand, Susan Santos of the E.C. Jordan Company, who formerly worked for EPA Region I, spent considerable effort dealing with community concerns when she served as EPA representative on a Superfund site with a history of unsatisfactory interaction between the community and the agency. During her first meeting to update community residents, they essentially shouted her down, accusing her of being another EPA employee who would not listen to them. They suggested that before she spoke with authority she go through their files of information, which she did. Santos "got very involved in finding out what their concerns and fears were— whether they were real or not— and initially not worrying about whether to confirm or sway their fears, but just letting them know that someone was out there to listen to what their concerns were...." Santos' obvious interest in community concerns helped to turn the situation around so some meaningful dialogue could occur between her and citizens. Although this type of listening and involvement takes a good deal of time, failing to take the time at the outset can cost the agency more time in the long run.

Although "explaining" skills are also relevant, the moral of these stories is that the agency's attitude toward and interaction with the public are key variables in explaining risk.

1. **Consider the outrage factors when explaining risk.** In order to avoid upsetting people you must first understand what upsets them. (See Chapter I.) Although some of the factors that contribute to community anger are not susceptible to agency control, the agency can influence others, such as how fair a risk is or the extent to which citizens can exert control over the risk. If the agency is forthright in its communications and involves the public, public perception of the risk is more likely to be on target.

- **Be prepared to give people's concerns as much emphasis as the numbers.** Give as much consideration as possible to community concerns and feelings. Many people make their decisions based on their feelings, their perception of the agency, their sense of justice, etc. Numbers alone will rarely sway them.

- **Be forthcoming about information about the situation from the outset.** (See Chapter III.)

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- **Be sensitive to related issues that may be more important to many people than the risk itself.** Expect different people to see the risk differently. Sometimes the risk that practitioners are trying to explain is secondary to people's other concerns, such as property values. Regardless of whether the agency sees these concerns as important or within the scope of the agency's authority, they can critically influence a community's views. Try to identify and address these concerns. If you cannot address them, at least consider acknowledging them and explaining why your agency cannot deal with them.

2. **Find out what risk information people want and in what form.** There may be differences between the risk information scientists and regulators think communities should have and the information communities actually want. Before presenting risk information, understand community concerns by meeting with the community or developing a checklist of likely concerns based on agency experience with similar situations.

3. **Anticipate and respond to people's concerns about their personal risk.** Consider responding personally. Although agencies are concerned largely with risks to populations, people are most concerned about their own risk and that of their families. Prepare to respond to personal concerns ("Can I drink the water?") and incorporate answers in presentations and informational materials. Some practitioners suggest speaking personally and giving an individual perspective on the risk, while making clear the distinctions between agency policy and your personal opinions: "The levels of contamination in your water are low enough that the agency feels you can continue to drink it without worry. Personally, I would drink the water. My sister, however, tries to eat mainly natural foods and I suspect she would be concerned enough to consider drinking bottled water— despite the fact that bottled water is not regulated."

4. **Take care to give adequate background when explaining risk numbers.** Most people do not have the same frames of reference as scientists and need some background to put the risk in perspective.

- **If you are explaining numbers derived from a risk assessment, explain the risk assessment process *before* you present the numbers.** Some practitioners have held risk assessment workshops to explain the process even before the risk assessment was completed.

- **Explain and, if possible, show in clear and simple graphics the routes of exposure.** Frequently, the issue is not whether a dangerous substance exists in relatively high quantities but whether the routes of exposure put people at risk.

- **Put data in perspective. Avoid dichotomizing risk.** Agencies should avoid fueling communities' tendency to see risks as "safe" or "dangerous." Instead of presenting standards as a cut-off figure, attempt to explain risk numbers in ranges: 1-10 ppb as "low risk," for example. Also show how data relate to similar data. To provide con-

> *"Health matters raise very strong fears, concerns, and emotions among people. To treat it as a technical analysis and not to recognize the extent to which people feel strongly, not to acknowledge their concerns and fears and attempt to deal with them is a fatal mistake...."* Vincent Covello, Director of Risk Assessment, National Science Foundation

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> "[A slide comparing cancer risk from industrial emissions with the risk from diet soft drinks] provoked a lot of negative reaction. People said 'I can choose to drink or not to drink diet coke, but I can't choose not to breathe.' Nobody is going to make a decision on a smelter based on how the risk stacks up against the ingestion risk from saccharin in diet coke." Randall Smith, Chief, Hazardous Waste Policy Branch, USEPA Region X.

text for one community's data, for example, you might compare it to the regulatory action level and to the levels found in other communities in the state.

- **Express risks in several different ways, making sure not to evade the risk question.** People whose minds are not already made up are very influenced by how data are presented. Because no presentation of risk is entirely objective, it may help to present risk in a variety of ways, expressing it both in terms that might make the risk seem larger and in other terms that might make the risk seem smaller. This approach also reduces the tendency of agencies to minimize the risk, which is likely to be viewed with skepticism by those outside the agency.

- **Explain the agency's protective approach to risk assessment and standard-setting.** People are often not aware of the extent to which buffers are built into risk assessments to ensure that they err on the side of caution. Because the word "conservative" has other connotations which may be misleading, substitute the word "protective" or "cautious."

5. Take care when comparing environmental risks to other risks:

- **Avoid comparisons that ignore the "outrage factors."** The least useful and most inflammatory comparisons agencies can use are those that ignore the variables discussed in Chapter I. In particular, beware of comparisons of everyday activities people do of their own accord—such as smoking—to imposed risks. These comparisons backfire most often when used to reassure people; they can be used a bit more freely when trying to alert people to risk.

- **Avoid comparisons that seem to minimize or trivialize the risk.** For example, it's generally not useful to compare parts per billion to sheets of toilet rolls spanning continents or drops in swimming pools. Also, these comparisons assume (inaccurately) that low concentration necessarily means low risk.

- **Develop comparisons of similar situations or substances.**

  a. Use comparisons of the same risk at two different times: "in 1979 before regulation versus this year after regulation."
  b. Compare with a standard: "This level is 25% below the federal standard and somewhat below the state guideline." (Use this comparison carefully if the standard is controversial.)
  c. Compare with different estimates of the same risk: your estimate of the risk side-by-side with the industry assessment and the environmentalists'. Then explain the differences.
  d. As stated previously, explain how the data relate to other data: the levels in one community compared to national averages, to other levels in the state, etc.

6. Acknowledge uncertainty. Obscuring uncertainties makes you extremely vulnerable to charges of inaccuracy at best, or "cover up" at worst. You are better off leading with an explanation of the uncertainty than waiting to be confronted with it.

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- **Give people background on the inevitable uncertainty of science.** Help people understand uncertainty so that they do not assume something is amiss if the agency says it doesn't know.

- **Be specific about what you are doing to find answers.** In order to avoid people thinking that you are hiding something or acting incompetently, explain the process you are using to find the information. Or explain why it is not possible to find.

- **Consider involving the public in resolving the uncertainty.** It is easier for people to accept uncertainty if they can play a role in its resolution. This approach not only is likely to be perceived as fairer but may also lead to better solutions.

- **Give people as much individual control as possible over an uncertain situation.** Give people something they can do other than wait. At a minimum, give them a telephone number to call for information or to report problems.

- **Stress the caution built into setting standards and developing risk assessments.** Even though people don't necessarily like the idea that the agency isn't sure, they are relieved to know that you are taking a protective approach in response to the uncertainty.

- **If people are demanding certainty, pay attention to values and other concerns, not just the science.** When people demand certainty, the underlying issue is often a question of values and process, not merely science. The demand for absolute certainty can result from frustration because agency representatives failed to involve people, did not listen to their concerns, etc. When confronted by a demand for certainty, back up and listen to the concerns behind the demand. Consider working with the community to address those concerns.

- **Acknowledge the policy disagreements that arise from uncertainty.** Attempt to explain and clarify the areas of disagreement. When the disagreements are about judgment calls or management options, rather than science, it is usually not helpful merely to argue the science. In addition, agency credibility is likely to suffer from highlighting limitations of "opposing" scientists. Arguing issues can be productive, but attacking individuals is likely to elicit hostility from those who respect them.

7. **Recognize that communities determine what is acceptable to them, not the agency.** Agencies realize that even with unlimited funds they could not reduce most risks to zero. While communities need to appreciate this reality, agencies need to appreciate that "acceptable risk" is a relative term. The more agencies try to impose a definition of "acceptable" on communities, the more communities will resist that definition. (See Chapter I.)

- **Don't confuse people's understanding of a risk with their acceptance of it.** People can fully understand the nature of a risk but not want to live with it.

- **To the extent possible, build in ways for people to have control over the risk.** Because people feel more comfortable with risks over which they have control,

> *"We succeeded in communicating that life's not perfect in the way government makes decisions ... that there are pressures to decide, inadequate information, and uncertainty ... but what we are doing at a minimum is sharing the entire problem we face with the public."* Randall Smith, Chief, Hazardous Waste Policy Branch, USEPA Region X.

"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

> *"Value judgments are part of the risk assessment process, but if you are part of defining those judgments and those decisions then the outcome of it is something you can trust."*
> Lois Gibbs, Executive Director, Citizens Clearinghouse for Hazardous Wastes

consider giving people more control. Community monitoring, oversight, and on-going feedback can be measures that help people exert some control over risks and thus feel more comfortable with them.

• **Acknowledge that there are other aspects of decision-making besides risk, and be prepared to listen and address people's concerns.** People will often argue about risk when they're as concerned about issues such as property values, because risk is considered a more legitimate issue by agencies. As said previously, it is usually helpful to recognize, acknowledge, and address these other concerns.

• **Help people to help their neighbors decide what is acceptable to them.** Sometimes people can better accept problems when they can talk them over with others. Encourage rather than discourage dialogue.

8. **Take even greater care presenting technical information than presenting other information.** Many of the keys for presenting technical information are the same as those for presenting other information, but are often overlooked.

• **Know your audience and gear your presentation to its level.** Think through: (a) what the audience already knows; (b) what the audience wants to know; and (c) what you want the audience to know. When explaining technical information, it can help to imagine that you are talking to an intelligent but uninformed friend and speak at that level.

• **Prepare as thoroughly as you can.** Practice your presentations. Role-playing can also help.

• **Consider which information is most important to convey.** This often includes: (a) the facts your agency wants people to know about a situation; (b) the background information they need in order to understand the facts; and (c) the additional facts they need to know so they won't get misimpressions. Identify three or four main ideas you want to convey and make sure the details support those points, rather than obscuring them by sheer volume. Finally, make sure to address people's concerns rather than just giving the facts.

• **Be sure to give people sufficient background.** Don't assume that condensing information is the same as making it clearer.

• **Use as down-to-earth language as possible.** Watch jargon and acronyms.

• **Beware of the tendency to oversimplify and give only data that support your point.** People know when you are using ammunition for your argument as opposed to presenting information.

• **Choose supporting graphics that illustrate your message clearly and simply.** Be cautious about using the same graphics used for technical audiences. Hastily or ill-conceived graphics can be worse than none. Even well-executed graphics will not go over well if they do not deal with people's concerns.

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- **Be aware of body language and other signals your audience gives you that they're lost.** Slow down, back up, or ask questions.

- **Have background material available at meetings.**

- **Always have question-and-answer periods after presentations.**

- **Critique your presentation afterward, so you can learn from the things you did right as well as those you did wrong.**

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YES, BUT....

- ***We still don't have a clear ways to explain very complex information. If we did, it's likely the public would understand better.***

It is true that further research is needed about how to explain environmental health risks. EPA and DEP's Division of Science and Research are both funding projects in this area. However, regardless of our sophistication in explaining risk, people's perception of the risk will be influenced by far more than scientific data. If you continue to stress explaining data and fail to attend to these other variables, you will probably create problems.

- ***It is extremely difficult to help people put environmental health risks in perspective if we can't compare these risks to other risks in people's lives.***

Comparisons can be used, but those employed by agencies are frequently not helpful. Comparing voluntary to involuntary risks and other comparisons that ignore the outrage factors are apt to make people angry. The section on comparing risks in this chapter gives examples of some useful comparisons. Further research is being done to develop and test others.

- ***It is difficult to see why an agency should admit uncertainty when people will use such admissions against us.***

This chapter suggests that people are already alert to uncertainty. Failing to disclose uncertainty is likely to undermine trust in the agency. As suggested, agency representatives should not merely admit uncertainty and then drop the subject. The uncertainty should be put in context in several ways, as suggested in this chapter.

VI. TEN MYTHS OF RISK COMMUNICATION

As with most myths, myths concerning risk communication have an element of truth. But they should not be swallowed whole. The following beliefs often interfere with effective risk communication and deserve closer scrutiny.

1. ***We don't have enough time and resources to do risk communication.*** Risk communication does take time and staff. ***But*** if you don't devote efforts to interacting with the public, you may be forced to mop up communications disasters—which typically takes more resources.

Suggestion: Train the staff you have, including clerical staff who answer the telephone, to communicate more effectively. Plan projects to include time to involve the public.

2. ***Communicating with the public about a risk is more likely to unduly alarm people than keeping quiet.*** Risk communication can be risky. ***But*** not giving people a chance to express their concerns is likely to increase rather than decrease alarm.

Suggestion: Consider releasing information earlier rather than later.

3. ***If we could only explain risks clearly enough, people would accept them.*** True, explaining risk is important. ***But*** data are not the only factors which influence people's perception of risk.

Suggestion: Pay as much attention to your process for dealing with people as you do to explaining the data.

4. ***We shouldn't go to the public until we have solutions to environmental health problems.*** Problems can seem easier to deal with when coupled with solutions. ***But*** failing to involve people in decisions that affect their lives may result in tremendous opposition.

Suggestion: Release risk management options, not decisions, and involve communities in discussions of risk management strategies in which they have a stake.

5. ***These issues are too tough for the public to understand.*** Environmental health issues can be complex. ***But*** as demonstrated by citizen groups throughout the country, laypeople can grasp a great deal of the substance.

Suggestion: Do not assume that the public's disagreement with your policies indicates a misunderstanding of the science.

"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

6. ***Technical decisions should be left in the hands of technical people.*** Technical staff generally are better versed in the scientific aspects of environmental health. ***But*** many of the problems government deals with raise policy and values issues that go beyond the technical realm.

Suggestion: Develop mechanisms to listen to communities' concerns about policy and values issues. Inside the agency, involve staff with diverse backgrounds in developing policy.

7. ***Risk communication is not my job.*** True, you were probably hired because of other credentials. ***But*** as public servants, agency staff have a responsibility to deal with people.

Suggestion: Learn to integrate communication into your job and help others to do the same.

8. ***If we give the public an inch, they'll take a mile.*** If the interaction with the community more closely approximates a battleground than a discussion, this may be true. ***But*** if you listen to people when they are asking for inches, they are less likely to demand miles.

Suggestion: Avoid the battleground. Involve people early and often.

9. ***If we listen to the public, we will devote scarce resources to issues that are not a great threat to public health.*** In any public policy arena we can find such inconsistencies. ***But*** closing out the public is likely to cause distrust and further skew the policy debate.

Suggestion: Be sensitive to public concerns. Otherwise you will unwittingly create controversy and contribute to raising the profile of issues of lesser significance.

10. ***Activist groups are responsible for stirring up unwarranted concerns.*** True, activists help to focus people's anger. ***But*** activists do not create the concerns: they merely arouse and channel those that already exist.

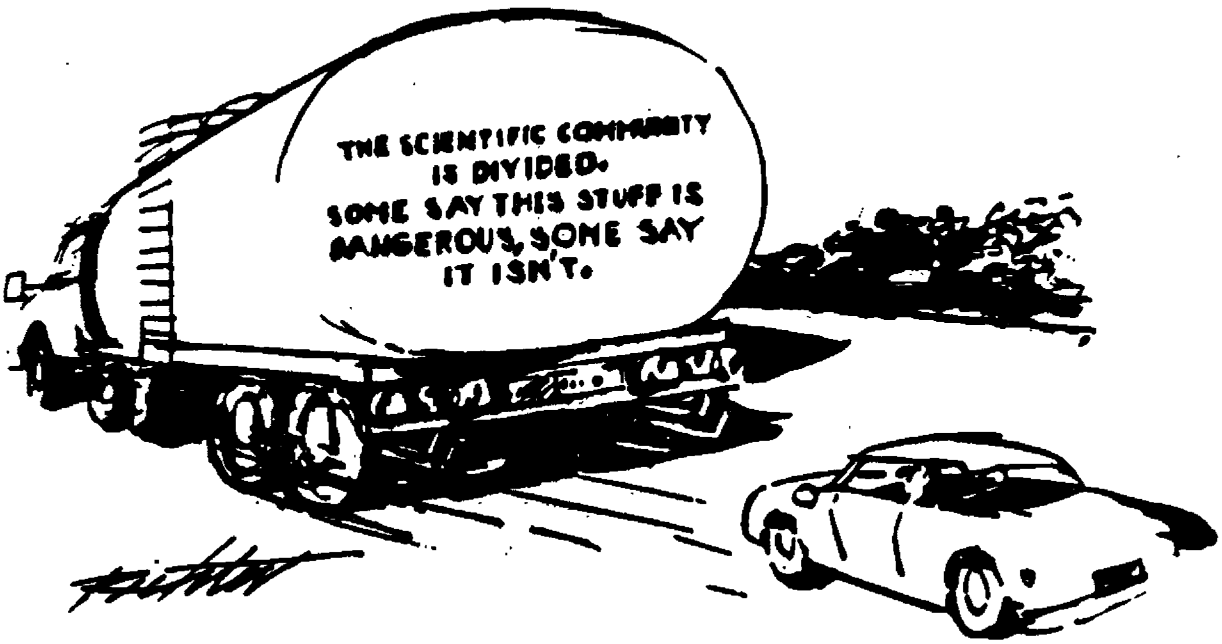
Suggestion: Deal with the groups and their concerns rather than merely fighting them.

"Improving Dialogue with Communities," written by Caron Chess, Billie Jo Hance, and Peter Sandman of the Environmental Communication Research Program at Cook College, Rutgers University, 1987.

DRAFT

WORKSHOP ON RISK COMMUNICATION

U.S. EPA Risk Communication Project



THE STATE UNIVERSITY OF NEW JERSEY
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A program of the Agricultural Experiment Station
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TEN WAYS TO LOSE TRUST AND CREDIBILITY

Take a good look at most risk communication "horror stories" and you'll probably find a major breakdown in trust between government representatives and the public they are supposed to serve. The next time someone comes to you with a sob story about communicating with the public, you might want to hand them this tongue-in-cheek list. Or better yet, hand it out before the damage is done.

1. ***Don't involve people in decisions that directly affect their lives.*** Then act defensive when your policies are challenged.

2. ***Hold onto information until people are screaming for it.*** While they are waiting, don't tell them when they will get it. Just say, "These things take time," or "It's going through quality assurance."

3. ***Ignore peoples' feelings.*** Better yet, say they are irrelevant and irrational. It helps to add that you can't understand why they are overreacting to such a small risk.

4. ***Don't follow up.*** Place returning phone calls from citizens at the bottom of your "to do" list. Delay sending out the information you promised people at the public meeting.

5. ***If you make a mistake, deny it.*** Never admit you were wrong.

6. ***If you don't know the answers, fake it.*** Never say "I don't know."

7. ***Don't speak plain English.*** When explaining technical information, use professional jargon. Or simplify so completely that you leave out important information. Better yet, throw up your hands and say, "You people could not possibly understand this stuff."

8. ***Present yourself like a bureaucrat.*** Wear a three-piece suit to a town meeting at the local grange, and sit up on stage with seven of your colleagues who are dressed similarly.

9. ***Delay talking to other agencies involved***— or other people involved within your agency— so the message the public gets can be as confusing as possible.

10. ***If one of your scientists has trouble relating to people, hates to do it, and has begged not to, send him or her out anyway.*** It's good experience.

From C. Chess, Hance, B.J., and Sandman, P.M., "Improving Dialogue With Communities: A Short Guide For Government Risk Communication," (Trenton, NJ, Division of Science and Research, NJ Dept. Of Environmental Protection, 1987).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 29 1987

THE ADMINISTRATOR

Honorable Henry A. Waxman
Chairman, Subcommittee on Health
and the Environment
Committee on Energy and Commerce
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

On March 24, 1987, I responded to your January 6 letter pertaining to air toxics and gasoline marketing. At that time I said a response would be forthcoming on your question on comparative risk. I am now enclosing that reply.

Thank you for your interest in this matter.

Sincerely,

Lee M. Thomas

Enclosure

QUESTION

Please provide a table comparing risk levels which have supported regulatory actions under RCRA, TSCA, the SDWA, Clean Air Section 112, and other provisions of the Clean Air Act. Please explain any inconsistencies in EPA's views on the levels of acceptable risk under different environmental statutes, or different provisions within the same statute.

RESPONSE

The two tables below provide comparative information about cancer risk in EPA decisions under the Resource Conservation and Recovery Act, the Safe Drinking Water Act, the Toxic Substances Control Act and Section 112 of the Clean Air Act.

Table 1 addresses the levels of population and individual risk that led to regulation. Table 2 gives information on the residual risk remaining after regulation. Although you asked that the table include other CAA provisions, the pollutants addressed under them are not generally carcinogens and their risks are not readily comparable.

The tables are illustrative of EPA's risk management actions, rather than a comprehensive review of all such actions. While they include some information about the reasons for decisions, any judgment about why EPA reached particular decisions without a thorough examination of the decisional records would be incomplete. For example, some decisions not to regulate are made with the expectation of revisiting the issue later or are elections to use an alternative regulatory mechanism, rather than conclusions that regulation is unnecessary or that existing regulations are sufficient.

It is important to recognize that uncertainty, often great uncertainty, generally underlies calculations of risk from chemicals in the environment. As a result, we attempt to be conservative in estimating risk, preparing what are in effect plausible upper bound estimates. That is, the true risk is not likely to be greater than estimated and could be much lower, even zero.

Another uncertainty in the tables is that population risk is based on where people live today. Future risks may be quite different, especially site-specific ones such as those from hazardous waste.

Sources for the estimates in the tables are generally the Federal Register documents for each decision, although you may have seen differing estimates of the risk from a given chemical or activity. The estimates themselves span more than a decade and methodologies for assessing toxicity and predicting exposure have evolved enormously over this time, as have the assumptions and data we use in applying these methods. Because exposure pathways differ among the environmental media, and for various program specific reasons, there are also differences in methodologies, data and assumptions across programs. As a result, one should be cautious in making comparisons among the estimates in the tables.

Over the past few years we have moved vigorously to assure the quality of our risk assessments, and their consistency. These efforts include creating institutions such as the Risk Assessment Forum to address technical issues, developing risk assessment guidelines, developing consistent databases about risk and other activities. For example, our newly developed Integrated Risk Information System (IRIS) will provide the Agency's current view of the toxicity of any chemical in the system.

While we are conducting a broad range of research to increase our understanding of environmental risk, much uncertainty will remain in the short run and some will endure no matter how much research we do. We must inevitably make decisions to protect human health and the environment in the face of uncertainty. This alone makes it very difficult to conceive of using some "magic number" of acceptable risk as a guide in our decisions about when and how much to regulate. Moreover, the very concept of acceptable risk in risk management decisions is a complex one. Part of the complexity is shown in the tables: we consider both individual and population risk, rather than simply the individual risk you cite in your letter.

A second kind of complexity is implicit in your question: we must consider how the environmental statutes differ in their treatment of risk. For example, both FIFRA and TSCA explicitly provide for weighing human health risk against the economic and other benefits of chemical use. The Safe Drinking Water Act allows consideration of costs and other factors in setting contaminant levels (MCLs), but requires that goals (MCLGs) be based on health risk alone. Complexity arises not only from differences in the degree to which other factors can be considered with risk, but also in how and when such considerations can be included in decisions under the various statutes.

Third, we seek to protect against many different risks: lead poisoning, asbestosis, a wide variety of cancers, damage to property and natural resources, reduced recreational opportunities and many purely ecological risks. It is very difficult to compare these quantitatively. Our recent comparison of the risks addressed by EPA programs (Unfinished Business: A Comparative Assessment of Environmental Problems) defines four broad categories of risk (cancer, non-cancer, ecological and welfare) rather than attempting to weigh very different kinds of risks against one another.

Our ability to reduce risk can also be a factor in deciding whether a given risk is acceptable. Where appropriate, we con- er factors such as technical feasibility, control costs and efits, and the availability and impact of substitutes. For example, our decision to phase down the amount of lead in gasoline from the standard of 1.1 grams/gallon set in 1982 was based upon a 1984 comparison of increased refining costs with benefits in the form of reduced vehicle maintenance, better fuel economy, reduced emissions of HC, NO_x and CO, lower levels of lead in children's blood, and improvements in adult blood pressure.

In management decisions about environmental risk, EPA weighs considerations such as those above, and others which apply to a given case. We assess the risks as objectively as possible, using appropriate quantitative and qualitative information and taking into account the weight of the underlying scientific evidence. We do this both to assure full understanding of the decisions facing us and to provide some consistency among the Agency's actions. Nonetheless, risk management decisions will show variations in what level of risk is accepted both because of the need to consider factors other than risk and because assessment of risk itself is complex.

Reviews of past risk management decisions can show how the risks addressed by those decisions vary, as do the tables here, but such historical reviews may not show which factors were deter- inative, how heavily they were weighed or even the full set of tors considered. Nor can they answer the question of precisely t risk will be acceptable in the next risk management decision. here will inevitably be some application of judgment and, therefore, limits to the usefulness of narrow decision rules or numerical risk targets.

We are moving to make better risk management decisions by improving the quality of our risk assessments, advancing the science on which they are based, and increasing consistency in interpreting scientific information and balancing it with other factors. We also seek to do better at informing the public about our decisions and how we reach them.

Table 1 PREREGULATORY RISK LEVELS

Act/Subtance	Decision	Preregulatory Population Risk (cases/yr)	Maximum Individual Risk
CAA--NESHAPS			
Benzene			
1. Maleic Anhydride Emissions	Not regulated 1984 (Risks do not warrant Federal reglatory program)	.03	8x10-5
2. Fugitive Emissions	Regulated 1984	.5--.9	2x10-3
Chlorinated benzenes	Not Regulated (Risks do not warrant Federal regulatory program)	.007	1x10-5
Vinyl Chloride			
1. Emissions from EDC-VCM plants	Regulated 1976 (Risks not explicitly considered)	.6	3x10-3
. Emissions from PVC plants	Regulated 1976 (Risks not explicitly considered)	15	9x10-3
Inorganic Arsenic			
1. Low Arsenic copper smelters	Regulated	.2--.3	2x10-3
2. Glass manufacturing	Regul ted	.3	8x10-4
Ethylene oxide	Intent to List	56	2x10-3
1,3-Butadiene	Intent to List	19	3x10-1
Chloroform	Intent to List	13	7x10-4

S ʾ3

. alomethanes	Regulated (as calculated in 1979)	660	> 6x10-4

TSCA

Formaldehyde in school labs	Addressed by CPSC	.1	7x10-5-- 3x10-6

RCRA

Listing of Haz-ardous Wastes	Regulated (Chemicals are added to list based on risk)		10-4--10-6
Delisting	Regulated		10-5--10-6
Standards for Treatment, Storage and Disposal	Regulated (Risk information is used only to check reasonableness of technological solutions proposed)		10-4--10-7
Used Oil	Proposed	> 10	10-4--10-7
ective Action	Pending proposal	> 10	10-4--10-8
Location Standards	Pending proposal	> 10	10-3--10-6
Land Disposal Bans	Regulated	5--10	10-3--10-8
Organic Toxicity	Pending Proposal	5--10	10-3--10-8
Subtitle D	Pending Proposal	5--10	10-4--10-8
Liner/Leak Detection	Pending Proposal	5--10	10-4--10-8
Waste-as-Fuel	Pending Proposal	< 5	10-4--10-8
Mining Waste	Pending Proposal	< 5	10-5--10-8
Listings	Pending Proposal	< 5	10-3--10-8

Table 2 Risk Levels for Regulatory Decisions

Act/Subtance	Decision	Risk Avoided (cases/yr)	Residual Risk: Population Risk (cases/yr)	Residual Risk: Maximum Individual Risk
CAA--NESHAPS				
Benzene				
A. Maleic Anhydride Emissions	Not to regulate 1984 (Risks do not warrant Federal regulatory program)	--	.03	8x10-5
B. Fugitive Emissions	Regulated 1984	.4	.2-.5	2x10-4--4x10-5
Chlorinated benzenes	Not to regulate (Risks do not warrant Federal regulatory program)	--	.007	1x10-5
Vinyl Chloride				
A. Emisssions from EDC-VCM plants	Regulated 1976 (Risks not explicitly considered)	.5	.03	2x10-4
. Emissions from PVC plants	Regulated 1976 (Risks not explicitly considered)	14	.8	6x10-4
Inorganic Arsenic				
A. Low Arsenic copper smelters	Regulated	.03-.1	.2	2x10-3
B. Glass manufacturing	Regulated	.2	.1	8x10-5
SDWA				
Trihalomethanes	Regulated (1979) Recalculated with new data			4x10-4 10-5
TSCA				
Formaldehyde in school labs	Addressed by CPSC	--	.1	7x10-5--3x10-6

Differences Between Expert and Public Rankings of Environmental Problems

Background

- EPA published a report, *Unfinished Business: A Comparative Assessment of Environmental Problems,* in February 1987. The report examined the risks of cancer, non-cancer health effects, ecological effects, and welfare effects posed by 31 different environmental problems. Stimulated by this report, the Roper Organization polled nationwide samples in December 1987 and January 1988 to find out how the public ranks the seriousness of essentially the same list of environmental problems.

Caution

- The two groups addressed slightly different questions. The EPA experts only looked at the tangible aspects of the risks (cancer incidence, etc.), whereas the public was not similarly constrained and could consider intangible effects in ranking overall concern.

Differences

- The most striking difference is that the public ranks active and inactive hazardous waste sites as #1 and #2, whereas the EPA experts ranked them medium/low in the various risk categories listed below.

- At the other end of the scale, the public ranked indoor air pollution, including radon and consumer product exposure, and global warming very low, while the EPA experts ranked them quite high.

- Important points of agreement included pesticide risks and worker exposure to toxic chemicals (relatively higher risks and higher public concern) and contamination of drinking water as it arrives at the tap (relatively medium in both cases).

- In general, EPA's legislative priorities correspond more closely to public perceptions than to expert assessments of risk.

Why the differences?

- The subject is vast, and it is hard for anyone to have full knowledge of it.

"Differences Between Expert and Public Rankings of Environmental Problems" prepared by the Environmental Protection Agency: Office of Policy, Planning, and Evaluation.

- Research has shown that people often overestimate the frequency and seriousness of dramatic, sensational, dreaded, well-publicized causes of death and underestimate the risks from more familiar, accepted causes that claim lives one by one.

- The public perception of hazardous waste is driven by drama and dread. The intrusive, involuntary nature of the risk, the fact that slow-moving ground water can stay polluted for a very long time, the presence of an identifiable "scapegoat," and the difficulty many people have in seeing an overriding benefit to having a hazardous waste site nearby are also important. The EPA report noted that in certain locations hazardous waste does pose a very serious risk, but relatively few people live near enough to the sites to be directly affected; other environmental problems simply cause more damage to more people and ecosystems.

- Indoor air pollution, including radon and consumer product exposure, and global warming are risks to which everyone is exposed. The risks are not dramatic and come from familiar, diffuse, generally accepted sources. It is usually difficult, if not impossible, in these cases to finger a "scapegoat"; and the benefits from the problem-causing substances are clear. Some of these problems are also not well understood by many members of the public.

Implications

- Public policymakers and all those involved in discussing environmental problems and risks with each other and with the public need to recognize how people may react to the problems and risks, to understand why the risks have been assessed technically as high or low, and to tailor policies and communications to accommodate differing perspectives. Experts should avoid thinking of the public as "wrong" or "irrational," when in fact the public may simply be following a different rationale.

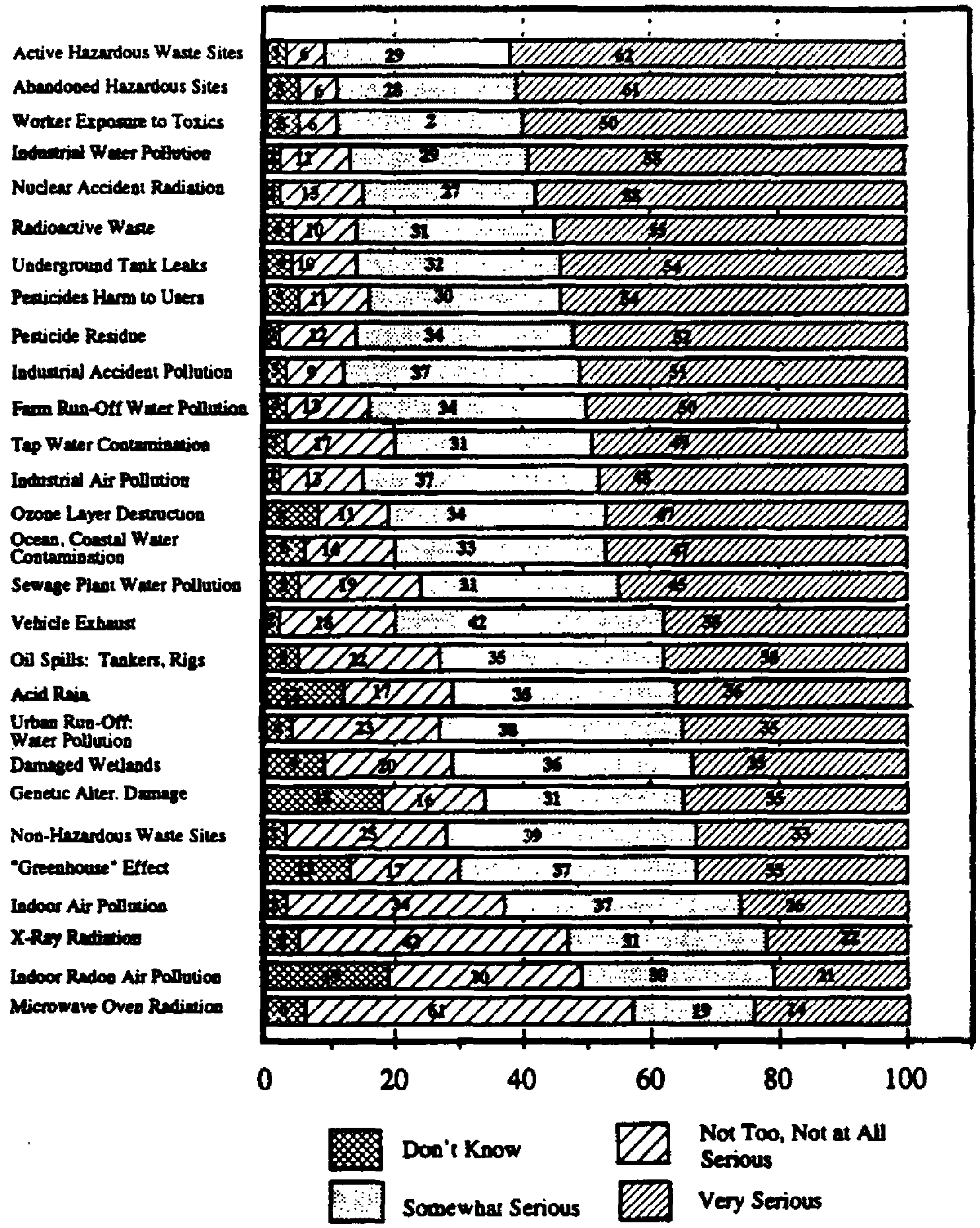
- The differences raise an important issue for a democracy. Put crudely, should a democracy focus available resources and technology where they can have the greatest tangible impact on human and ecological health and welfare, or should it focus them on those problems about which the public is most upset? Put more pragmatically, what is the proper balance?

For Further Information

- Contact the Office of Policy, Planning, and Evaluation or the Office of Policy Analysis (202-260-4012) or (202-260-4012).

"Differences Between Expert and Public Rankings of Environmental Problems" prepared by the Environmental Protection Agency: Office of Policy, Planning, and Evaluation.

Perceived Seriousness of Some Environmental Problems



"Differences Between Expert and Public Rankings of Environmental Problems" prepared by the Environmental Protection Agency: Office of Policy, Planning, and Evaluation.

How EPA Experts Rank Environmental Risks—Highlights

Overall High/Medium Risk

- "Criteria" air pollution from mobile and stationary sources (includes acid precipitation)
- Stratospheric ozone depletion
- Pesticide residues in or on foods
- Runoff and air deposition of pesticides

High Health; Low Ecological and Welfare Risk

- Hazardous/toxic air pollutants
- Indoor radon
- Indoor air pollution other than radon
- Drinking water as it arrives at the tap
- Exposure to consumer products
- Worker exposures to chemicals

Low Health; High Ecological and Welfare Risk

- Global warming
- Point and nonpoint sources of surface water pollution
- Physical alteration of aquatic habitat (including estuaries and wetlands) and mining waste

Overall Medium/Low Risk (Ground-Water-Related Problems)

- Hazardous waste sites—active (RCRA)
- Hazardous waste sites—inactive (Superfund)
- Other municipal and industrial waste sites
- Underground storage tanks

Mixed and/or Medium/Low Risk

- Contaminated sludge
- Accidental releases of toxic chemicals
- Accidental oil spills
- Biotechnology (environmental releases of genetically altered materials)

Source: Unfinished Business: A Comparative Assessment of Environmental Problems (EPA 1987)

The Lethal Legacy of Lead Poisoning

Long After a Battery Plant Shuts Down, Contamination Lingers in Soil and Bones

By Mark Jaffe
Knight-Ridder Newspapers

THROOP, Pa.

From morning to night, for 14 hours straight, residents of this northeast Pennsylvania community arrived at the local high school for medical tests they feared would uncover a long-buried problem.

Moving slowly from gymnasium to classroom, they filled out health histories, gave blood and were subjected to a battery of tests to measure such things as nerve response and motor skills. The final stop was a 35-foot-long Chevy van parked nearby. There, each resident slid his or her leg into a new X-ray machine that screened their bones for lead.

After five days of testing, John Rosen, one of the nation's leading experts on childhood lead poisoning, announced the results: One third of the 200 residents he tested had elevated levels of lead in their bodies. Many of them were children.

For years, residents had wondered whether the old Marjol Battery & Equipment Co. was polluting their town. Black clouds of smoke had belched from the battery plant and wafted over nearby ... Acid mists had eaten holes ... clothing hanging out to dry.

... even when lead contamination was found in nearby yards and streets in 1975 and again in 1986, government environmental officials had assured residents there was no health problem. Not trusting the official assessment, they sought the help of Rosen, who told them their fears were realistic. The problem, Rosen concluded, was lead poisoning, a hidden and lingering problem that might affect countless children and adults in other communities.

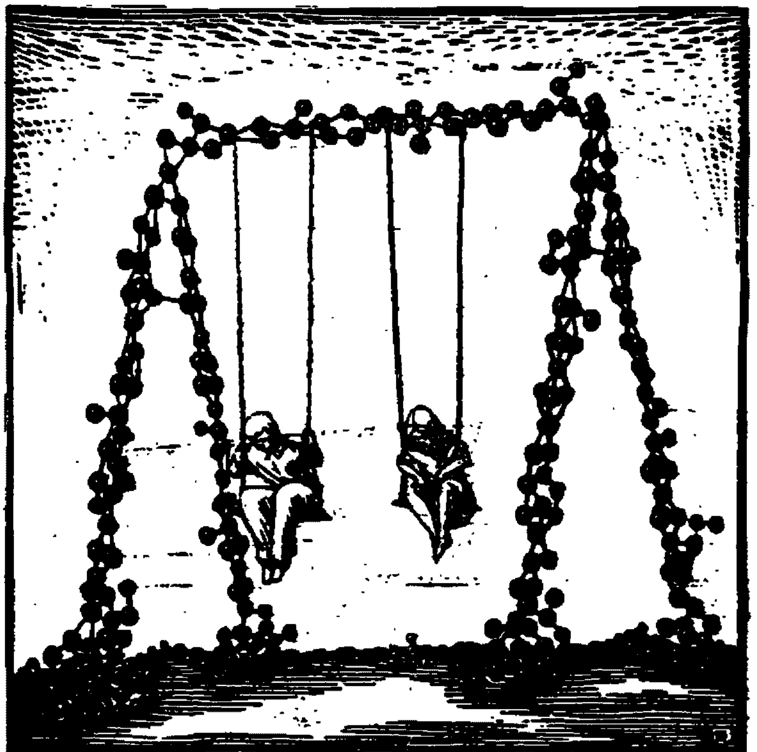
Lead is a highly toxic material. Children are particularly susceptible because the metal can damage the growing nervous system, creating nerve disorders and learning disabilities.

Because many of the effects are subtle and difficult to detect, and because the threat of lead poisoning had lingered for so long, residents here were skeptical of government reassurances.

"We had a situation where our children had been playing in a heavily contaminated environment," said Nicholas Mutos, a school psychologist and father of four children. "We wanted answers, and we didn't trust the government."

Throop's search for an answer led residents to an experimental technique that looks for lead in the bones. Traditionally, doctors have measured lead exposure in the blood, where the substance is most toxic and may cause permanent damage. But the metal lingers in the blood only 30 to 45 days.

"... -five percent of the body burden ... stored in the bones," said Andrew ... professor of medical physics at the



University of Maryland and a pioneer in X-ray bone-lead studies. "So that's where you have to look."

And that is where the residents of Throop, including the Schortzes, found their answers. The Schortz family moved into a big, frame Victorian home near the Marjol site in 1979. "We did it because it was such a big place and we had a growing family," Susan Schortz recalled.

They knew about Marjol's smoke, about the mist, about the lead that had been found in the soil of neighbors' yards back in 1975. But they also knew that their daughters, Julie and Diana, had been among the 200 children in town who, as part of the state's assessment of Marjol in 1975, had received blood tests that revealed no problem.

As for the lead-tainted soil, Schortz said, the state Department of Environmental Resources "told us to cover our lawns with topsoil and replant. The lead, they said, would dissipate in 10 years."

In 1976, after repeated violations, the department ordered Marjol to shut down its lead smelter. In 1982, the entire plant was closed for good. That seemed to be the end of Throop's problem.

But in 1986, the federal Environmental Protection Agency came to town, tested the soil and shocked residents by announcing that the yards of the Schortz home and 80 others were heavily contaminated.

According to the EPA guideline, soil with more than 50 parts per million of lead might be dangerous. EPA found levels of 2,000 to 19,000 parts per million in Throop. Schortz had an average of 8,000 parts per million in her spacious, tree-shaded yard.

The Marjol site and the surrounding area were designated for cleanup under the federal Superfund law. Beginning in 1988, the yards of the 81 homes were excavated to remove the contaminated soil. One house was declared totally unsafe. Several months ago, a contractor cleaned the interior of 60 houses to remove lead dust.

The cleanup, now estimated at $18 million, is being paid for by the Gould Corp., which bought the Marjol site after the plant closed.

But while EPA officials acknowledged that soil and homes had been contaminated, they maintained there was no health problem for residents. And, indeed, another round of tests appeared to support that claim: Blood tests conducted on 300 children did not reveal any elevated exposure to lead.

But this time many people here refused to believe everything was all right.

Throop, a modest community of frame and brick homes where traditional values predominate, was not a likely candidate to dispute government experts.

But the shock of being declared a Superfund site a dozen years after the state had said there was no problem weighed heavily on many residents.

Mutos, Schortz and 40 other families formed Halt Environmental Lead Pollution, HELP, which persuaded several of the nation's leading experts in childhood lead poisoning, including Rosen, to counsel them. The group rented a van and in late 1989 started ferrying people 120 miles to Rosen's clinic in the Bronx, where he was conducting bone-lead studies.

"I really didn't know what to expect," recalled Rosen, "but I was shocked." More than a third of the 75 Throop residents Rosen had elevated levels of lead in their bones. He decided to go to Throop.

Last June, Rosen and five technicians screened an additional 125 residents here and conducted neurological and learning-development tests.

"The preliminary results indicate that a highly significant percentage of residents across a wide age range have clear-cut evidence of lead exposure that occurred earlier in their lifetime," he said.

Those with the highest level of lead exposure had grown up during the years the Marjol plant was operating. Nearly two thirds of the teenagers who were tested had high lead levels.

Diana Schortz, 16, is among them. Although her mother said she has no medical problems, Rosen's tests found that Diana has 57 parts per million of lead in her bones.

There are no standards yet for how much lead in the bones poses a threat, but Diana's level clearly was remarkable. Todd, the University of Maryland researcher, has found an average of 30 parts per million in lead-smelter workers in Europe.

Lead particles are generally inhaled or ingested, then find their way into the bloodstream and are finally absorbed by the bones. Once locked in the bones, they do not present an immediate threat. But the reserve of the toxin can be released under certain circumstances.

For example, lead is released if a bone is broken, if the individual is bedridden for a long time or if he or she suffers bone disease.

A serious release could occur if Diana were to have a baby, Rosen warned the Schortzes. Because mothers' bones are the source of calcium for the fetus, there is a risk of essentially poisoning the fetus.

Rosen advised the Schortz family to monitor Diana's blood-lead levels and kidney function in future checkups, because lead can easily impair the kidneys.

Pennsylvania officials have little to say about Throop. "Our understanding of the problems of lead are so much greater now than when we initially looked at the problem in 1975," said Susan Wood, a spokeswoman for the environmental resources department. "But it was the state that suggested the EPA go back and take a second look."

Officials at the state Department of Health say that the X-ray technique is experimental and that the result does not demonstrate that a health problem exists. There are no comparable studies to show the bone-lead levels in the general population, department spokesman Robert Fischer said. ■

Preparing for the Interview

by
Paul Lapsley

1. Learn who your audience is and what issues they're concerned about. When the journalist or reporter calls to schedule the interview there are several items you should discuss with them in setting up the interview:

   o Ask them how much they know about the issue. Take this opportunity to give them a brief background or if they don't have time, offer to send them some written materials; if they don't have time to discuss it, you'll know that the only opportunity you'll have to inform them and their audience will be during the interview. That information, by itself is important.

   o Learn from the reporter what issues their audience is concerned about. Often this will give you an insight into what issues you need to be prepared to deal with. If the reporter doesn't give you any guidance, it's an opportunity for you to suggest areas that you will cover in the interview. If the journalist has little knowledge on the topic they will welcome you outlining how the interview should go.

   o Learn how much time you'll have to explain the Agency's position. This will help you determine how to make your presentation. If the journalist tells you that you're only going to have a ten second spot on the evening news, that will motivate you to get your message out clearly and succinctly. On the other hand, if the interview will be a dialogue that will come out in a Questions and Answers session for the audience, then you'll have an opportunity to provide more extensive explanation to a series of key issues, which you will be able to frame for the journalist.

2. Decide what it is you want to convey and how much time you'll have to do it. Think through the logical explanation of how the Agency arrived at its current position and what actions it's taking to deal with the situation, both now and in the future. Be prepared to answer criticism that the Agency should have known the hazards earlier and taken action more quickly. At the same time, be prepared to respond to criticism that the Agency is overreacting and that the hazard doesn't really exist. You must present a dispassionate and reasoned approach to dealing with a hazard that has been established through credible information.

3. Learn what others are saying about the risk so that you can defend the Agency's position. We will frequently be presented with statements that environmentalists are making, or statements from the chemical industry, and asked to

reconcile those statements with the Agency's action. Be prepared to respond with a logical explanation of why the Agency's action is most appropriate in light of available information and why environmental or industry actions are inappropriate.

4. Be familiar with the various exposure routes that could lead to risk, and state what exposures (e.g., groundwater, inhalation, homeowner, etc.) present risks of concern and, just as importantly, those exposures which are not reasons for concern. Know what assumptions have been used in the risk assessment. Be prepared to explain that the Agency has used conservative assumptions in estimating risks and what they are. It's important to comment that conservative assumptions are used as a prudent approach to protecting public health and the environment, however we expect that actual risks would be less.

5. Know what the economic impacts will be. Frequently the audience is more concerned about the impact on their economic situation then they are about the risk implications. You must be able to assure them that the Agency has considered the economic implications, and believes its action is necessary in spite of those impacts.

6. Prepare yourself to represent the Agency, regardless of your own position. Your audience will be assuming that you are the spokesperson for the Agency. Consequently, regardless of your support for the Agency's action, you must be prepared to present the Agency's position and defend it, without calling into question any aspect of the decision. Any concerns you may have should be discussed internally.

EXCERPTS FROM PRESENTATION BY TOM VACOR AT THE NATIONAL CONFERENCE ON RISK COMMUNICATION (JANUARY 1986)

The point of all this is that most of the information on risk assessment is funneled through the media - local news sources more than national ones. The national news has a half-hour every night to tell you everything of consequence that happened on earth. Risk assessment is very rarely part of that. The nightly national news broadcast is usually a recap of the hits, runs, and errors of the day.

Most local reporters have little or no knowledge of or background in technical matters. Yet when something happens, they are sent out on a story. In 90 minutes or so they must become instant experts because they have got to make the air that night or the deadline for the newspaper. Most of them tend to parrot things that are told to them. Very little local news is analytical, and when it is, it tends to be analytical in the sense of "this is what one side says, this is what the other side says." As I said, we are required to be instant experts, but we rarely investigate further the story of the day. There are big incidents, but there is very little follow-up.

The media's posture with regard to risk is primarily reactive, which is to say that we tend to come in after an incident involving risk. We look primarily for victims: victims make good television, good print. We also investigate the aftermath of incidents, assisted by critics. We like critics because they can look at some event and say that if something had happened or had not happened, there would clearly have been a different outcome. Rarely do we take time to look in advance at things that might happen.

We also often look for officials, for two reasons. First, they are people in authority, although they are in fact rarely authorities. Indeed, they are rarely capable of even commenting on risk issues because of their sensitive news nature. Second, we look for officials because we want to affix blame. If we need someone to blame, we usually choose an official; he or she can be portrayed as asleep at the switch, so to speak.

After interviewing officials, we do a thing called Man on the Street - "What do you think about that?" We go out and get three or four interviews, 10 or 15 seconds from one person or another, and that is the local news.

Now if that sounds critical, it is meant to be. We are reactive, and we are allowed to be that way. You have allowed us to go off half-cocked on a variety of issues. You have not corrected us; you have not given us advance information. The result is exactly what you see in the news media today. What you see is reaction rather than analysis. When you do see analysis, it is not very good analysis. The media are highly speculative. For instance, the media are now trying to figure out what

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From Risk Communication: Proceedings of the National Conference on Risk Communication. Edited by J. Clarence Davies, Vincent T. Covello, and Frederick W. Allen (The Conservation Foundation, 1987).

happened to the Challenger before any of the experts have collected its parts. That is what the public demands from us. We are always trying to fix blame.

The reality of the situation is that most viewing or reading audiences are not very attentive. They do not pay much attention to what the media are saying. We are generally background noise for dinner. We are required not to be terribly lengthy in our comments because we tend to bore people.

Why is that important? It is important because it encourages us to look for the smoking government, the body count, or the rocket's red glare. You have seen it all a hundred times, and you will see it a hundred times again. Therefore, you have to educate the media; you have a responsibility to become a participant. If you let us keep going the way we are going, everybody is going to survive, but things are going to become more difficult as our society becomes more technological.

You have to understand the risk that you are communicating, but, more importantly, you have to understand the media. You have to talk to us in advance. You have to involve the public early. If we do not pick up on you information often enough, then you have a legitimate basis for a complaint.

Furthermore, you have to speak to us in English. What is 10 to the minus seventh? What is one part per billion? I may not understand the concept of a billion, but when you explain that one part per billion is one second out of 32 years, that does not seem to be much dosage or much time to be exposed to something that is considered to be so awfully dangerous. There are a lot of extremely dangerous things you can be exposed to for one second out of 32 years and not suffer any great consequences.

So, as scientists, regulators, and policy makers, you have to figure out what the media do, how they work, and how to make them work for you. You have to participate. That means that you must be aggressive rather than reactive. You must help people understand things rather than defending a company or an agency from criticism. You have to learn to deal with media inquiry, to supply information in advance and consider the medium. If you are dealing with television, you do not want to have a group of people sitting up here talking. You want to be able to show pictures. If you are dealing with radio and print, you need to paint pictures with words.

You have to learn how to be a source of information that is trusted. You have to decide who should talk to the media. Very often the media contact is a public relations person who either does not understand the issue or is allowed to speak only the party line. When something bad happens, the person who made the decision should take the heat because the heat will go away that much more quickly. It is crucial to understand how the system works. You have to know how the media format a newscast, a newspaper, or broadcast. You have to understand who the players are, on the screen, on the air, in print, and even more importantly, behind the scenes. You have to understand how to gain access to the nonnews media out there: the feature editors of the newspapers, the morning television shows that you would never think anyone would be interested in, although they have vast audiences and 8 or 10 minutes of unedited time that is almost never utilized. There are great media wastelands that you are not taking advantage of: the weekends, for example. In most major cities, the most watched newscasts are on Sunday evening.

Finally, you have to understand that if you have a news event planned on certain days or when certain types of events occur, you must cancel it. The situation with the Challenger is a case inpoint: if you have a conference or press briefing planned for this week, you should reschedule it, because it is unlikely to be covered.

If you understand how the media work and demand a higher degree of participation in the system, everything will improve. Then, if you see a pattern of abuse, you have a duty to make complaints that may attack the broadcasting license that is damaging your industry or your profession.

DO'S AND DON'TS FOR SPOKESPERSONS

The following list contains a checklist of DOs and DON'Ts to review before you agree to an interview.

1) *DO* ask who will be asking the questions.

DON'T tell the news organization which reporter you prefer to work with.

2) *DO* ask which topics they want to cover.

DON'T ask for specific questions in advance.

3) *DO* caution them that you are not the right person to interview if there are topics you cannot discuss (due to lack of knowledge, litigation, trade secrets, etc.)

DON'T insist that they promise not to ask about certain subjects.

4) *DO* ask how long the interview will be and what the format will be.

DON'T demand that your remarks not be edited.

5) *DO* ask who else will be interviewed.

DON'T insist the reporter not interview an adversary.

Prior to interview/news conference:

1) *DO* obtain accurate information and be completely honest.

DON'T try to fool the reporters and the public.

2) *DO* decide what you want to say, and check to make sure you have the appropriate information.

DON'T believe you know it all.

Reprinted in Risk Communication Student Manual, edited by Erin Donovan, Vincent Covello, and John Slavick (Chemical Manufacturers Association, Washington, DC 1989).

During the Q & A:

1) *DO* be honest and accurate. Your credibility depends on it.	*DON'T* lie.
2) *DO* stick to your key points.	*DON'T* improvise.
3) *DO* lead. Take charge.	*DON'T* react passively, but *DON'T* be overly aggressive or rude either.
4) *DO* raise your key messages.	*DON'T* dwell on negative allegations.
5) *DO* offer to find out information you don't have if a question is raised about it.	*DON'T* guess, because if you are wrong your credibility will be shot.
6) *DO* explain the subject.	*DON'T* use jargon.
7) *DO* stress the facts.	*DON'T* discuss hypothetical questions.
8) *DO* explain the context.	*DON'T* assume the facts speak for themselves.
9) *DO* be forthcoming to the extent you've decided upon beforehand.	*DON'T* decide to reveal something that is confidential without considering its implications.
10) *DO* give a reason if you can't talk about the subject.	*DON'T* dismiss a question with "No comment."
11) *DO* state your points emphatically.	*DON'T* ask reporters for their opinions.
12) *DO* correct big mistakes by stating that you didn't give an adequate answer and you would like a chance to clear up the confusion.	*DON'T* demand that a botched answer not be used.

13) *DO* remember the media are interested in "what? when? where? who? how? and why?"

DON'T be afraid to say that you don't have the answers to "who? how? or why? at the present time.

14) *DO* stress any heroic efforts by individual employees.

DON'T stress any individual errors or negligence.

15) *DO* emphasize what is being done to correct the problem.

DON'T estimate monetary damages, costs to the company, insurance coverage or level of interference with company activities.

16) *DO* state your conclusions first, to get your main points across, then back them up with facts.

DON'T let your message get lost in a morass of detail.

17) *DO* have available information relating to company processes, raw materials, and chemical intermediates.

DON'T hesitate to refuse to give proprietary information.

18) *DO* try to be as open with the media as possible.

DON'T give one reporter exclusive information.

After the Q & A:

1) *DO* remember, what you say is still on the record.

DON'T assume the interview/conference is over.

2) *DO* remember, it's *all* on the record.

DON'T insist that some comment will now be put "off the record."

3) *DO* be careful around microphones and tape recorders.

DON'T assume that a microphone is ever off.

4) *DO* correct any mistakes you made in the Q & A.	*DON'T* let sleeping dogs lie.
5) *DO* volunteer to get additional information reporters need.	*DON'T* refuse to talk any further with reporters.
6) *DO* tell reporters to telephone if they have any questions about something that you said.	*DON'T* ask "How did I do?"
7) *DO* volunteer to be available if a reporter wants to go over something with you.	*DON'T* ask a reporter to show you a copy of the story in advance of publication or broadcast so you can correct it.
8) *DO* call reporters if stories appear that are inaccurate, and politely point out what is wrong.	*DON'T* call the reporter's boss to complain without first speaking with the reporter.

Five Most Frequent Interview Failures

1) ***Failure to take charge.*** The spokesperson must be a leader. His/her role is not just there to answer questions, but to disseminate information.

2) ***Failure to anticipate questions.*** Don't just concentrate on assembling the factual details. Prepare for obvious questions. Remember, the public wants to know "Is it safe?"

3) ***Failure to develop key message.*** This is you opportunity to communicate with the public. Make sure you can take advantage of it by having your organization's message prepared and ready for use.

4) ***Failure to stick to the facts.*** Speculating or answering hypothetical questions can get you into trouble. Avoid "what if" questions by confining your answers to what is known.

5) ***Failure to keep calm.*** By not letting questions get under your skin, you will show a willingness to cooperate with courteous journalists and convey an impression of candor. Keep cool.

Risk Analysis, Vol. 10, No. 3, 1990

What Do We Know About Making Risk Comparisons?

Emilie Roth,[1] M. Granger Morgan,[2,3] Baruch Fischhoff,[2] Lester Lave,[2] and Ann Bostrom[2]

Received April 5, 1990

The risks of unfamiliar technologies are often evaluated by comparing them with the risks of more familiar ones. Such risk comparisons have been criticized for neglecting critical dimensions of risky decisions. In a guide written for the Chemical Manufacturers Association, Covello *et al.*[1] have summarized these critiques and developed a taxonomy that characterizes possible risk comparisons in terms of their acceptability (or objectionableness). We asked four diverse groups of subjects to judge the acceptability of 14 statements produced by Covello *et al.* as examples of their categories. We found no correlation between the judgments of acceptability produced by our subjects and those predicted by Covello *et al.*.

KEY WORDS: Risk comparison; risk communication; risk perception.

1. INTRODUCTION

A tempting way to describe the risks of hazardous technologies is by comparison with other, better known risks,[2,3] such as: the cancer risk of living at the boundary of a nuclear power plant for 5 years equals the cancer risk of eating 40 tablespoons of peanut butter (due to aflatoxin).[3] Despite their appeal,[4] such comparisons have come in for considerable criticism.[5-7] There are two major thrusts to this criticism. One is that these comparisons reduce risks to a single dimension (e.g., loss of life expectancy), whereas many risks are multidimensional. As a result, risks are not fully represented. The second thrust is that risk comparisons are used not just to communicate how large risks are, but also to persuade listeners regarding how large risks should be (e.g., if you are willing to eat 40 tablespoons of peanut butter over the next 5 years, then you should be willing to live near a nuclear power plant). Such implicit rhetorical arguments ignore critical elements of people's risky decisions, such as how voluntary the choices are and what benefits they are expected to provide. Because people perceive risks in multiattribute terms, the fact that a risk has a low value on a single focal dimension (e.g., estimated fatalities in an average year) does not imply its acceptability.[8] As a result of these logical and ethical flaws, it should not be surprising that risk comparisons have provoked anger and mistrust (responses that can only be aggravated by skepticism about how far the risks estimates themselves can be trusted).

In order to help chemical industry spokespeople avoid these pitfalls, Covello *et al.*[1] developed a manual advising plant managers on how to present risk comparisons so that the public will perceive them as useful and legitimate. Their manual has been published and distributed widely by the Chemical Manufacturers Association.

The manual represents a significant contribution to the risk communication literature. It provides, for the first time, an analysis of the different ways that risk comparison statements have traditionally been employed, and offers a framework for evaluating them. Covello *et al.* enumerate 14 commonly used types of risk comparisons, which they then group into five categories, ranked according to their predicted acceptability

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to lay people (see Table I). The manual recommends that spokespeople select the highest ranking risk comparisons whenever possible, and use low ranking risk comparisons with caution, alert to the possibility that communications using them could backfire.

Because the research base is thin, Covello *et al.*'s ranking is based on their accumulated experience and intuitions. Because of its potential significance for guiding risk communication, their proposal warrants empirical evaluation. The present study focused on how well Covello *et al.*'s ranking predicted lay people's judgments of the acceptability of risk comparisons. Its results provide us with a point of departure for a throretical analysis of Covello *et al.*'s proposal.

2. THE STUDY

The Covello *et al.* manual provides concrete examples of their 14 categories of risk comparisons, set in the context of a specific scenario: A manager of a chemical plant in a small town is faced with the task of communicating to the community about the risk of a chemical produced by the plant (see Appendix). We asked several groups of laypeople to evaluate the acceptability of these statements.

Such an evaluation requires an operational definition of "acceptability." The definition intended by Covello *et al.* is suggested by the following quotation.

> The highest-ranking comparisons are assumed to be those that put the least strain on the trust relationship between a plant manager and the public. These comparisons tend to strike even skeptical listeners as relevant, appropriate, and helpful information. The lowest-ranking comparisons, on the other hand, are those that have no intuitively obvious claim to relevance, appropriateness, or helpfulness. Such comparisons are more likely to be seen as manipulative or misleading—that is, as efforts to preempt judgments about the acceptability of the risk. (p. 17)

Thus, there are several distinct elements that contribute to acceptability. As a result, we devised seven rating scales that seemed to tap different elements of Covello *et al.*'s definition of "acceptable." These scales appear in Table II. Scale 1 asks about how clear and easy to understand the statement is. Scales 2 and 3 consider the perceived relevance and helpfulness of the risk comparison. Scale 4 ask whether the risk comparison seems misleading, in the sense of underemphasizing or overemphasizing the risk. Scales 5 and 6 ask how the risk comparison will affect public trust in the plant manager. Scale 7 provides an overall measure of acceptability, by asking whether the statement should be included in the plant manager's talk. Our subjects' response should reveal how these alternative criteria are correlated with one another as well as with Covello *et al.*'s predictions.

2.1 Method

2.1.1. Participants

Four groups participated in the study: (A) second-year graduate business students ($N=13$); (B) members (or their spouses) of a suburban garden club from a mid-

Table I. Covello *et al.* Risk Comparison Categorization and Ranking System

First-rank risk comparisons
1. Comparisons of the same risk at two different times
2. Comparisons with a standard
3. Comparisons with different estimates of the same risk
Second-rank risk comparisons (second choice—less desirable)
4. Comparisons of the risk of doing and not doing something
5. Comparisons of alternative solutions to the same problem
6. Comparisons with the same risk as experienced in other places
Third-rank risk comparisons (third choice—even less desirable)
7. Comparisons of average risk with peak risk at a particular time or location
8. Comparisons of the risk from one source of a particular adverse effect with the risk from all sources of that same adverse effect
Fourth-rank risk comparisons (fourth choice—marginally acceptable)
9. Comparisons of risk with cost, or of cost/risk ratio with cost/risk ratio
10. Comparisons of risk with benefit
11. Comparisons of occupational with environmental risks
12. Comparisons with other risks from the same source, such as the same facility or the same risk agent
13. Comparisons with other specific causes of the same disease, illness, or injury
Fifth-rank comparisons (last choice—rarely acceptable—use with extreme caution!)
14. Comparisons of unrelated risks.

Table II. Scales Used to Rate Covello *et al.* Statements.

1	This statement is clear, easy to understand.	☐	☐	☐	☐	☐	This statement is unclear, difficult to understand.
2	This statement will help townspeople to better understand the risk.	☐	☐	☐	☐	☐	This statement will *not* help townspeople to better understand the risk.
3	This statement gives information needed by townspeople in their personal decisions about the risk.	☐	☐	☐	☐	☐	This statement gives *no* information needed by townspeople in their personal decisions about the risk.
				This statement's tone correctly conveys the risk.			
4	This statement's tone underemphasizes the risk.	☐	☐	☐	☐	☐	This statement's tone overemphasizes the risk.
5	This statement is likely to reassure the townspeople.	☐	☐	☐	☐	☐	This statement is likely to scare the townspeople.
6	This statement is likely to increase the townspeople's trust in the plant manager.	☐	☐	☐	☐	☐	This statement is likely to decrease the townspeople's trust in the plant manager.
7	This statement should definitely be included in the plant manager's talk.	☐	☐	☐	☐	☐	This statement should definitely be left out of the plant manager's talk.

dle-to-upper income community ($N=33$); (C) members of a synagogue ($N=28$); and (D) members of a Protestant church ($N=21$) from middle and lower income communities in Pittsburgh. The 95 total participants included a wide range of ages, socioeconomic backgrounds, religions, and both sexes. Participants were either paid \$10 or had a \$10 donation made to their organization.

2.1.2. *Materials*

In order to introduce the evaluation task, we converted the scenario described in the manual into a cover story which read as follows:

> Suppose that the manager of a chemical plant that manufactures ethylene oxide in the small midwestern town of Evanston has been asked to give a talk to a local community meeting about risks posed by his plant. The local newspaper plans to reprint the speech in its entirety and make it widely available. People in the town are concerned about the possible risks posed by the plant, but there is no crisis situation or serious confrontational atmosphere.
>
> The plant manager has been a friend of yours for many years. He is concerned about making this speech and, as an old friend, has asked you for your candid advice about some things he is considering saying.
>
> Before starting, here is some background information: Ethylene oxide is used in almost all hospitals and other medical facilities as a disinfecting agent. However, it can cause cancer. A risk assessment has shown that the cancer risk that the Evanston plant poses for citizens living in the town is about two additional cancers per year for every million people exposed (there are in fact only 3500 people in Evanston). The plant manager is looking for appropriate and acceptable ways to communicate this risk to the public and to compare it with other risks.
>
> He wants to give a clear honest picture of the risks. He feels that this is both his ethical responsibility and that if he were to misrepresent the situation, eventually that would be discovered and hurt his credibility. He is concerned, however, that even an accurate statement can come out sounding wrong or have the wrong impact. He also wants to keep the talk fairly short and simple, while still doing the topic justice.
>
> The following are 14 different pieces of text that the plant manager is considering using in his talk. Some of them overlap a bit in content. Assume that he will edit them so that they fit together well without much overlap. For each statement, please give your advice on the following questions.

This cover story appeared on the front page of a booklet that contained the 14 statements. There was one statement per page. Each statement appeared on the left side of its page, while the seven rating scales appeared on the right.

As indicated in Table II, each rating scale had five points with endpoints labeled. These were coded 1–5 from left to right. With the exception of scale 4 (tone of statement), a lower number indicates a more favorable value. In the case of scale 4, both endpoints of the scale represent unfavorable values (1 = underemphasizes the risk; 5 = overemphasizes the risk).

The order of presenting the 14 statements was varied across participants. Fifteen of group B received the statements in Covello *et al.*'s original order, while the remaining 18 received the statements in the reverse order. Two random orders of the 14 statements were also generated. Approximately half of the participants in each of the other three groups received the statements in each of these orders.

Groups A, C, and D completed the questionnaires in a group setting at the site of their organization or class. Group B members received brochures by mail.

2.2. Results

2.2.1. Results Across Groups

Table III shows mean responses for each statement on each scale for all 95 participants. With the exception of scale 4, Covello *et al.*'s proposal predicts that each successive group of statements will have higher means than its predecessors.[4] This was not found. Spearman rank-order correlations were computed between the mean ratings of each of the 14 statements and the rank order of the class to which it belongs. Table IV presents these correlations, both across all 95 participants and for each of the 4 groups.[5] None of the seven scales was significantly correlated with Covello *et al*'s. order in the direction predicted. For all participants combined, the correlation with scale 7 (whether to include the statement in the plant manager's talk) is close to zero ($r = -0.13$). The only significant correlation ($r = 0.51$, $p < 0.05$) is that with scale 1 (clarity of statement). However, its sign is opposite to that predicted by Covello *et al.* Each of the four groups produced a similar pattern of results, described more fully below.

Friedman two-way analyses of variance computed on the rank sums across the 95 participants were significant for all seven scales ($p < 0.001$). This nonparametric test indicates that there are reliable differences in

[4] On scale 4 a "3" was the most favorable value. Because all mean responses for scale 4 were less than 3, higher ratings indicate more favorable responses.

[5] Analyses were also performed on the rank sums for each statement. The rank sum for each scale was computed by determining each participant's rank ordering of the 14 statements. The rank sums across the 95 participants were highly correlated, with the mean scores appearing in the table (all correlations above 0.85). The results using this measure were essentially the same as when mean scores were examined.

Table III. Mean Responses for the 14 Sentences on Each Scale (Average Across all 95 Participants)

		Scales[a]						
		1	2	3	4	5	6	7
Rank	Statements[b]	Clarity	Aids understanding	Information needed	Under/over-emphasizes risk	Reassuring	Increases trust	Should be included
First	1	1.71	2.16	2.10	2.77	2.00	1.75	1.82
	2	2.29	2.76	2.55	2.57	2.54	2.50	2.55
	3	3.02	2.73	2.32	2.87	2.95	2.54	2.92
Second	4	2.19	2.67	2.37	2.67	2.94	2.71	2.68
	5	2.10	2.54	2.32	2.66	3.04	2.59	2.98
	6	1.69	2.69	2.58	2.24	2.19	2.33	2.35
Third	7	2.17	2.48	2.24	2.81	2.85	2.71	2.71
	8	2.50	2.51	2.34	2.85	2.76	2.44	2.61
Fourth	9	1.63	2.70	2.37	2.81	2.44	2.44	2.36
	10	1.56	2.81	2.10	2.53	2.65	2.53	2.27
	11	2.08	2.13	1.88	2.66	2.26	2.42	2.37
	12	2.15	3.67	3.47	2.12	3.25	3.44	3.63
	13	1.51	1.98	2.03	2.62	2.44	2.41	2.42
Fifth	14	1.82	2.03	2.18	2.57	2.35	2.48	2.39

[a] For scales 1 through 3 and 5 through 7, 1 is the most favorable response. For scale 4, 1 = underemphasizes risk, 5 = overemphasizes risk.
[b] The statements are listed in decreasing favorability, according to Covello *et al.*'s predictions.

Table IV. Spearman Rank-Order Correlation with the Covello *et al.* Ranking[a]

Scale	All groups	Garden club.	MBA students	Synagogue	Church
Clarity	−.51	−.60	−.27	−.19	−.45
Aids understanding	−.24	−.04	−.16	−.12	−.24
Information needed	−.31	−.43	−.04	.03	−.32
Over/underemphasizes risk	−.35	−.36	−.06	−.32	−.18
Reassuring	−.10	−.42	.07	.02	−.09
Increases trust	.01	.23	.29	−.12	.11
Should be included	−.13	−.30	−.09	.08	−.02
	$N = 95$	$N = 33$	$N = 13$	$N = 28$	$N = 21$

[a]All correlations at or above .46 are significant at the .05 level. Correlations at or above .65 are significant at the .01 level.

the ratings among the 14 statements (not just the differences that were predicted).

Table V presents Pearson correlations among the seven rating scales, computed on mean ratings over all 95 participants. As can be seen, these means tended to be positively and significantly correlated,[6] indicating that statements judged positively in one respect were also judged positively in others. These results indicate that the weak correlations between scale ratings and the Covello *et al.* ranking cannot be be attributed to their being such poor measures that they cannot correlate with anything. Although all scales correlated with subjects' judgments of whether a statement should be included (scale 7), the strongest predictors were how reassuring it seemed and whether it seemed likely to increase trust.

The statements tended to be rated positively on all scales, with a rating of "1" given in almost 40% of all cases. One possible explanation is that the verbal labels anchoring the scales were too moderate (so that 1 connotes *good* rather than *excellent* performance). The resulting "ceiling effect" would reduce differences between statements, even though there were still statically reliable differences in acceptability (see Section 2.2.4). A second possibility is that most statements were actually pretty good, even though some were intended to represent seriously flawed risk comparisons (see Section 3.1).

Table V. Correlation Matrix for the Seven Scales

Scale	Scale 1	2	3	4	5	6	7
1 Clarity	1.00						
2 Aids understanding	0.28	1.00					
3 Information needed	0.22	0.88	1.00				
4 Over/underemphasize risk	0.32	−0.52	−0.66	1.00			
5 Reassuring	0.56	0.66	0.55	−0.09	1.00		
6 Increases trust	0.29	0.74	0.72	−0.49	0.82	1.00	
7 Should be included	0.53	0.71	0.75	−0.36	0.90	0.91	1.00

[6]As mentioned, higher ratings indicate more favorable responses on scale 4, so that the negative correlations there are consistent with the positive correlations on the other variables.

2.2.2. Breakdown by Group

The results are similar when the four groups are considered separately. For three groups, there was no significant correlation between mean scale ratings and the Covello *et al.* ordering. For group B, there was a negative correlation (-0.60; $P < 0.05$) between Covello *et al.*'s ranking and subjects' clarity ratings.

Every correlation between mean scale ratings of the different groups was positive, indicating a consistent degree of agreement. Correlations ranged between 0.23 and 0.88 with a mean, using Fisher's Z-transformation, of 0.63.

2.2.3. Effects of Order of Presentation

Mean ratings were computed separately for each of the four orders of presentation. Three of the four groups were highly similar to one another and to the overall averages. These were the two groups receiving random orders and the group rating the 14 statements in the order predicted to show decreasing acceptability. These means were all unrelated to Covello *et al.*'s prediction order. The ratings of the 15 participants who received statements in Covello *et al.*'s original order were significantly correlated ($P < 0.05$) in three cases. Two were in the predicted direction, scales 4 and 6 (-0.57 and 0.52, respectively); while one, scale 5 (-0.52) was in the opposite direction. Overall, the weak and inconsistent pattern with this small group does not shake the general conclusion that order of presentation did not affect subjects' ratings.

2.2.4. An Ordered Categorical Response Model

An ordered categorical response model, specifically a three-level ordered probit model, was used to clarify the differences in ratings among the 14 statements.[9,10][7] The model included the 14 statements, 7 scales, 4 orders of presentation, and 4 groups as predictor variables and the ratings as the dependent variable. Ratings were recoded into three categories, where 0 was "best" (rating "3" on scale 4; "1" and "2" on other scales), 1 was intermediate ("2" and "4" on scale 4, "3" on others), and 2 was "worst" ("1" and "5" on scale 4; "4" and "5" on others).[8] The model was estimated in LIMDEP,[11] using maximum likelihood estimation. The base case (represented by the intercept) was item 14, scale 7, order 1, and group 4 (D). This analysis characterizes predictors by beta coefficients that indicate changes in the underlying dependent variable, all else being equal. According to Covello *et al.* hypothesis, the beta coefficients for statements 1–13 should all be negative because each is contrasted with statement 14, which was predicted to be the worst. The coefficients should be increasingly negative as the statements become more attractive and statement number decreases. The beta coefficients for the 14 statements and their 95% confidence bands are presented in Fig. 1. They show reliable differences in ratings among the 14 statements that are not captured by the Covello *et al.* ranking system, even when effects of scale, order of presentation, and group are statistically controlled. The beta coefficients typically had the wrong sign (positive). There was no consistent trend over the five ranks.

The analysis yielded significant coefficients for scale and group, but not for order of presentation. The lack of an order effect with this more sophisticated analysis strengthens our inclination to discount the weak differences reported in Section 2.2.3. The overall fit of the model is moderately good. The χ^2 statistic from the log-likelihood ratio test is highly significant (727.5, 24 df, $p < 0.001$) and the model correctly predicts 55% of the observations.

[7] An ordered probit model assumes that the observed ratings are discrete and have ordinal properties (i.e., no interval relation between rating points is assumed), but that the underlying (unobservable) dependent variable (i.e., statement acceptability) is continuous and normally distributed, conditional on the predictive variables.

[8] The original five-point ratings for all scales, except 4, were also fit with an analogous model as was an alternative 3-point set of collapsed ratings (0 = 1; 1 = 2,3,4; 2 = 5 for all scales except 4, which was collapsed as above). Similar results were obtained and are available upon request.

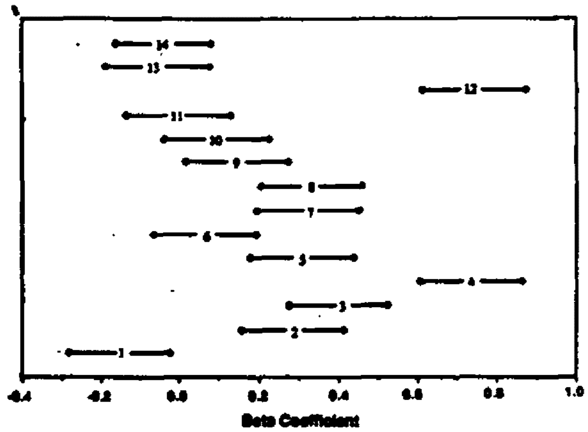

Fig. 1. Estimated beta coefficients for the statement dummies from the ordered probit regression model, with 95% confidence intervals marked (based on the coefficient's estimated standard deviation). Statement 14 is the base case (intercept).

3. DISCUSSION

Our subjects' ratings reliably distinguished among the statements, but not in the way predicted by Covello *et al*. This section discusses why Covello *et al*'s predictions might have fared so poorly and offers some alternative perspectives on risk comparison statements.

3.1. Risk: Comparisons Deviating From Predictions

One place to look for insight is at those statements whose ratings deviated the most from the Covello *et al.* predictions. As can be seen in Table III, three statements at the top of Covello *et al.*'s list were near the bottom of our subjects' ratings, while three of the four worst statements according to Covello *et al.* were rated among the best here.

3.1.1. Comparisons of Risks Across Domains Fared Better Than Expected

According to Covello *et al.* and others,[7] risk comparisons are particularly problematic when they involve risks with very different features. As a result, the examples that Covello *et al.* identify as worst involve risks from different domains. Their statement 13 (representing comparisons that invoke other specific causes of the same consequence) compares the risk of cancer from the chemical ethylene oxide to the risk of cancer from x-rays. Their least favored statement (14) compares ethylene oxide with other hazards whose consequences did not include cancer (e.g.,lightning). Nonetheless, both statements were in the top half of the set for six of the seven scales. Indeed, they were the highest ranked statements on scale 2, how much a statement would "help townspeople to better understand the risk."

Covello *et al.*'s critique of cross-risk comparisons applies most strongly to cases where they are advanced with a rhetorical purpose—of the form "if you accept Risk A, then you ought to accept (equivalent) Risk B." Such comparisons have, however, no logical force unless the two risks are equivalent on all their risk features (not to mention their associated benefits and control options). A more modest use of risk comparisons is to convey a feeling for the magnitude of a risk, with no claim of acceptability. Such magnitude comparisons might focus on either the probability of negative consequences (e.g., as likely as being struck by lightning during an equivalent exposure period) or on their intensity (e.g., as painful as a root canal without anesthesia). Given their more limited ambitions, magnitude comparisons should be easier to make appropriately than acceptability comparisons.

Conceivably, Covello *et al.*'s own sensitivity to these issues kept them from creating truly bad risk comparisons, particularly ones containing indefensible acceptability arguments. As a result, our subjects were able to focus on the magnitude comparisons in the statements. These were, in turn, executed relatively well. If that is the case, then, in effect, Corvello *et al.* foiled their own prediction when they created the illustrative statements.

3.1.2. Comparison of Occupational with Enviromental Risks Fared Better Than Expected

A second unexpected success was statement 11, which was intended to exemplify comparisons between occupational risks and environmental risks. Rather than emerging near the bottom of the ratings, statement 11 appeared in the top half of all seven scales. It was ranked best on scale 3 ("gives information needed by the townspeople in their personal decisions about the risk") and was one of the top 3 statements on scale 2 ("will help townspeople to better understand the risk") Covello *et al.* do not explain why they expected such comparisons to be received particularly poorly. One possible reason is that the assumption of occupational risks often implies the acceptance of risk–benefit tradeoffs that seem quite inappropriate outside of working life.

However, although Covello *et al*'s statement 11 does refer to occupational and environmental risks, it does not invite risk–benefit comparisons. Rather, its main thurst is that the risk to employees is very small, implying that the risk to the community will be even smaller. Again, the example may have fared unexpectedly well because it lacked the particular feature of its category that people find objectionable.

3.1.3. Comparison with a Standard and Comparisons with Different Estimates of the Same Risk Fared Worse Than Expected

Covello *et al.* stressed the importance of being honest and forthright in providing risk information. Elements of such frankness include indicating uncertainties or disagreements regarding the size of the risk, discussing worst-case estimates as well as best-guess estimates, and noting how a risk compares to various proposed standards of acceptability.

Statements 2 and 3 were intended to exemplify this principle. Statement 2 compares the focal risk to five different emission standards, while statement 3 provides six alternative estimates of the size of the risk, based on different data, different assumptions, and different originating sources. Both statements should have been attractive. However, each was ranked in the bottom half of the set on six of the seven scales. They were among the worst three items on scale 1, measuring how "clear, easy to understand" a statement was. This last result suggests that these statements may have been ranked so poorly because of the quantitative and probabilistic information that they contained. The price paid for such candor may have been confusing recipients. Statement 3 may have been particularly difficult because it included small probabilities presented in decimal form (e.g., 0.007 cancers per 3500 persons). The Covello *et al.* manual itself explicitly warns against this format. Statement 8, which was designed to reflect a more effective way of communicating small probabilities, had some of the worst ratings on the clarity scale. Apparently, we still have much to learn about presenting such information.

A second possible source of confusion in these statements was the need to integrate the multiple perspectives that they presented. For example, what are recipients to make of a risk that meets one of several standards, especially when they know little about the organization that set each standard or the purpose for which it was set? Similarly, how are they to recocile competing scientific estimates of a particular risk without understanding the underlying science (and scientists) producing those estimates? Offering multiple perspectives may be a meaningless gesture unless recipients can put them into context. Clearly, more research is needed here as well.

3.1.4. Comparisons of Risk of Doing and Not Doing Something Fared Worse Than Expected

Statement 4, which was intended to illustrate comparing the risks of doing and not doing something, received unexpectedly poor evaluations. It ranked in the bottom half of the set on six of the seven scales, faring particularly poorly on scales 1 (clarity), 5 (reassuring), and 6 (increases trust). It shared the bottom in the ordered probit analysis (Fig. 1). Here, too, presenting small probabilities in decimal form may have been problematic. In addition, statement 4 notes that the risk could be reduced (by a small amount) by purchasing new equipment, but without indicating whether the plant intends to do so. Silence on that issue may have raised suspicions and reduced ratings related to trust.

3.2. Explanations for Failure of Predictions

Reviewing our results in the light of these arguments suggests three reasons why Covello *et al.*'s predictions may have failed.

3.2.1. Flaws in Measurement

The first possibility is that Covello *et al.*'s theory is correct, but our rating scales failed to measure what they intended by "acceptability." As mentioned, we used a variety of rating scales in an attempt to capture the diverse elements of the complex notion of "acceptability" advanced by Covello *et al.* It is, of course, possible that none of our rating scales was related to the lay notion of "acceptability." However, the fact that so diverse a set of scales failed to correlate with Covello *et al*'s predicted ranking indicates the need to clarify the goals of risk comparisons as well as to study how to reach them.[8]

[8]Any other feature of our measurement procedure might also be called into question. For example, in their thoughtful response to this article, Slovic *et al.*[12] wonder about what would have happened had we used another cover story. Progress here requires accounting for both those patterns that did emerge in previous studies as well as for those that did not.

3.2.2. Flaws in the Examples

A second possible source of failure is that the 14 statements did not capture the essence of the categories that they were meant to represent. Section 3.1. raises some such possibilities (e.g., avoiding the risk acceptability arguments that can make some categories offensive, burdening relatively sound comparisons with unfamiliar decimal probabilities). The fact that recognized experts of this field might encounter such problems suggests the limits to our understanding of risk comparisons.

3.2.3. Flaws in the Underlying Theory

A third possibility is that the theory underlying the ranking system is flawed. It is always difficult to falsify a theory when there is uncertainty about how it should be implemented and evaluated. Nonetheless, it should be troubling to find failures with statements produced by the theory's creators and evaluation scales adapted from their stated objectives.

In Covello *et al.*'s theory, there are two obvious places to work on: its classification scheme and the predicted rankings of its categories. Covello *et al.*'s classification scheme sorts risk comparisons primarily according to what risks are being compared, and only secondarily according to the purpose of the comparison or the specific information that it contains. Elaborating these features may be a way to improve our understanding of risk comparisons.

3.3. Toward a Systematic Classification of Risk Comparisons

One significant contribution of the Covello *et al.* proposal is describing the variety of features of a risk that comparison statements can highlight. Indeed, each category in their system deals with a different aspect of risk. For example, statement 1 describes trends over time, while leaving the communication of absolute and relative magnitude to other statements. It seems unlikely that any criterion of acceptability could apply to messages having such a variety of purposes. Each is legitimate for some purposes and flawed for others, with its acceptability depending heavily on the quality of its implementation.

One way to conceptualize the potential purposes of risk comparisons is according to the roles that they may play in helping people to make decisions about risks. From a decision theory perspective, a decision involves a choice among options, each of which can be characterized by a vector of attributes, representing its possible consequences. With risky decisions, at least some of those attributes involve uncertain negative consequences. When considering decision options (risky or otherwise), one needs to go through three stages: identifying the set of relevant attributes (i.e., the ones that might matter when one makes a choice), characterizing each option in terms of each attribute, and determining the relative importance of each attribute (in this set of options).

Risk comparisons have a legitimate role to play in supporting each of these stages. That is, they can help people to determine:

1. what attributes merit consideration;
2. how each option rates on each relevant attribute; and
3. how those attributes should be weighted.

3.3.1. *Evoking Attributes of a Risk*

Risk perception research has found that people are capable of rating risks on a large set of attributes (e.g., voluntariness, equity, dread), which are relevant to their judgments of risk acceptability.[13,14] The fact that these attributes are recognized when they are presented explicitly carries, however, no assurance that will be recalled spontaneously when a risk is mentioned. Indeed, the great number of possible attributes means that it would be hard to bear all in mind at once. A risk comparison might be able to help people by evoking decision-relevant attributes that they might otherwise neglect. Doing so in an unbiased fashion will pose a challenge to the design of communications. Considerations that are out of sight tend to be out of mind.[15,16] Conversely, those comparisons that are made may powerfully shape the attributes that people do consider (e.g., "This is the next dioxin" or "They tell us this is safe, but that's what they said about cigarettes and Agent Orange" or "They are just like tobacco company scientists").

3.3.2. *Determining the Values on Risk Attributes*

Once the attributes relevant to a decision have been identified, decision-makers must determine how each option rates on each attribute. Conveying information about the magnitude of consequences is one clear purpose of risk communications. As mentioned, risk comparisons might be a useful tool for doing so, by providing a familiar point of comparison for an unfamiliar hazard—as long as claims of risk acceptability can be avoided.

3.3.3. *Crystallizing Preferences*

A final role for risk communications is helping people examine and crystallize their own preferences. Simplistic models of decision-making assume a high degree of articulation in people's preferences, namely, they will know how to make all relevant tradeoffs, judging the relative importance of different outcomes. However, with options involving the sort of esoteric consequences involved with many risky decisions, people may welcome noncoercive suggestions of alternative perspectives.[17] Properly qualified risk comparisons might fulfill that role.

3.4. Reflections on Category Definition

The analysis above suggests that the details on content may be more important than the form of a risk comparison in determining its acceptability. This may explain some of the lack of predictive power of the Covello *et al.* classification scheme. In some cases, the categories in Covello *et al.*'s taxonomy are sufficiently broad to include statements with quite varied character. Conversely, statements that communicate very similar information by different means are sometimes classified separately. For example, statement 11 uses the experience of plant employees as an upperbound estimate of the risk to the townspeople. As such, this statement might arguably belong in category 6 with (other) comparisons that use the risk level experienced by one group as an input to estimating the risk to another.

Category 4 ("comparison of the risk of doing something versus not doing it") provides another example of a category that includes comparisons with varied content. For example, it includes both actions intended to increase risk and actions intended to reduce risks, which may invoke different attitudes. Moreover, all such comparisons invoke risk-benefit tradeoffs, insofar as as other consequences accompany these actions. As a result, category 4 overlaps category 9. The fact that these tradeoffs are left implicit in statement 4 may account for some reasons why it was judged more poorly than statement 9, where the tradeoffs are explicit.

4. CONCLUSIONS

Covello *et al.* have enumerated and classified a variety of risk comparisons. They were not, however, able to predict the acceptability of statements generated to represent those categories, at least as measured by our subjects' responses. This failure seems to reflect a combination of (1) difficulty in translating the theory into concrete communications, (2) confounding the different possible purposes of risk comparisons within individual messages, and (3) the absence of adequate research on how to represent different kinds of information credibly. As a result, we need more and better theoretical and empirical research to build on Covello *et al.*'s challenging beginning.

APPENDIX

The following is the text of the 14 specific risk comparison statements, developed by Covello *et al.* (1988), which were evaluated in this research.

Statement 1

"Health risks from emissions of ethylene oxide at our plant are 40% less than a year ago, when we installed exhaust scrubbers. With more equipment coming in, we expect to reduce the risk another 40% by the end of the next year."

"Despite the extremely low health risks to the community from emissions of ethylene oxide at our plant, we are still looking for ways to lower these levels further. These are some of the plans we have under way to accomplish this: (provide specifics). As we implement these steps, we will keep you and the community informed of our progress. We will also continue to monitor our workers and keep track of health statistics within the community to ensure that the risks posed by our plant to our workers and to the community remain in the future as low as, if not lower than, they are today. Since some of you may have further questions about these and other matters concerning our plant operations, as plant manager, I am providing my work and home phone numbers so you can call me. I will do my best to supply you with answers to your questions as quickly as possible."

Statement 2

"Emissions of ethylene oxide from our plant are half the levels permitted by the U.S. Environmental Protection Agency and by our state's Department of Environmental Protection."

"Emissions of ethylene oxide from our plant are five times lower than the U.S. Environmental Protection Agency's safety standard."

"Plant emissions of ethylene oxide are five times below what was permitted under the old EPA standard, and two times below the level established by the new, stricter EPA standard.

Statement 3

"Laboratory studies on rats and mice suggest that current exposure to ethylene oxide may cause seven cancers in 1000 generations of residents in this city. This estimate is the maximum that would occur under worst-case conditions. Actual health effects from exposure to ethylene oxide are likely to be lower."

"Let me try to put this number into the context of other numbers. We've said that our worst case prediction is seven thousandths of one extra cancer within the next 70 years from our plant's emissions of ethylene oxide. Now, no one ever gets seven thousandths of a cancer. A better way to see the effect is that if 130 different communities the same size as Evanston had a plant just like this one, 129 of those towns would see no effect on their cancer rate. One of the 130 Evanstons might have a single extra cancer."

"Our best estimate of the risk is 0.001 cancers per 3500 persons using what we believe are realistic assumptions. This estimate is based on work done by our own scientists and by researchers at Evanston University. However, you should be aware that the state Department of Environmental Protection (DEP) has calculated a worst-case risk estimate of 0.007 cancers per 3500 persons. DEP made the assumption that all individuals living in Evanston would be expressed to emissions of ethylene oxide 24 hours a day for 70 years. This formula gave DEP a human-lifetime dose. DEP then took the best available laboratory information for ethylene oxide—data obtained from studies on the laboratory mice most likely to develop cancer in response to ethylene oxide—and calculated first the lowest dose that caused adverse health effects in mice and then the equivalent dose in humans. On the basis of these and other pieces of information, DEP concluded that the maximum cancer risk to people in the community is 0.007 cancers per 3500 persons over 70 years."

"Our worst-case estimate of the risk is seven thousandths of a cancer per 3500 persons over the next 70 years. How sure are we that the risk is really this low? The bad news is that we're not as sure as we'd like to be. Risk assessment is a pretty new science, based on models and assumptions rather than hard data. The good news is that we're almost certain the risk is actually smaller than our estimate—we've instructed our scientists to make every assumption on the cautious side, to provide an extra margin of safety. And here's a piece of hard information. We've been manufacturing ethylene oxide in Evanston for 35 years now. We have continually monitored our employees for signs of adverse health effects associated with exposure to ethylene oxide. In all that time, as far as we know, not a single worker or retiree has had the sort of cancer normally associated with ethylene oxide. Please keep in mind that these workers are exposed to consistently higher levels of emissions than the surrounding population is. Therefore, on the basis of our workers' experience so far, the risk is zero. There are also people who think our risk estimate is too low. The Evanston chapter of the Sierra Club estimates seven hundedths of a cancer per 3500 persons over the next 70 years. That's 10 times higher than our estimate—but even if they're right, it's still an extremely small potential increase in the cancer rate. And we haven't found anyone with a higher estimate than theirs."

Statement 4

"If we buy and install the newest and most advanced emission-control equipment available, the worst-case situation is that the maximum total risk will be 0.005 additional cancers per 3500 persons, a very low number. If we don't buy new equipment and keep operating the plant with our current pollution-control system, the worst-case situation is that the maximum total risk will be 0.007 additional cancers per 2500 persons—also a very low number. Please keep in mind that both of these risk estimates are worst-case estimates."

Statement 5

"The maximum health risk from our plant's emissions of ethylene oxide is 0.007 additional cancers per 3500 persons. We could switch to producing the only known chemical substitute for ethylene oxide. However, the maximum health risk of emissions of that chemical is 50 times higher."

Statement 6

"We have installed in our plant the most advanced emission control system now operating in the country. Compared with those of older plants, such as the one in Middletown, our emissions are 10 times less."

Statement 7

"The risk posed by emissions of ethylene oxide is extremely low, no matter where you live or work in Evanston. However, the risk posed by emissions of ethylene oxide for people living two miles from the plant is 90% less, than for people living in the nearest home; and the risk for people living in the nearest home is 90% less than for people working within the plant gates. And our workers haven't had a single case of the type of cancer normally thought to be linked to ethylene oxide."

Statement 8

"Let me see whether these numbers will help. Roughly a quarter of all of us get cancer—a disease caused by smoking, diet, heredity, radon in the soil, pollution, and many other factors. Out of 3500 people, medical data show that one-quarter—or about 875—are going to get cancer sometime in a lifetime. So here's *the predicted effect of ethylene oxide emissions from* our plant on the overall cancer rate. In 129 of 130 hypothetical Evanstons, no effect—that is, no expected increase in cancer rates at all. In the 130th, cancer rates would rise from 875–876. Although this is only a tiny increased risk, it is still an increase. If we can find a way to make it even smaller, we should and we will. The most important thing is for all of us in Evanston to work together to find ways to bring down the total cancer rate, that unfortunate 875 out of 3500. But we at our plant have a special responsibility to be safe neighbors. Much higher risks due to other factors are no reason to ignore a small risk in our facility. Here's what we're doing to make sure we keep the risk from our plant as low as it can possibly get: (provide details)."

Statement 9

"During the next year, our plant will spend more than $2 million to reduce our already small emissions even further. This new investment will hurt us economically but will reduce the risk of cancer in the community by more than 25% when fully operational."

Statement 10

"If we stopped producing ethylene oxide today, many more people here and throughout the United States might die than could possibly be affected by emissions from our Evanston plant. Ethylene oxide is the best sterilizing agent used by hospitals today. No equivalent substitute for ethylene oxide is available. Continued production of this production will contribute to saving many lives and will ensure that the surgical instruments that doctors and hospitals use are free from infectious agents."

Statement 11

"One way to look at the data is to compare the risks of emissions of ethylene oxide to plant neighbors with the risks to plant employees. We have been operating this plant for 35 years, with an average employment of 400 people. We therefore have about 10,000 person-years of worker exposure to ethylene oxide at this plant. Health monitoring at our plant indicates that the average workplace concentration of ethylene oxide is 0.5 ppm, a dose 200 times higher than that in the community. The primary health concern about ethylene oxide is its potential for causing certain types of brain cancer. We have not had a single case of brain cancer in our work force. Moreover, the overall incidence of cancer in our employees is lower than that of the U.S. population as a whole. Nor has Evanston's health department documented any brain cancers among our workers. On the basis of this information, I believe that the health risk posed by the plant to the community is insignificant."

Statement 12

"I believe that our ethylene oxide emissions do not pose a significant health risk to the community. I also believe that our emissions pose a much less serious problem than our hazardous waste problem, which is daily becoming more serious because the repositories in our state are filled and none are being built."

Statement 13

"One way to look at the cancer risk from emissions of ethylene oxide in our community is to compare the risk with the cancer risk from the x-rays you get during a health checkup. One chest x-ray per year presents a risk of developing cancer that is twice that of developing cancer from our plant's emissions of ethylene oxide."

Statement 14

"Another way to get some perspective on the risk of ethylene oxide emissions is by comparing it to some of the risks that we all face in our daily lives, such as the risk of being killed by lightning or the risk of beng killed in an auto accident. My purpose in making such a comparison is only to put the size of the risk in context. I recognize that such comparisons are like comparing apples and oranges. Still, I think the comparison can help us all understand and gain some perspective on the size of the risk we are talking about. For example, the risk of death by salmonella food poisoning from poultry bought at the local supermarket is at least five times greater than the risk of cancer from the highest exposure to ethylene oxide in this community."

"You may be wondering, 'But what does that mean to me as a resident of this community? What's the risk to me and my family?' First let me tell you that I am convinced that there is no threat to the health or safety of any member of our community at these extremely low exposure level. However, I recognize that the data still may be troubling. So it would probably be helpful to put these levels of risk from exposure to ethylene oxide into the context of other risks that we're all exposed to in our daily lives. For example, the risk to the average American of death from lightning is at least 140 times greater than the risk of cancer in Evanston from the highest exposure to ethylene oxide. Hurricanes and tornadoes also pose a risk about 140 times greater. Insect bites pose a risk about 70 times greater. The additional 0.007 cancer risk is about the same as the additional cancer risk you would incur spending four hours in Denver rather than at sea level because of Denver's high altitude and higher radiation level."

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Comment

What *Should* We Know About Making Risk Comparisons?[1]

Paul Slovic,[2] Nancy Kraus,[2] and Vincent T. Covello[3]

The study by Roth *et al.* [1] provides a valuable lesson for risk communicators—test your messages. The factors that determine how a person interprets a risk communication are subtle and not well understood. As a result, those who draft and disseminate risk messages cannot accurately predict how they will be interpreted and what influence they will have.

The results obtained by Roth *et al.* are surprising in many ways. Particularly surprising is the finding that the comparisons of unrelated risks were rated relatively favorably. Although such comparisons have been strongly recommended for more than 25 years as ways to put risks in perspective, [2,3,4] they have been criticized for ignoring many of the quantitative and qualitative factors that determine the perception and acceptance of risk.[5] A harsh editorial in *Nature*, following Lord Rothschild's advocacy of such comparisons, [6] described them as "the kindergarten of risk." The data obtained by Roth *et al.* suggest that these criticisms may have been misplaced, and that comparisons among unrelated risks, if framed carefully, may indeed provide valuable insights.

Before breathing new life into comparisons of unrelated risks, we would like to offer several reasons for restraint and further study. The first pertains to the fact that the study by Roth *et al.* employed only one scenario. In this scenario, respondents were asked to evaluate the comparison statements from the perspective of advising a plant manager who is about to communicate to a concerned community in a noncrisis, nonconfrontational atmosphere. Many plant managers must communicate in just such a setting. However, we believe that it is important to replicate this study within diverse contexts, including a setting where the community is angry or distrustful as well as a benign setting in which trust, mutual respect, and meaningful public involvement prevail. We would expect comparisons of unrelated risks to be relatively less satisfactory as the context becomes increasingly hostile. Second, other comparison statements should be evaluated in addition to those drafted by Covello *et al.*[7]. Third, we would like to emphasize a point made by Roth *et al.*, and to provide some supporting evidence. Roth *et al.* suggest that the specific comparison of unrelated risks drafted by Covello *et al.* may have done well because *it did* not argue that the risk of cancer was *acceptable* because it was equal to or smaller than other risks that are commonly accepted. Instead, this message stated that the "...purpose in making such a comparison is only to put the risk in context" and "...to gain some perspective on the size of the risk."

We believe this to be a critical point. Many comparisons of unrelated risks do not include this qualification. Instead of adopting this modest objective (i.e., providing perspective), comparisons of unrelated risks are frequently advanced as a means for setting priorities and determining which risks are acceptable.[7] More specifically, they are advocated as a means for determining which risks to ignore, which risks to be concerned about, and how much risk reduction to seek.[2-4,8,9]

We believe that these arguments are flawed and that risk acceptability depends on a wider range of factors than the probabilities or expected fatality or morbidity estimates that are typically compared. Comparisons that stress acceptability of risk are, therefore, vulnerable to criticism. To support this claim, we would like to offer some additional empirical data. We have conducted an experiment in which subjects played the role of jurors in a simulated trial in which a company that supplied asbestos insulation materials was charged with exposing the students and staff of a school to unreasonable risk of disease. In our scenario, the company contended that the use of this product in the school building did not pose a health hazard to the students and staff of the school.

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The subjects is this study were 117 persons who answered an ad in a community newspaper. They were assigned to one of three groups, each of which received different information about the risks from asbestos and other hazards. All subjects were given the same background briefing about the nature of asbestos and its health hazards. They were also given background information about the trial. Finally, all subjects were told that an authoritative source had determined that the average concentration of asbestos in the air at the school was .001 fibers per cubic centimeter and that students attending the school for three years faced an increased lifetime fatality risk of 0.23 per million.

The three information conditions differed as follows:

Group I received no additional information. They were asked to answer the following questions about risk and guilt:

1. In your opinion, how high is the risk of exposure to the asbestos concentrations found at Jefferson Junior High School?

very low risk			moderate risk			very high risk
1	2	3	4	5	6	7

2. If you were on the jury in this case, would you find [the company] guilty or not guilty of exposing the students and staff of Jefferson Junior High School to unreasonable risk of disease resulting from exposure to asbestos fibers introduced into the air by their products?

   [ ] guilty [ ] not guilty

Group II received the same background information followed by Exhibit A (shown in Table I), comparing the asbestos risk with risks from smoking, diet soft drinks, chest x-rays, peanut butter, and background radiation from living in a brick house. Accompanying Exhibit A was a statement by a (fictitious) expert witness, Dr. A. Davis, called on behalf of the defendant to explain and interpret the risk comparisons in the table. Dr. Davis concluded his explanation with the following opinion:

> So now, if we look at the risk associated with being exposed to asbestos fibers while attending Jefferson Junior High School for three years, it's less than one — 0.23 deaths per million to be precise. That's a very small fraction of the risk estimated for drinking diet sodas or even for eating peanut butter sandwiches. So, even though exposure to asbestos at very high levels has been shown to cause disease, I'd have to say, based on my professional experience and as a concerned citizen, that I would have no concern if anyone — including persons from my own family — were to attend Jefferson Junior High School.

After examining Exhibit A and reading Dr. Davis' statement, subjects answered the two questions about risk and guilt.

Subjects in group I were also shown the comparisons in Exhibit A after making their judgments and they were asked to answer the two questions a second time.

Group III was given the same information as group II, including the table of risk comparisons and the statement by Dr. Davis. In addition, subjects in this group were given a statement by a (fictitious) expert witness for the plaintiff, Dr. P. Stewart, criticizing the comparisons shown in Exhibit A. Dr. Stewart's testimony, which argues that Exhibit A has no logical implications regarding the acceptability of the asbestos in the school, is presented in Table II.

Table III presents the mean risk rating and the percentage of guilty judgments for the three information conditions. Data from group I show that the 0.23 lifetime risk estimate, presented alone, evoked a moderately high rating of risk and a judgment of guilty by more than half of the subjects. Seventy percent of these same individuals, shown the comparisons in Table I, subsequently lowered their judgments of risk; no one gave an increased risk evaluation. Judgments of guilt were less influenced by the comparisons in Exhibit A.

Group II, which responded only after seeing the risk comparisons, had a significantly lower mean risk judgment than group I ($p < 0.01$) and a markedly lower percentage of subjects finding the company guilty ($p < 0.05$). Presented without challenge, Exhibit A was clearly effective in reducing subjects' concerns.

Responses from group III, however, were virtually the same as those from group I, suggesting that the effects of the comparisons on perceived risk and judged guilt were fully offset by the critique presented in Table II.

Technical analyses of the asbestos problem have

Table I. Exhibit A: Lifetime Risks per Million Persons

	Deaths per million persons
Smoking one pack of cigarettes each day for 20 years	88,000
Drinking one diet soft drink containing saccharin per day for a lifetime	170
Chest x-rays	61
Eating 4 tablespoons of peanut butter per day (aflatoxin)	11
Living in a brick house (radiation)	4
Attending Jefferson Junior High School for 3 years (asbestos based on 0.001 fibers per cubic centimeter)	0.23

Table II. Statement by Dr. P. Stewart, An Expert Witness Called on Behalf of the Plaintiff, Jefferson Jr. High School, in Testimony About the Statistics Presented in Exhibit A

Dr. Stewart

As I understand it, Exhibit A shows the risk per million persons of dying from the activities listed. The numbers shown on the chart are estimates, based on statistical analyses.

In my opinion, the numbers in this chart are misleading, and fail to have any logical implications for the asbestos decision under consideration.

First, the estimates in the Exhibit may not be accurate, particularly in the case of asbestos. The risk value given for asbestos is based on an average reading of .001 fibers per cubic centimeter. But, at times, the level of asbestos fibers people in the building are exposed to may be much higher (for example, when repair work is being done). The average exposure given in the exhibit may not accurately represent the risk from such higher "peak" concentrations.

My second objection is more fundamental. The fact that one risk is accepted does not necessarily mean that another, lower risk is acceptable.

Acceptability must weigh risks against benefits. The risks from asbestos, no matter how small, are not acceptable if there are no compensating benefits or if there are less risky alternatives that can provide similar benefits.

Furthermore, most of the risks presented in Exhibit A are voluntary activities. Attending a school contaminated by asbestos is involuntary, not under the control of the children who are at risk. The standards for acceptability need to be much stricter for exposing children involuntarily to risk.

So, I'd have to say, as a professional and as a parent of school-age children, that the risks from exposure to the asbestos levels found at Jefferson Junior High may indeed be low. They may be very low. But I wouldn't want to expose my kids even to a theoretical risk of asbestos if I didn't have to.

Table III. Perceived Risk and Judgments of Guilt for Three Information Conditions[a]

Group	Information Presented	N	Mean perceived risk	% finding company guilty
I	Lifetime risk	30	3.53 (2.13)	54 (45)
II	Lifetime risk plus Exhibit A	27	2.48	30
III	Lifetime risk Exhibit A, and critique of Exhibit A	60	3.53	52

[a] Parenthesized values for group I summarize responses after being shown Exhibit A. Perceived risk decreased for 21 of 30 subjects, remained the same for 9 subjects, and increased for 0 subjects. Two subjects changed their assignments from guilty to not guilty.

generally concluded that the risks to school children are quite small, far lower than the risks to workers who are called upon to remove the asbestos.[10] The data shown in Table III suggest that this "small risk" does not appear small or acceptable to people when presented as a single estimate (0.23 fatalities per million students). The results show how sensitive perceptions of risk and guilt are to contextual information provided by a simple table of comparisons and to a critique that undermines the legitimacy of inferring acceptability of risk from comparisons across diverse hazards.

The results of this modest empirical study should be interpreted with caution. The trial setting was artificial and the arguments were quite abbreviated selections from the many possible ways of presenting, challenging, and counterchallenging the information about asbestos risks. The few prior attempts to examine the content of risk messages, going back to Fischhoff[11] and including the study by Roth *et al.*, are similarly incomplete — more on the order of demonstration studies. Despite being incomplete, these studies do demonstrate that content and context matter in risk communication. If we take this message seriously, we should incorporate a carefully designed and executed evaluation component into every important communication effort.

Recognizing the limitations of our simulated trial, it still seems remarkable to us that the effects of the comparisons in Exhibit A were so easily offset by the critique despite the fact that they show the asbestos risk to be minuscule relative to other commonly accepted risks. This suggests to us that the analyses and opinions of technical experts who believe that asbestos in schools should be left in place may not be convincing to the public in an adversarial context. More generally, the impotency of quantitative risk assessment in adversarial settings has important implications for the way that we manage risk in our society. One implication is that those who assess and manage risks need to relate to their constituents over the long term in ways that establish trust, credibility, and mutual respect.

In summary, the simplicity and intuitive appeal of comparisons of unrelated risks may be highly deceptive. Many factors appear to play a role in determining whether such comparisons will be useful. Whether these kinds of comparisons ultimately generate more light than heat will depend on the degree to which both the context of risk communication and the content of the messages are sensitive to those factors.

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Explaining Environmental Risk

Some Notes on
Environmental Risk
Communication

by
Peter M. Sandman

November 1986

Contents

"Explaining Environmental Risk: Some Notes on Environmental Risk Communication," by Peter M. Sandman for the TSCA Assistance Office, Office of Toxic Substances, U.S. Environmental Protection Agency, November 1986.

"Important If True"

In colonial times newspaper "correspondents" were nothing more than acquaintances of the publisher, writing home from their travels. Unable to confirm or disconfirm their reports, cautious publishers often printed them under the headline "Important If True."

"Explaining Environmental Risk" should be read in the spirit of this caution. While I have leaned heavily on the risk communication research literature where I could, many questions haven't been thoroughly studied, and here I have relied on my experience, my sense of other people's experience, and, frankly, my biases. If your experience and biases suggest different answers, try them. If you want to stick more closely to research findings, check the sources listed at the end.

Why are so many risk assessment and risk management people beginning to take an interest in risk communication? There are two answers, I think, one entirely admirable and the other more open to question. The good news is that experts and managers are coming to recognize that how people perceive a risk determines how they respond to it, which in turn sets the context for public policy. It is hard to have decent policies when the public ignores serious risks and recoils in terror from less serious ones. The task of risk communication, then, isn't just conveying information, though that alone is a challenge; it is to alert people when they ought to be alerted and reassure them when they ought to be reassured. If your job is directing the cleanup at chemical spills, or running a right-to-know program, or siting new waste facilities—in fact, if your job has anything to do with setting or administering or following environmental regulations—explaining environmental risk is an important piece of your job. And it's probably a piece for which you have had little training.

The more questionable reason for the growing interest in risk communication is the hope in some quarters that communicating about the environment can somehow replace managing it or regulating it aggressively. This is a common dilemma for communication specialists—advocates of bad policies sometimes imagine that they can get away with anything if they sell it cleverly enough, while advocates of good policies sometimes imagine that they don't have to sell at all. At a January 1986 national conference on risk communication (co-sponsored by the Conservation Foundation, the National Science Foundation, the

"Explaining Environmental Risk: Some Notes on Environmental Risk Communication," by Peter M. Sandman for the TSCA Assistance Office, Office of Toxic Substances, U.S. Environmental Protection Agency, 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.

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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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Dealing With The Media

1. Environmental risk is not a big story. The mass media are not especially interested in environmental risk. Reporters do care whether or not an environmental situation is risky: that's what makes it newsworthy. But once the possibility of hazard is established—that is, once someone asserts the risk on the record—the focus turns to other matters: how did the problem happen, who is responsible for cleaning it up, how much will it cost, etc. Assessing the extent of the risk strikes most journalists as an academic exercise. The reporter's job is news, not education; events, not issues or principles. And the news is the risky thing that has happened, not the difficult determination of how risky it actually is.

In an emergency, of course, the extent of the acute risk is the core of the story; radio reporters in particular want to know first and foremost whether to tell listeners to stay indoors, to evacuate, not to drink the water, etc. But the media don't especially want to know the ins-and-outs of risk assessment, the details of how great the risk is likely to be, how sure the experts are, or how they found out. If the story is important enough, these technical details merit a follow-up, a sidebar on the third or fourth day—but few stories are important enough.

The typical news story on environmental risk, in other words, *touches* on risk itself, while it *dwells* on more newsworthy matters. In 1985 newspaper editors in New Jersey were asked to submit examples of their best reporting on environmental risk, and the articles were analyzed paragraph by paragraph. Only 32 percent of the paragraphs dealt at all with risk. Nearly half of the risk paragraphs, moreover, focused on whether a substance assumed to be risky was or was not present (e.g. is there dioxin in the landfill), leaving only 17 percent of the paragraphs that dealt directly with riskiness itself (e.g. how hazardous is dioxin). In a parallel study, reporters were asked to specify which information they would need most urgently in covering an environmental risk emergency. Most reporters chose the basic risk information, saving the details for a possible second-day story. What happened, how it happened, who's to blame, and what the authorities are doing about it all command more journalistic attention than toxicity during an environmental crisis.

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The nature of the crisis determines how much stress the media put on risk as opposed to other issues. Reporters know, for example, that a chemical spill is a risk story, and at the scene of a spill they will keep asking about toxic effects even after they are told the chemical is benign and inert. A fire story, on the other hand, automatically raises questions about how the fire started, how much damage was done, who turned in the alarm, and the like; many reporters won't realize unless told that a fire in a battery factory or a supermarket warehouse is a toxic event. But even when reporters understand that environmental risk is a key element of the crisis, their appetite for risk information is strong but easily sated; they want to know badly, but they don't want to know much.

And when there is no crisis? The extent of a *chronic* risk is newsworthy only when events make it so—for example, when a court battle or a regulatory action hinges on a disputed risk assessment. Sources wishing to "sell" a chronic risk story to the media must therefore work to make it newsworthy. Give it a news peg—that is, make something happen that reporters can cover. Make it interesting. Build the case for its importance. Provide a prop worth focusing a camera on. But expect only partial success; reporters flock to the scene of a crisis, but they have to be seduced into covering chronic risk.

Among the greatest environmental risks in New Jersey is indoor radon contamination. Because it is new and serious, it received considerable media attention in 1985 and early 1986. Then the coverage began to slip. The easy news pegs were over: the discovery of the problem, the first home in the state with a super-high reading, the passage of radon legislation. With no "radon industry" to fight back, the conflict that journalism feeds on has been conspicuously missing from the radon story. Radon is more a health problem and a housing problem than an environmental controversy, and its coverage is correspondingly muted. And radon at least has the "advantage" of cancer, the disease we love to hate. Imagine its low visibility if it gave people emphysema instead.

2. Politics is more newsworthy than science. The media's reluctance to focus on risk for more than a paragraph or two might be less of a problem if that paragraph or two were a careful summary of the scientific evidence. It seldom is. In fact, the media are especially disinclined to cover the science of risk. Most of the paragraphs devoted to risk in the New Jersey study consisted of unsupported opinion—someone asserting or denying the risk without documentation. Only 4.2 percent of the paragraphs (24 percent of the risk paragraphs) took an intermediate or mixed or tentative

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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;

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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

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bystanders, the views of ideologues, the speculations of spokespeople, the history of mismanagement. Environmental risk stories often turn into political stories in part because political content is more readily available than technical content. Experienced sources work at filling the vacuum.

Although journalists tend not to believe in Truth-with-a-capital-T, they believe fervently in facts. Never lie to a reporter. Never guess. If you don't know, say you don't know. (But expect reporters to ask why you don't know.) If you don't know but can find out later, do so, and get back to the reporter as soon as possible, remembering that journalistic deadlines are measured in minutes, not months. If you know but can't tell, say you can't tell, and explain why. If you know but can't manage to say it in English, find someone who can. Reporters do not expect you to be neutral; in fact, they assume that you probably have an axe to grind, and prefer that you grind it visibly. They do expect you to grind it with integrity.

4. **The risk story is simplified to a dichotomy.** The media see environmental risk as a dichotomy; either the situation is hazardous or it is safe. This is in part because journalism dichotomizes all issues into sides to be balanced. But there are other reasons for dichotomizing risk. (1) It is difficult to find space for complex, nuanced, intermediate positions in a typical news story, say 40 seconds on television or 15 short paragraphs in a newspaper. (2) Virtually everyone outside his or her own field prefers simplicity to complexity, precision to approximation, and certainty to tentativeness. As Senator Edmund Muskie complained to an aide when the experts kept qualifying their testimony "on the other hand": "Find me an expert with one hand." (3) Most of the "bottom lines" of journalism are dichotomies— the chemical release is either legal or illegal, people either evacuate or stay, the incinerator is either built or not built. Like risk managers, the general public is usually asked to make yes-or-no decisions, and journalists are not wrong to want to offer information in that form.

Reporters are accustomed to the fact that technical sources invariably hedge, that nothing is ever "proved." They see this as a kind of slipperiness. Someone can always be found to advocate a discredited position (the tobacco industry has plenty of experts); no one wants to go too far out on a limb in case new evidence points in a different direction; researchers in particular like to leave the issue open so they can justify more research. Pinning down evasive sources is a finely honed journalistic skill. In terms of our 0-to-10 scale, reporters spend a fair amount of time trying to get 5-ish sources to make clear-cut 3 or 7 statements.

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Sources, especially technical sources, greatly resent the pressure from journalists to dichotomize and simplify. The dichotomization of risk distorts the reality that nothing is absolutely safe or absolutely dangerous, and polarizes "more-or-less" disagreements into "yes-or-no" conflicts. And oversimplification of any sort can mislead the audience and damage the reputation of the source. But recognize that journalists must simplify what they cover. If you refuse to simplify what you say, the reporter will try to do the job for you (at great risk to accuracy) or will turn to a more cooperative source.

The most qualified person to simplify your views is you. Decide in advance what your main points are, and stress them consistently and repetitively, even if you have to hook them onto your answers to irrelevant questions. Leave out the technical qualifiers that your colleagues might insist on but the general public doesn't need to know (but leave in the qualifiers that really affect the bottom line). Stay away from jargon, and explain the technical terms you can't avoid. Check to make sure the reporter understands what you are saying: if the reporter looks glassy-eyed or starts frantically taking down every word, back up and start over.

When you explain the significance of a toxic substance to reporters, try to avoid the "is it there or not" dichotomy, which can so easily alarm people about tiny concentrations. On the other hand, don't expect reporters to sit still for a dissertation on uncertainty in dose-response curves. Your best bet, when you can, is to specify the amount involved, then set it against some standard of comparison, ideally a government exposure standard. This is still a dichotomy, of course; it leaves the misimpression that exposures just under the standard are perfectly safe while exposures just over are deadly. But as dichotomies go, "over or under" is preferable to "there or not."

If you want to fight the journalistic tendency to dichotomize risk, fight it explicitly, asserting that the issue is not "risky or not" but "how risky." Recognizing that intermediate positions on risk are intrinsically less dramatic and more complex than extreme positions, work especially hard to come up with simple, clear, interesting ways to express the middle view. Even so, expect reporters to insist on knowing "which side" you come down on with respect to the underlying policy dichotomy.

5. Reporters try to personalize the risk story. Perhaps nothing about media coverage of environmental risk so irritates technical sources as the media's tendency to personalize. "Have you stopped drinking it yourself?" "Would you let your family live there?" Such questions fly in

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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.

8. 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.

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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 to be safe may or may not be hazardous naturally strikes people as

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alarming, almost regardless of the amount of attention paid to the two sides; imagine reading this evening that scientists disagree over whether your favorite food is carcinogenic. Thus, sociologist Allan Mazur has found that public fearfulness about risky new technologies is proportional to the amount of coverage, not to its character. Media coverage of environmental risk alerts the public to risks it was otherwise unaware of, and thus increases the level of alarm *even when it is balanced.*

None of this is a rationale for avoiding the media. Even balanced media coverage may not reliably lead to balanced public opinion, but balanced coverage is preferable to unbalanced coverage. And the coverage is most likely to be balanced when sources on all sides are actively trying to get covered. People with knowledge and opinions to share perform a public service when they share them. What can you do to alert people to the risks of a new technology before it is too late? What can you do to redress the alarming imbalance once the media have begun to overdramatize the risks? Energetic public relations will help with both tasks, though in both cases you will be working against the grain.

7. Reporters do their jobs with limited expertise and time. At all but the largest media, reporters covering environmental risk are not likely to have any special preparation for the assignment. Specialized environmental reporters are more the exception than the rule. Reporters covering an environmental emergency, for example, are mostly general-assignment reporters or police reporters, sent to the scene (or the phones) without time to scan the morgue, much less a technical handbook. And reporters tend to be science-phobic in the first place; the typical college journalism major takes only two science courses, and chooses those two carefully in an effort to avoid rigor. Though there are many exceptions, the average reporter approaches a technical story with trepidation (often hidden by professional bravado), expecting not to understand.

It doesn't help that the average reporter covers and writes two to three stories a day. Here too there are exceptions, but most journalists are in a great hurry most of the time. They must make deadline not just on this story, but quite often on the story they will be covering after this one. Their goal, reasonably, is not to find out all that is known, but *just to* find out enough to write the story. Even if they knew more, they would not have the space or airtime to report more, nor do they believe their readers or viewers would have the interest or patience to absorb more.

Note also that irrespective of what journalistic superstars earn, the average reporter at a small daily newspaper takes home perhaps $13,000-$16,000 a year. Considering their

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incomes. journalists are shockingly competent and dedicated. but there are limits to how much competence and dedication a salary in the teens can purchase.

If the idea appeals to you. by all means offer to teach local journalists the basics of your field—but don't expect general assignment reporters to find much time (or much stomach) for technical training they will use only a few times a year. A beat reporter who covers your issue full-time (if you are lucky enough to have one) is a much better candidate for technical training.

Better still. train yourself (and your colleages and staff) in dealing with the media. Hiring effective public information specialists also helps. but reporters much prefer to talk to the people in charge and the people in the know. Especially during an emergency. press calls often go to the boss and the expert instead of the press office. so the boss and the expert should know how to talk to reporters. The annals of risk communication are full of stories of corporate managers and agency bureaucrats who shot themselves in the foot—and permanently damaged their organizations—because they hadn't the least idea of how to deal with the media. Even the best communication skills can't rescue a technical disaster. of course: who wants to handle the PR at Chernobyl or Bhopal? But inadequate communication skills can create a disaster that needn't have been.

And adequate communication skills are not so hard to develop. All it takes is a little understanding of how the media work. a little training in dealing with reporters. and a little experience to smooth out the rough edges. Why. then. do so many managers. bureaucrats. and technical experts avoid all contact with the media? Because it's risky. Reporters don't always understand what you're telling them: they don't always share your goals and values: they don't always handle their jobs the way you want them to. In all these ways and many others. reporters may be different from the people you usually work with. And so working with reporters may sound like something less than an unalloyed pleasure.

Pleasure or not. the risks of ducking the media are far greater than the risks of working with them. Every news story about environmental risk is a collaboration between the journalists working on the story and the sources they talk to. There's not too much you can do to change the nature of journalism or the performance of journalists. But you can understand them and figure out how to deal with them. By improving your own performance as a source. you can bring about a real improvement in media coverage of environmental risk.

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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

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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 fearful because it

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is unfamiliar or unfair will help. Doing something to remedy the unfamiliarity or unfairness will help even more.

Just to make things more complicated, risk perception is not linear, not for anybody. That is, you can't just multiply how probable a risk is by how harmful it is to get how badly people want to prevent it. (If you could, there would be no insurance industry and no gambling industry.) In general, people will pay more to protect against low-probability loss than to pursue low-probability gain—but if the price is low enough to be dismissed as negligible, even an infinitesimal chance at a big payoff looks good.

Risk judgments are also very responsive to verbal cues. Doctors, for example, are much more likely to prescribe a new medication that saves 30 percent of its patients than one that loses 70 percent of them. A pollutant or an accident that will eventually give cancer to 10,000 people sounds very serious, but one that will add less than one tenth of one percent to the national cancer rate sounds almost negligible. There is in fact no "neutral" way to present risk data, only ways that are alarming or reassuring in varying degrees.

Finally, people's perception of risk is greatly influenced by the social context. Our responses to new risks, in fact, are largely predictable based on our enduring values and social relationships. Do we like or dislike, trust or distrust the people or institutions whose decisions are putting us at risk? Do our friends and neighbors consider the risks tolerable or intolerable? Are they enduring higher risks than ours, or escaping with lower ones? All these factors, though they are irrelevant to the mortality statistics, are intrinsic parts of what we mean by risk.

2. Moral categories mean more than risk data. The public is far from sure that risk is the real issue in the first place. Over the past several decades our society has reached near-consensus that pollution is morally wrong—not just harmful or dangerous, not just worth preventing where practical, but wrong. To many ears it now sounds callous, if not immoral, to assert that cleaning up a river or catching a midnight dumper isn't worth the expense, that the cost outweighs the risk, that there are cheaper ways to save lives. The police do not always catch child molesters, but they know not to argue that an occasional molested child is an "acceptable risk."

Government agencies build their own traps when they promulgate policy (and public relations) in the language of morality, depicting food additives or chemical wastes or polluted water as evils against which they vow to protect the innocent public. It is not at all obvious which environmental "insults" (another term with moral overtones) a society should reject on moral grounds and which it should assess

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strictly in terms of impact. But an agency that presents itself and its mission in moral terms should expect to be held to its stance. And an agency that wishes to deal with environmental risk in terms of costs-and-benefits instead of good-and-evil should proceed gently and cautiously, aware that it is tromping on holy ground.

Nor is morality the only principled basis for questioning the costs-and-benefits premises of risk assessment. Just as the moralist challenges the rightness of trading off certain risks against costs or benefits, the humanist challenges the coherence of the tradeoffs. How, the humanist asks, can anyone make sense of a standard that tries to put a cash value on human life? Or, indeed, of a standard that assumes that a hundred widely scattered deaths per year are equivalent to a one-in-a-hundred chance of obliterating a community of 10,000?

Similarly, the political critique of the premises of risk assessment begins by noting that "the greatest good for the greatest number" has always been a convenient rationale for the oppression of minorities. Democratic theory asserts that individuals and groups should be free to bargain for their own interests, and should be protected from the tyranny of the majority. There is nothing unreasonable about the suggestion that equitable distribution of risks and benefits—and of the power to allocate risks and benefits—is often more important than the minimization of total risk or the maximization of total benefit. It may be efficient to dump every environmental indignity on the same already degraded community, but it is not fair.

3. Policy decisions are seen as either risky or safe. Like the media, the public tends to dichotomize risk. Either the risk is seen as very frightening, in which case the response is some mix of fear, anger, panic, and paralysis; or the risk is dismissed as trivial, in which case the response is apathy.

In their personal lives, people do not necessarily dichotomize risk. Most of us are quite capable of understanding that the picnic might or might not be rained out, that the boss might or might not get angry, even that smoking might or might not give us lung cancer. Of course quantified probabilistic statements are genuinely hard to understand, especially when the probabilities are small, the units are unfamiliar, and the experts disagree. But beyond these perplexities lies another issue of enormous importance to risk communication. While people may (with difficulty) master a probabilistic risk statement that concerns what they should do to protect themselves, they are bound to resist probabilistic risk statements that concern what others (government, say) should do to protect them. On my own

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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

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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

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may feel we have no choice but to trust the authorities, again despite our reservations. The gravest problems of risk communication tend to arise when citizens determine that the issue is important, that the authorities cannot be trusted, and that they themselves are powerless. Then comes the backlash of outrage.

5. Risk decisions are better when the public shares the power. People learn more and assess what they learn more carefully if they exercise some real control over the ultimate decision. But this sort of power-sharing is, of course, enormously difficult for policy-makers, for a wide range of political, legal, professional, and psychological reasons. Interestingly, corporate officials may sometimes find power-sharing less unpalatable than government officials. Corporations have a bottom line to nurture, and when all else fails they may see the wisdom of sharing power in the interests of profit. But government officials have no profit to compensate for the loss of power, so they may find it harder to share.

"Public participation," as usually practiced, is not a satisfactory substitute for power-sharing. To be sure, telling the public what you're doing is better than not telling the public what you're doing. Seeking "input" and "feedback" is better still. But most public participation is too little too late: "After years of effort, summarized in this 300-page report, we have reached the following conclusions.... Now what do you folks think?" At this point it is hard enough for the agency to take the input seriously, and harder still for the public to believe it will be taken seriously. There is little power-sharing in the "decide-announce-defend" tradition of public participation.

The solution is obvious, though difficult to implement. Consultations with the public on risk management should begin early in the process and continue throughout. This means an agency must be willing to tell the public about a risk *before* it has done its homework—before the experts have assessed the risk thoroughly, before all the policy options have been articulated, way before the policy decisions have been made. There are dangers to this strategy: people will ask the agency what it proposes to do about the problem, and the agency will have to say it isn't sure yet. But on balance an agency is better off explaining why it doesn't yet have all the answers than explaining why it didn't share them years ago. In fact, not having all the answers can be made into an asset, a demonstration of real openness to public input. The goal, after all, is to enlist the rationality of the citizenry, so that citizens and experts are working together to figure out how great the risk is and what to do about it.

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Of course no responsible agency will go public without *any* answers. What's important is to propose options X, Y, and Z tentatively, with genuine openness to V and W, and to community comments that may eliminate Z. A list of options and alternatives—and a fair and open procedure for comparing them and adding new ones—is far more conducive to real power-sharing than a "draft" decision.

This sort of genuine public participation is the moral right of the citizenry. It is also sound policy. Undeterred by conventional wisdom, lay people often have good ideas that experts can adapt to the situation at hand; at a minimum, lay people *are* the experts on what frightens them and what would reassure them. When citizens participate in a risk management decision, moreover, they are far more likely to accept it, for at least three reasons: (1) They have instituted changes that make it objectively more acceptable; (2) They have got past the process issue of control and mastered the technical data on risk; that is, they have learned why the experts consider it acceptable; and (3) They have been heard and not excluded, and so can appreciate the legitimacy of the decision even if they continue to dislike the decision itself.

6. Explaining risk information is difficult but not impossible, if the motivation is there. High school teachers have long marveled that a student who couldn't make sense of Dickens's *A Tale of Two Cities* had no trouble with *Hot Rod's* far more complex instructions on how to adjust one's sparkplugs for a fast start on a rainy day. Motivation makes the difference. When people have a reason to learn, they learn.

It is still possible for communicators to make the learning easier or harder—and scientists and bureaucrats have acquired a fairly consistent reputation for making it harder. At Three Mile Island, for example, the level of technical jargon was actually higher when the experts were talking to the public and the news media than when they were talking to each other. The transcripts of urgent telephone conversations between nuclear engineers were usually simpler to understand than the transcripts of news conferences. To be sure, jargon is a genuine tool of professional communication, conveying meaning (to those with the requisite training) precisely and concisely. But it also serves as a tool to *avoid* communication with outsiders, and as a sort of membership badge, a sign of the status difference between the professional and everyone else.

Like any piece of professional socialization, the tendency to mystify outsiders becomes automatic, habitual more than malevolent. It's hard for a layperson to get a straight answer from an expert even when nothing much is at stake. When a potentially serious risk is at stake, when people are

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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 assess-

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ments 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 who are confident that the risk is small and the facility needed may

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well try to sympathize with the target community—but their training tells them playing the odds is a good bet, somebody has to take the risk, the decision is rational, and that's the end of the matter.

Thus the most common sources of risk information are people who are professionally inclined to ignore feelings. And how do people respond when their feelings are ignored? They escalate—yell louder, cry harder, listen less—which in turn stiffens the experts, which further provokes the audience. The inevitable result is the classic drama of stereotypes in conflict: the cold scientist or bureaucrat versus the hysterical citizen.

Breaking this self-defeating cycle is mostly a matter of explicitly acknowledging the feeling (and the legitimacy of the feeling) *before* trying to explain anything substantive—because any effort to explain substance first will be experienced by people as just another way of not noticing how they feel. The trick, in other words, is to separate the feeling from the substance, and respond to the feeling first. "I can tell you're angry about this" won't eliminate the anger—nor should it—but it will eliminate the need to insist on the anger, and will thus free energy to focus on the issue instead. "A lot of people would be angry about this" and "in your position I would be angry about this" are even more empathic remarks, legitimating the anger without labeling the citizen. All three responses are far more useful than pretending that the anger isn't there or, worse yet, demanding that it disappear. Techniques of this sort are standard practice in many professional contexts, from police crisis intervention to family counseling. Training is available; risk communicators need not reinvent the wheel.

It helps to realize that experts and bureaucrats—their preferences notwithstanding—have feelings too. In a public controversy over risk, they are likely to have very strong feelings indeed. After all, they consider themselves moral people, yet they may be accused of "selling out" community health or safety or environmental protection. They consider themselves competent professionals, yet they may be accused of egregious technical errors. They very likely pride themselves on putting science or public service ahead of personal ambition, yet they may be accused of not caring. They chose their careers expecting if not gratitude at least a calm working environment and the trust and respect of the community. Instead they are at the center of a maelstrom of community distrust, perhaps even community hatred. It hurts.

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The pain can easily transform into a kind of icy paternalism, an "I'm-going-to-help-you-even-if-you-*don't*-know-what's-good-for-you" attitude. This of course triggers even more distrust, even stronger displays of anger and fear. Risk communication stands a better chance of working when both sets of feelings—the expert's and the community's—are on the table.

Feelings are not usually the core issue in risk communication controversies. The core issue is usually control, and the way control affects how people define risk and how they approach information about risk. But the stereotypical conflict between the icy expert and the hysterical citizen is nonetheless emblematic of the overall problem. The expert has most of the "rational" resources—expertise, of course; stature; formal control of the ultimate decision. Neither a direct beneficiary nor a potential victim, the expert can afford to assess the situation coldly. Indeed, the expert dare not assess the situation in any other way. The concerned citizen, meanwhile, has mainly the resources of passion—genuine outrage; depth of commitment; willingness to endure personal sacrifice; community solidarity; informal political power. To generate the energy needed to stop the technical juggernaut, the citizen must assess the situation hotly.

A fundamental premise of "Explaining Environmental Risk" is that risk understanding and risk decision-making will improve when control is democratized. We will know this is happening when citizens begin approaching risk issues more coolly, and experts more warmly.

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PUBLIC MEETING

TYPICAL QUESTIONS & SAMPLE RESPONSES

Prepared by

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Following is a list of questions which are often asked by the public, along with some typical responses. The list is taken from EPA, Region 9's Risk & Decision Making and Risk Communication & Public Involvement Courses. It serves to illustrate the use of EPA's Seven Cardinal Rules of Risk Communication and the careful preparation that is required.

The authors welcome your comments and any suggestions for additional questions. Based on your responses, the list may be expanded or revised. All comments may be directed to the authors at (415) 744-1019 or 744-1018.

A CAUTION TO THE READER - The sample responses are offered ***only*** as ***ideas,*** from which you must develop your own responses. The responses are ***not*** intended to be memorized and used verbatim. A response may be used only if it addresses the specific needs of your audience, and it is comfortable for both you and your agency. ***Your responses must be open, honest, frank, and meet the needs of your public or audience.*** It may not be obvious, but developing your responses usually requires policy input from management as well as technical input from other credible sources. ***This preparation is essential to your performance; if you fail to prepare, you can't expect to gain the important trust and respect of our public constituents, and you won't be effective. (CR 2)****

* Cardinal Rule #2 from EPA's Seven Cardinal Rules of Risk Communication (See page 2.)

EPA's

Seven Cardinal Rules of Risk Communication

1. Accept and involve the public as a legitimate partner. (CR1)

2. Plan carefully and evaluate your performance. (CR2)

3. Listen to the public's feelings. (CR3)

   (Examples of ***"active listening"*** are offered in some of the responses to the questions which follow. These specific examples are underlined for easy reading.)

4. Be honest, open, and frank. (CR4)

5. Coordinate and collaborate with other credible sources. (CR5)

6. Meet the needs of the media. (CR6)

7. Speak clearly and with compassion. (CR7)

"Public Meeting: Typical Questions and Sample Responses," By Alvin Chun and Arnold R. Den, Office of the Regional Administrator Office of the Senior Science Advisor, EPA Region 9, revised January 1992.

1. **Q. Why can't I ask my question now?**

Underlying Public Need: The Agency agenda isn't working and the public would like their concerns and questions addressed first.

- Reminder Note: Underlined sentences are examples of "active listening."

A. Sounds like there are a lot of questions that need to be answered now. Maybe we should do that first and save the rest of the agenda for later? Is that OK? (Principles: Listen, feedback, and accept the public as a legitimate partner in deciding on the agenda.) (CR 1, 3)

A. I know you all have a lot of questions that you want answered. Would it be alright if we proceed with the 20-30 minute presentation, where I suspect that many of your questions will be answered, and then leave the next period of time for the rest of your questions? (Principles: Listen, feedback with a recommendation and accept the public as a legitimate partner in deciding on the agenda.) (CR 1, 3)

A. Poor Response: Please let me finish my talk! (Not listening to the audience's need for answers to their questions, and giving the impression that we don't care and that we know better than they do. Thus, we are not treating them as legitimate partners.)

A. Poor Response: Please (*with hand raised at audience*) all questions will be taken after our presentation! We need to follow the agenda. Let us give our presentation and then we'll take questions.

2. **Q. Why won't you answer my question? (This is usually a follow-up question to Question #1 when the Agency insists that questions will be answered only after the presentation.)**

Underlying Public Need: The public would like to vent feelings and have us listen and be responsive so that they can find out if we are on their side and taking adequate action. Also, they may not want a "slick" presentation but are more interested in direct answers to their personal questions.

A. I apologize if we have not answered your questions. I have written your questions here (on flip chart), and I have saved this part of the agenda to answer them. I think that many of your questions will be answered in the 20-30 minute presentation that we have prepared, and it may save everyone some time. Our

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presentation will cover some important questions which may be on your mind such as, "Is my family safe? What are we planning on doing about it? What's been going on?" If that sounds like it will work for you, could we proceed? And if it isn't working, then we'll have to think of something else. (Principles: Listen, feedback with helpful suggestions and involve the public in deciding how to proceed.) (CR 1, 3)

A. <u>You've asked a very good question and maybe we haven't been listening too well</u>. How many of you have questions and would like them answered? I see there are a lot of questions. Let me make 2 suggestions for how you might want to proceed, and you can tell me if either one sounds good. (Principles: Listen, feedback with helpful suggestions and involve the public in deciding how to proceed.) (CR 1, 3)

One suggestion is to answer your questions first until they are all answered, and then if you are still interested and have the time, we could give our 20 minute presentation. Also, we have a fact sheet which summarizes much of the presentation if you can't stay for the whole meeting.

The other suggestion is to let us give a 20-minute presentation so that everyone will have some common understanding of the situation, and be able to ask some questions which they may not have otherwise. We have a 20 minute presentation, and it may answer many of your questions. After the presentation, we can spend the rest of the evening answering all your questions. Since there are a lot of questions, and many of you can't stay pass 11 P.M., when the meeting was suppose to end, we will try to accommodate your questions first and stay until all your questions have been addressed.

Now let's have a show of hands to decide how we should proceed. How many would like to hear the presentation first? How many would like to get at the questions first?

A. Poor Response: Sir, if you would just let me finish, I'll get to your question at the end, and we'll answer all questions then. (Not listening to the public; Agency is more concerned about sticking to the agenda and maintaining control of the meeting. In its attempt to maintain control, the Agency will likely lose control. An important point to consider: If your meeting goal is to give your presentation at any expense, then this would have been a good response. However, this is usually not our intended goal. Our goal normally is to try to meet the needs of the

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community in trying to solve the environmental problem. Given that as our goal, if a community is insisting to be heard we should recognize their need and try to meet it, or present them with alternatives that meet both their needs and the Agency's, and let them choose.)

3. Q. **What have you done about it? Why are you taking so long?**

Underlying Public Need: The public would like to know if we are being responsive in correcting the problem, and if we care.

A. Sir, you'd like to know what we're doing, and you're angry that it's taken so long. We share your concerned about taking care of this as quickly as possible. Unfortunately, there are no simple solutions for cleaning up hazardous waste sites. Each site must be carefully characterized before a clean up plan can be made to enable us to do a good job. This takes longer than we would all like but it is needed to ensure that it is done right in order to safeguard public health. We are proceeding as fast as we can, and here's what we are doing: .... (Principles: Listen, feedback, share concern, and answer.) (CR 3, 4, 7)

A. Poor Response: Ah, Ah, Ah.....Don't you know we're doing our best! (Didn't have an answer, wasn't prepared to answer a basic question, and became defensive. This increases the public outrage which delays discussion on options and solutions.)

A. Poor Response: I have 5 other sites that I'm working on and I'm working hard on all of them. (The public is not interested in other sites or excuses. They want to know what we *are* doing about *their* site to protect them.)

4. Q. **Why haven't you closed the plant? How many more cancers do you want?**

Underlying Public Need: The public is worried about cancer (or some other health issue) and needs to know how we're planning on addressing the problem and if we care about them. To the public, closing the plant is a logical solution.

A. We share your concerns about health. Let us assure you that the plant isn't posing an immediate health hazard where closing the plant would be needed. However, a long term and constant exposure to DNC could present a health hazard, and that is why we are proposing some immediate actions which will ensure your safety. Here's what we are proposing, and we believe this

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will correct the problem, protect your health, and not create a hardship for the people who are currently employed at the plant. (Principles: Give a direct answer that addresses our concern for protecting people's health and welfare, and state our actions.) (CR 3, 4, 7)

A. Poor Response: Let me finish my presentation!

A. Poor Response: We've been working with the plant, and we don't think that it's necessary!

5. Q. **Is it safe? Are my kids safe?**

Underlying Public Need: The public needs to know if there is any immediate danger to their family and that we care about that. They want "micro" risk answers to the "Am I safe?" questions, not "macro" risk answers which the Agency has been concerned with in their decision making, i.e., "The hazard presents a 10^{-5} risk to the community."

A. Your concern for safety is our concern also. Any cancer causing agent is potentially dangerous (The non-threshold concept). DNC is such a substance. Based on our knowledge of the amount of DNC that people are being exposed to, we feel it is safe for all residents east of Electrobotics because DNC isn't in the air or drinking water. For residents to the west of Electrobotics, DNC is only present in the air, but in such small quantities that exposure will only be a health concern if it is not reduced in the next several years. We are proposing to reduce and minimize the exposures to DNC by permanently capping the source of the DNC to eliminate its presence in the air, and cleaning up the contaminated soil to minimize any contamination of the water. This will make it safe. (CR 3, 4)

For a more typical case when the contamination *cannot* be totally removed from the ground water, a response could be:

A. Your concern for safety is our concern also. Any cancer-causing agent is potentially dangerous (The non-threshold concept). DNC is such a substance. Based on our knowledge of the amount of DNC which people are being exposed to, we feel it is safe for all residents east of Electrobotics because it isn't in the air or drinking water. For residents to the west of Electrobotics, DNC is only present in the air, but in such small quantities that exposure will only be a health concern if it is not reduced in the next several years. We are proposing immediate actions to reduce and minimize the exposures to DNC by permanently capping the source of the DNC to eliminate its presence in the air, and cleaning up the contaminated soil to a safe level. (In this case there will be a finite but small concentration of DNC remaining in the drinking water, but it will be at a level which is between 10^{-4} to 10^{-6} risk which we, as Agency personnel, have established in the regulatory processes for various air, and water standards as being "safe." This still may not be acceptable to some people, and understandably so, especially if they hadn't been involved in the decision making process. Similarly, it may not be acceptable to you as an Agency person because the risk is not zero, and a residual risk remains.) (CR 3, 4)

A. <u>Your concern for safety is our concern also</u>. We believe it is safe for you and your kids to drink the water and breath the air. There is no DNC in the drinking water, but we feel there will be in the future if a leak from the company's holding pond is not controlled. There is some DNC contamination in the air and this will become a dangerous situation if it is not controlled and people are exposed to it over their entire life. (CR 3, 4)

A. Poor Response: The life time risk of getting cancer based on the current level of DNC in the air is 10^{-4}. Based on that estimate, we feel that we should reduce the risk to a level of 10^{-6}. (What's probably not needed here is more jargon.)

6. Q. **Are there any safe levels for a carcinogen?** (Class A, B, or C carcinogens)

A. <u>Your question on carcinogens is an excellent one</u>. EPA has identified some chemicals as (A) known, (B) probable or (C) possible human carcinogens based primarily on human data (A), and on animal studies (B and C). If we believe it to be a carcinogen, we assume that all levels of exposure will have some level of cancer risk. The smaller the exposure, the smaller the risk. We generally describe these risks in terms of probability. If in asking your question, you want to know if there are levels of exposure that are free from risk, the answer is no. If, on the other hand, you are asking whether certain levels of chemical exposure are too small to be of a health concern, then the answer is yes. Our goal is to reduce the level of exposure to a safe level where it will be safe to drink the water and breath the air. (Remember that a safe level does not necessarily mean zero risk. It could mean for example that 10^{-4} or 10^{-5} risk is a safe level. There are many reasons why zero risk may not be feasible,

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but one must also remember that 10^{-4} or 10^{-5} are upperbound or maximum risks. This means that the actual probability may be much lower and may even be zero because of all the health protective assumptions that are used.) (CR 3, 4)

7. Q. **Would you drink our water? What about breathing our air?**

Underlying Public Need: Again, the public would like to know how this affects their family and if we are sincere about our concern for them.

A. Yes, I would drink the water because it is not contaminated, and I am here breathing the air because it is such a low risk that it isn't a health problem. I understand that some of you may feel that any concentration of DNC in the air is unsafe. If you feel that way, I would recommend that you consult with your doctor or do what you feel will make you more comfortable. However, we feel there is no immediate hazard, and we can clean up the situation so that there will be no long term health concern. (If there was an immediate health hazard, an emergency response action would be ordered, and bottled water could be offered or recommended if the drinking water was contaminated.) (CR 3, 4, 7)

A. Poor Response: That's a personal choice whether to drink the water or not.

A. Poor Response: (Hesitates and doesn't answer.)

8. Q. **How can you say it's acceptable? My family has cancer! Look at the neighborhood and all the sickness and cancers!**

Underlying Public Need: Public wants to have some control over determining what is acceptable, and to have it be as safe as possible.

(The phrase "acceptable risk" should not be used because it requires a value judgement which can only be made by the public, not solely by an agency. An agency can decide what it considers "safe" and the public has every right to say that it isn't acceptable.)

A. I'm hearing that you're not satisfied with our clean-up proposal, and that you're very concerned about the cancer which the contamination may cause. We too are concerned, and that is why the clean-up plan that we are proposing addresses the concern for safety. The plan will clean up the contamination to

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a safe level. However, it sounds like you might be more comfortable with a greater-than-safe level which we are proposing. I can't make any promises, but I would be interested in any ideas or concerns which you may have. But at this time, I am confident that our proposal will make it safe for you and provide the level of health protection which you are expecting. (CR 1, 3, 4, 7)

A. <u>It's unfortunate that there is so much sickness</u>. I am concerned and sad to hear that. Our goal is to make it as safe as possible with your input. I believe we can develop a solution to control the risk. (CR 3, 4, 7)

A. Poor Response: It's acceptable because the risk is 10^{-6}. Based on that risk level, we don't see how those illnesses and cancers can be attributed to DNC.

A. Poor Response: We don't know what caused the cancers. However, you should know that 1 out of 4 of you will get cancer in your lifetime because of everyday activities and exposures. For example, it's more likely that you'll get cancer from eating peanut butter or charcoal broiled steaks than it would be from exposure to DNC. (Whether this is true or not is irrelevant when people are upset. The people want to be involved. They are not asking for an explanation. In this case, an explanation belittles the public and their concerns over the site.)

9. Q. **What does 1×10^{-6} mean? What is risk?**

Underlying Public Need: The public needs to know if we're trying to "snow them" with jargon or if we're looking after their best interest. Discussing first how the situation affects them personally, i.e., "Is it safe?" will reach people directly and get at their needs. Then, the public may want to have specific technical discussions about risk calculations. Often, if the agency has done a good job addressing the "Is it safe?" question with honesty and compassion, the agency will have established some level of trust and credibility where the public will be willing to focus on the 10^{-6} terminology. Surprisingly, if the agency has done its job well in establishing trust and credibility with the public, the public's need to know about 10^{-6} will not be needed! Often times agencies tend to focus on the 10^{-6} issues too soon with the public without adequately addressing the real public concerns. This then creates a diversion to argue about 10^{-6} and misleads the agency to think that if only they could have explained 10^{-6} better, it would have not created an argument with the public. The argument was probably

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over the agency not listening, and as a result some underlying public needs were probably not met.

Assuming that this question is being asked at a technical meeting, some answers could be:

A. Risk is the probability or chance of getting cancer. 1×10^{-6} is another way of saying one-in-a-million chance of getting cancer (above the normal background cancers). In our definition, one-in-a-million is a probability based on data and many health protective assumptions that there may be one extra cancer case in a population of 1 million people over a lifetime of exposure to a chemical. The probability is an upperbound estimate and can be thought of as a maximum probability because worst case situations are assumed where science has no definite answers in order to be on the safe side of protecting public health. For example, "How is cancer caused?" is still an unanswered scientific question. To make up for this uncertainty, and since it is difficult to study human subjects over their lifetime, we rely on animal studies to determine the carcinogenicity of most chemicals. Because the one-in-a-million probability is an upperbound or maximum probability it means that a cancer case may not occur at all, but if it does, there is at most a one-in-a-million likelihood for an extra cancer case above the expected 250,000 cancer cases that would normally occur in a population of 1 million. (Remember, in the absence of sufficient data, worst case and upperbound assumptions are used in the risk assessment. This means that calculated risks are probably orders of magnitude higher than they should be, but since we don't have definite data and we are dealing with carcinogens, we want to be protective of public health and safety.) (CR 3, 4)

A. In this situation, we are talking about cancer risk. Cancer risk is the likelihood or chance of getting cancer. When we write, "1×10^{-6}" or say "one times ten to the minus sixth," we are using scientific terms to say "one-in-a-million." If we were to say there is a one-in-a-million excess cancer risk from a given level of exposure to a chemical, we mean that each individual exposed to that chemical at that level over his/her lifetime has a one-in-a-million chance of getting cancer from that particular exposure. This is similar to saying that because of that chemical we could expect to see one additional cancer case in a population of one million people who are all exposed under the same circumstances. However, we say "excess cancer risk" and "additional cancer" because we already expect to see, due to all

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other causes, about 250,000 cancer cases in a population of one million people.

You should also realize, however, that there is a great deal of uncertainty that accompanies our risk estimates. Science has not yet progressed far enough to explain exactly how cancer is caused. Nor can we ever be absolutely sure of the levels of a chemical that are present in the environment. But in order to be protective of public health, our risk assessments are designed to account for the various uncertainties. In fact, where our information is incomplete, we use assumptions that tend to overestimate the risk in order to further insure that we are being health protective. As a result, when we estimate that there is a one-in-a-million risk, the actual risk has very little chance of exceeding one-in-a-million. In actuality, one-in-a-million most likely overestimates the actual risk, and, in fact, may be zero.

Assuming that this question is being asked at a non-technical public meeting, some answers could be:

A. 1×10^{-6} is an expression which scientists often use to express one chance in a million. This in risk terms means one chance in a million of getting cancer from being constantly exposed to a certain level of a chemical over one's lifetime of 70 years. If that still isn't a good enough explanation, let me explain it another way and hopefully, this will be more helpful: DNC is a dangerous chemical because we have reasons to believe that it may cause cancer. Currently, there is no danger to you if you drink the water because it isn't contaminated. The air is contaminated with DNC, but in such small levels that it is safe in the short-term provided we further reduce the contamination to a lower level where it will be also safe in the long-term. I'm sorry if this sounded confusing because on the one hand we're saying it's safe in the short term, but on the other hand we're proposing to clean it up which will make it safe in the long term. If this is still confusing, let me use an analogy which may make this a little clearer. Some of you may say that my example is ridiculous because it will never happen, and you're right, but for a lack of a better example, allow me to try this one just to see if it gives you at least a better feel for what we have been talking about:

Imagine that there's a pallet of cement weighing 900 lbs suspended over your house. The pallet is being held by a cable which is rated at 1000 lbs. You are safe because the cable hasn't snapped and it isn't likely to. You may feel safe for a long time

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if the pallet remains overhead because the cable can probably support 2000 lbs. There is usually a safety factor built into the strength rating; however, you and your family may feel very nervous because you don't normally have a pallet of cement hanging over your home and there may be some risk that the cable will break. Because you're concerned about your family's well being, you'd probably like to get rid of it completely but let's assume that it would be too difficult or unaffordable. Then you'll probably try to do something like reinforce the cable or reduce the load so that you increase your confidence that your family won't get hurt. This is an unlikely example, but as an illustration, it may be useful. It is similar to our situation with DNC in the air. In that situation, the the weight of the cement or DNC contamination is closer to 500 lbs and our clean up plan calls for the cement or DNC to be reduced to less than 5 lb. Even with 500 lbs of cement there is still some small chance that the cable might break, and reducing the weight to less than 5 lb would greatly reduce that chance. In other words, for our situation around the Electrobotics Plant, we think it is presently safe, but we would feel much more confident about everyone's safety over the long term, if we could make it safer by further reducing the contamination of DNC. That is what we are trying to do. Even though this example doesn't give you a precise answer to what 10^{-6} is, I hope it gives you a better idea of how small 10^{-6} risk is, and why we are proposing these actions. (CR 3, 4, 7)

As in any response, this one may not be satisfying to everyone, and you may need to be prepared to offer other examples to be more helpful. For example:

A. <u>It looks like that analogy wasn't too good for everyone</u>. Maybe some of you now have some more specific questions that could help me to explain this better, or maybe I could meet with those of you who would like to discuss it further after this meeting. If you want, I could give you another example?

Other examples: A 10^{-6} risk level is equal to the risk level associated with EPA's drinking water standard for TCE, a probable human carcinogen; or 100 times more stringent than EPA's drinking water standard for vinyl chloride, another cancer causing chemical; or 10 times more stringent that EPA's air standard for benzene, also a carcinogen.

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A. Poor Response: It's almost like getting four-of-a-kind in a poker game. (If people are expressing doubt or confusion about the terms, and you proceed to explain the terms with more unfamiliar or technical terms instead of looking for a more relatable explanation or example, it will be non-productive and create outrage.)

10. Q. **Am I the one-in-a-million? Why isn't it zero?**

Underlying Public Need: The public is concerned about how they will be affected personally, and whether they can trust the Agency's judgement The public may also be giving an indication that they might be interested in being more involved in the risk management process to decide on an "acceptable" risk.

A. Your concerns about how the risk numbers would affect you personally is a very valid one. Because we are talking "probability" or "chance" when we talk about risk, there is unfortunately no definite answer to your questions. But based on the safety factors we've used to develop these risk numbers, we sincerely doubt if you will get cancer from DNC. Let me explain why. In estimating the risk, we've made numerous health protective assumptions and assumed several worst case exposure situations to be on the safe side. The assumed exposure situations are very unlikely, but because of the uncertainties about cancer, we wanted to be as protective as we could be. As a consequence, the actions we will take to reduce your risk based on these assumptions will be more substantial or health protective than if we had assumed more typical exposure situations. For example, we assumed a maximum exposure to DNC of 24 hours/day, 365 days/year for the next 70 years. If this describes your current situation, you may have at most a one-in-a-million chance of getting cancer from DNC. If you are exposed to DNC for less than 24 hours/day, then your risk is even less. Conversely, under those extreme exposures you have at least a 999,999 in-a-million chance of not getting cancer from DNC, and an even much less chance if your exposure is less than the extreme situation we assumed. In your case, I would guess that you will not be constantly exposed to DNC for all of your life, and thus your chance of getting cancer from DNC is much less than one-in-a-million, and for all practical purposes is zero, especially when one considers all the other health protective assumptions that are used. (CR 3, 4, 7)

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A. Poor Response: Chances are you will not be the one-in-a-million to get cancer from being exposed to DNC. You're more likely to get cancer from eating peanut butter or charcoal broiled steaks which also contain carcinogens.

11. Q. **What does 1 ppb mean; 1 μg/l; 1 $\mu g/m^3$?**

(The context of this question is that we've been using 1 ppm in all our previous discussions and now we've introduced 1 ppb. This is a technical question requiring a technical answer which should be given in terms that are familiar to the audience. The second response provided below can also be used to clarify "ppb" when it is introduced in a public discussion.)

For example,

A. <u>I'm sorry if we've confused things by switching from 1 ppm to 1 ppb concentration</u>. Here's one way to explain it:

1 ppm is 1000 ppb, or
1 ppb is a 1000 times smaller than 1 ppm

Another way to visualize 1 ppm is that is it is 1/1,000,000, and this would make 1 ppb 1/1,000,000,000. (Write the numbers on a flip chart to help illustrate your points.)

Even though these may be small numbers or small concentrations, a small concentration of a certain toxic chemical may still hurt you. Whether it can hurt you depends on the chemical, how much and how long you're exposed to it.

A. 1 ppb is a term for expressing concentration. 1 ppb is similar to one drop of water in an Olympic size swimming pool, 1 second in 32 years, or 1 item out of a billion of those items. I hope these examples are of some help. (CR 4, 7)

Does that clear up the confusion? (CR 3, 4, 7)

A. Poor Response: (Answering with technical terms or jargon similar to the previous response when the question was actually a non-technical question is a poor response because it doesn't address the real needs of the audience.)

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12. **Q. What does RCRA mean?**

A. See Answers to Question #11. (Avoid jargon and explain terms early in your presentation. Referring to "RCRA" as the "law" or the "regulations" may also be sufficient and won't sound so jargony once people are familiar with your term.) (CR 7)

13. **Q. How can you trust the company?**

Underlying Public Need: The public needs to know that our primary concern is for their health and well being. They would also like to know how we verify company data.

A. You're concerned about the credibility of the company's data. Let me assure you that we don't take the company's data on face value. We critically review the data and the process by which it was derived to ensure its credibility. If we had any doubts, we would get additional, more reliable data. Our goal is to protect your health by ensuring that we have the most reliable data from which to base our decisions. Unfortunately, because we have a limited budget and there are more environmental problems than we can address, we usually rely on company data and we do our best to ensure its quality. (CR 3, 4)

A. Poor Response: Why do you think we trust the company? (Defensive, and does not answer the question.)

14. **Q. Why did the company have to tell you? Why didn't you spot the problem and why did it take so long?**

Underlying Public Need: The public probably needs to vent their frustration about the situation, and to feel that we have been and are currently doing everything that we can. They may need an honest apology from the agency for any delays, and to know more periodically that progress is being made.

A. You would have wanted us to have known about the problem earlier. We wish we could have also. Unfortunately, we operate under limitations. (As some examples: We didn't have any authority in this matter until recently when the regulations came into affect; Nobody knew DNC was a carcinogen until recently when the cancer data was published; and, We have limited resources to deal with these problems.) However, we are taking actions to solve the problem, and here's what we are doing to protect your health: ....(CR 3, 4, 7)

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A. Poor Response: We're doing the best we can, and I would appreciate it if you could be patient and try to understand that we are doing our best.

15. Q. **What does 0.07 deaths mean? How can you have a partial death?**

Underlying Public Need: The public is confused by the information and would like clarification so that they can better understand it.

(A suggestion here is to revise the presentation and increase the population size even if it is larger than the real population to make 0.07 be a whole number. For example, 7 out of 100 million would be less confusing.)

A. I apologize for our poor example. Another way that may help to explain what we mean is to say that out of a population of 100 million people who might be exposed to this chemical, we might expect that no more that 7 cancer would result in a lifetime. So for a population of 100,000, it would be unlikely that there would be any cancers attributed to exposures to this chemical. Does that explain it better? (CR 3, 4, 7)

A. Poor Response: I'm not sure. (Even though this may be an honest response, it is embarrassing that such a basic question could not have been answered; this hurts credibility. The public would have expected an agency representative to have answered this question.)

A. Poor Response: Of the 100,000 people that would be exposed, a maximum of 0.07 deaths might result.

16. Q. **What do you mean you don't know?**

Underlying Public Need: The public probably needs to vent their frustration and concerns, and may also need a genuine apology from agency officials. IMPORTANT RULE: If you don't know, you should be open, honest, and frank and say so. You may have to repeat this several times, but never guess or make up an answer because you feel pressured: this is a sure way of losing any trust and credibility you may have established.

A. I'm sorry I don't have the answer today. Would it be O.K. if I called you next week after I've done some checking to see if I can get the answer for you. May I see you after this meeting and get your phone number? (CR 3, 4, 7)

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19. Q. One of our very close friends who lived near the hazardous waste site just died from cancer. *(Person breaks down in tears.)* How long are you bureaucrats going to take before we see some action? How many more people must die? We're taxpayers and *we* pay *your* salaries! I'm totally frustrated and angered by the amount of pressure we need to put on your office who we pay before we can get any action. What do you have to say for yourself? I want to hear! *(Person breaks out into tears.)*

Underlying Individual Need: The individual is very upset about the loss of a dear friend, and is probably needing, most of all, some place to vent their legitimate emotions, and perhaps to get some compassionate response.

A. Silence. (No response is needed or expected. One can satisfy the person's need for compassion by genuinely listening with empathy until the person stops. While listening, you may hear and decide that people may want to know more frequently what is being done, and what the schedule for future action is. Providing that information later may give people a better idea that things are being done and when they can expect them to be completed. Often times, not regularly presenting that information, will give people a false impression that nothing or very little is being done.) (Principle: Listen with compassion.) (CR 3)

A. (One listens and allows the individual to vent emotions, and empathically responds:)

I'm sorry for your loss. If you would like, we could discuss this some more after the meeting. (Principle: Listen and respond with compassion.) (CR 3, 4, 7)

A. (One listens and allows the individual to vent emotions before empathically responding:)

This is an especially sad and difficult time for you. I'm so sorry for your loss. (CR 3, 4, 7)

A. (One just keeps quiet.) (Because you may have been surprised by the emotional outburst, and may not know what to say, being quiet is the next best thing to do, given that no response was expected. Being quiet may also be hard to do because one may feel that a response was expected. Most of the time, all a grieving person wants is just a chance to vent their emotions and to share their grief.) (CR 3, 4, 7)

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A. Poor Response: (Interrupts the individual and gets somewhat defensive.)

We're doing the best we can. Why, last week we finished the proposed permit, report or RI/FS, and by next month we should be making a decision. Please be patient with us.

A. Poor Response: I'm sorry your friend died, but all of you should know that 1 out 4 of you will get cancer in your lifetime anyway from normal daily activities. Specifically, for the hazardous waste site, the added lifetime risk of getting cancer is only 1 in 10,000. Since there are 5,900 people in this community, we would not statistically expect to see any excess cancers in such a small population.

A. Poor Response: I'm sorry your friend died, but it probably wasn't because of the hazardous waste site because it's only been there for 5 years and it normally takes 15 years or longer for someone to develop cancer. We are doing everything we can.

A. Poor Response: Your friend's death is unfortunate, but you shouldn't be blaming us or the hazardous waste site because we had nothing to do with it.

20.* Q. **You don't have to live in our neighborhood! You don't have to deal with the stigma associated with this hazardous waste site! I've got my life savings tied up in my home! Would you live here? Would *you* buy my home?**

Underlying Individual Need: This person is very concerned about their property losing some of its value, and would like to know if the Agency is doing everything possible to ensure that property values will be protected, i.e., Are you, as the Agency representative, doing as much for the neighborhood as you would if you were a resident?

A. <u>Sir, it sounds like you'd like to know if I would buy a home here, but I think your real question or concern is about the type of clean up we will be doing to ensure that your property values are not affected, and that are we doing everything we possibly can</u>. Would answering that question be more helpful? (CR 1,3,4,7)

Option 1. If so, here's what we are doing: .... I would like to stress that our goal is to ensure that your environment is safe to live in. In other words, to ensure that the air you breath, the soil that your children play in, and the water that you drink

*"Public Meeting: Typical Questions and Sample Responses." By Alvin Chun and Arnold R. Den, Office of the Regional Administrator, Office of the Senior Science Advisor, EPA Region 9, revised January 1992.

A. <u>You sound very disappointed</u>, but I'm sorry, science just doesn't have all of the answers for us. (CR 3, 4, 7)

A. Poor Response: We don't know, and you can't expect me to know everything. (A rational response in this case fuels more anger when all people probably needed was an opportunity to vent their frustrations; any sarcasm added to the rational response just makes the situation even worse.)

17. Q. If we can't get action from EPA on maintaining the value of our property, who can we go to?

Underlying Public Concern: The public is no longer just outraged, but they are now ready to consider solving the problem. They also realize that EPA can't do all they had initially expected.

A. <u>I share your concerns about the value of your property</u>. We are trying to protect your health and in doing so, we may have to consider some remedies that may not make you happy but will protect your health. Our goal is to find a remedy that will protect your health and not affect your property values; but our primary concern is with your health. Your ideas and input will help us make the best decision. I encourage you to comment on the options that we will be considering, and I hope that in doing so we can correct this problem to your satisfaction. (CR 3, 4, 7)

A. <u>I know you are concerned about the future value of your property</u>. Even though we can't do anything directly about your property values, here are some suggestions: ....which may be helpful. Are there other ideas that someone else would care to offer? (CR 1, 3, 4, 7)

A. Poor Response: We *have been* working hard to solve the hazardous waste problems. Right now I'm working on 5 other NPL sites and your site is getting most of my attention. We don't have legal authority to address your property value concerns. (We're not listening to people's needs and reacting naturally, and inappropriately being defensive; this tends to create a negative perception that we're unwilling to consider or consult with other credible sources when it is needed.)

"Public Meeting: Typical Questions and Sample Responses." By Alvin Chun and Arnold R. Den. Office of the Regional Administrator Office of the Senior Science Advisor. EPA Region 9, revised January 1992.

18. **Q. I've been working here for 15 years and I'm fine. How can you say there's a problem?**

Underlying Public Need: The public needs to know how credible we and our science are. (This person's question may also represent some initial denial of the risk at hand, or a concern about their job.)

A. Sir, I'm very happy that you are fine, and I hope you remain that way. Unfortunately, I can't make that assumption about everyone else because some of your fellow residents may not be as healthy as you, and we must be cautious to ensure that everyone's health is being protected.

In saying that DNC is a probable carcinogen and that it has contaminated the air, we are not trying to create more of a problem. Unfortunately, science doesn't have all the answers that you and I would like, but we have to deal with that. In dealing with this, we use many health protective assumptions to make up for the uncertainties that remain in science. In our deliberation and examination of the health effects information related to DNC, we believe that it is a carcinogen which should be treated seriously. We do this to ensure that you and your family do not suffer from any future health problems. Because of the uncertainty in science about the causes of cancer, your statement of good health doesn't surprise me. Unfortunately, I cannot say with your degree of confidence that DNC is safe; the health data says we should treat DNC contamination with caution. Our goal is to ensure that you, your family and everyone in your community can say with your degree of confidence that the DNC exposure is so small that it doesn't pose a danger. (CR 3, 4, 7)

A. Poor Response: Your case is an exception. Our animal studies combined with our use of health protective assumptions in the risk assessment indicate that there is a cancer risk which may not be seen for another 20-30 years. (Even though you understand risk assessment, being argumentative and not acknowledging people's views can create obstacles in future communications. In this case, it creates unnecessary or false concerns.)

"Public Meeting: Typical Questions and Sample Responses." By Alvin Chun and Arnold R. Den, Office of the Regional Administrator Office of the Senior Science Advisor, EPA Region 9, revised January 1992.

are safe. We wouldn't like your property values to decline, and returning your environment to a healthful state or preventing it from being unsafe is our responsibility, and this is what we can offer to help protect your property values. As you know, there are other factors which also affect property values such as public perception which unfortunately neither you or we have any control over.

Option 2. If not, I don't know if I can really answer your question about whether I would buy a house here because like other major investments there's many things to consider such as schools, employment, environment, etc., before I could make such a decision. I know that if I were living here or if I had to buy a home here, I would at a minimum want the environment to be safe, and that is the goal of our Agency: to ensure that your environment is safe.

A. This whole situation has not been an easy or pleasant one for you, and we're also very concerned. As to whether I would live or buy a home here, that's usually a very complex question for most situations. But if my only considerations for making a decision were whether the air was safe to breath or the water safe to drink, I would say yes because our Agency's goal is to ensure that it is. As you know, there are other important and personal considerations such as cost, neighborhood, quality of schools, mortgage rates, etc., which most of us take into account before deciding on the purchase of a home. (CR 1,3,4,7)

A. Poor Response: Personally, I wouldn't live here. That's off the record, of course.

A. Poor Response: (You appear to be caught off guard and seem to be searching for an answer but can't give one, or are afraid to. This may give the community a false impression that you wouldn't ever buy a home here because the clean-up will not be effective.)

A. Poor Response: Property values are beyond our control and not our responsibility. I'm sorry we cannot help you.

"Public Meeting: Typical Questions and Sample Responses," By Alvin Chun and Arnold R. Den, Office of the Regional Administrator, Office of the Senior Science Advisor, EPA Region 9, revised January 1992.

21.* Q. **I am considering buying some property here. Given all that has happened, would you buy or recommend buying property here now or in the future?**

Underlying Individual Need: This person is concerned about investing his money here, and would like to know if that would be a wise thing to do.

A. Property investments are important transactions requiring careful consideration. I can appreciate your concern. Property investments are also very personal choices. Where I may be willing to invest my money may be very different from where you or someone else might be willing to invest their's. For me to tell you how you should spend your money would probably not be very helpful because I'm not very knowledgeable in that area, nor do I know what criteria you consider important. What I think would be more helpful would be to give you all the information about the hazardous waste problem that we have so that you or another potential buyer or seller can make the most informed choice possible. (CR 1,3,4,7)

A. Poor Response: Sorry, but we don't make those types of recommendations. (Even though this is true, it does not address the individual's underlying need, and may give the impression that you wouldn't recommend buying property here. In the preceding answer, the response was not only honest, but it also offered information that was helpful.)

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"Public Meeting: Typical Questions and Sample Responses." By Alvin Chun and Arnold R. Den, Office of the Regional Administrat.. Office of the Senior Science Advisor, EPA Region 9, revised January 1992.

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TEN REASONS TO RELEASE INFORMATION EARLY

Decisions about when to release information depend, in large part, on the situation. However, agencies should seriously examine the implications of holding onto information. The next time you contemplate whether to make information public, consider some of the reasons to release information early:

1. People are entitled to information that affects their lives.

2. Early release of information sets the pace for resolution of the problem.

3. If you wait, the story may leak anyway. When it does, you are apt to lose trust and credibility.

4. You can better control the accuracy of information if you are the first to present it.

5. There is more likely to be time for meaningful public involvement in decision-making if the information is released promptly.

6. Prompt release of information about one situation may prevent similar situations elsewhere.

7. Less work is required to release information early than to respond to inquiries, attacks, etc. that might result from delayed release.

8. You are more apt to earn public trust if you release information promptly.

9. If you wait, people may feel angry and resentful about not learning of the information earlier.

10. People are more likely to overestimate the risk if you hold onto information.

From C. Chess, Hance, B.J., and Sandman, P.M., "Improving Dialogue With Communities: A Short Guide For Government Risk Communication," (Trenton, NJ, Division of Science and Research, NJ Department of Environmental Protection, 1987).

FOCUS GROUP TECHNIQUE

A focus group is an in-depth, interactive discussion among peers (e.g., CEOs, doctors, homeowners) guided by an experienced researcher (moderator). A session generally lasts ninety minutes and is comprised of 8 to 10 consumers or 6 to 8 business executives. Interaction among the respondents is a key element of a focus group and the moderator is the major catalyst to this process.

The focus group moderator works from a guide developed in conjunction with the client. This guide outlines the pertinent topics and issues to be discussed. The moderator begins a session with introductory comments designed to relax the participants and set the stage. These remarks include a description of the focus group technique and the importance of candid responses by the group members. Then participants usually introduce themselves.

The discussion is typically opened with a general subject that is easy to talk about and to gain perspective from which to evaluate subsequent information.

The interactive process in focus groups makes it possible to obtain information to fulfill specific study objectives as well as to gain insight into other issues which could have an impact upon the research. Thus, a great depth and breadth of knowledge can be obtained through this process, including discovery of information not previously recognized as significant or connected to the key concerns of the client.

Focus group participants are usually recruited by a local market research firm which screens potential respondents to insure that they meet the specifications (e.g., watch television news, are dog owners, use personal computers). These homogeneous groups allow researchers to hear, first-hand, responses from those who have had similar experiences regarding the topic under discussion. Homogeneity also enhances relaxation among the group members and serves to contribute to an easy exchange of ideas and opinions.

Participants in focus groups typically receive a monetary incentive, usually $30 for consumers and between $50 and $200 for executives and other professionals attending in their business roles. In many instances, particularly with business executives, the opportunity to discuss a specific topic with their peers is almost incentive enough to ensure enthusiastic participation.

Focus group facilities contain conference rooms where the session takes place. Adjacent to the session room is an observation room where clients can watch the group via a one-way mirror. This allows observers to note subuties in facial expressions, body language and tone of voice among the respondents. In addition, the group is audio taped for use in analyzing the data and as a record of the session.

Video-taping can also be accomplished by filming through the one-way mirror. By recording the meeting on tape, others can view the session who are unable to attend the focus group. (Respondents are informed about all these facets of the process but are not told the identity of the client.)

The focus group technique is often used to gain insight and provide direction for marketing strategy and further research. However, conclusions must be tempered by the limited sample size inherent in this type of research. Thus, findings must be viewed as qualititative in nature and not necessarily representative of a larger population.

EPA Title III Focus Group Results

What sort of information can you expect to get out of a focus group? The results from a series of focus groups in 1988 can give you a good idea of the amount and quality of information focus groups generate.

The report about the six focus groups includes hard data ("half of the people said they had never heard of the chemical"). It also includes conclusions ("stores might therefore be the best places to distribute information"). The focus groups were conducted by Campbell Communications, Inc. and sponsored in part by the Environmental Protection Agency.

The six focus groups were conducted to assess the need for risk communication with the general public in four neighborhoods, two in New Jersey and two in Pennsylvania. They were conducted in light of the fact that plants would soon be releasing information as a result of SARA Title III.

The focus groups were part of a comprehensive study that included a review of existing survey data, interviews with government officials about their perceptions of the public's need for information, creation of a communications manual, and creation of a bibliography of public education materials. Additional focus groups with health professionals, environmentalists and other specialized groups also were part of the study.

In this section, we address what information the six focus groups with just the general public yielded. The participants were carefully selected to be a random sample of the general public -- for example, they were not employees of nearby plants or predominantly college graduates.

Adapted from material prepared for the Environmental Protection Agency by Elaine Arkin and David McCallum. As adapted and reprinted in the Risk Communication Student Manual, edited by Erin Donovan, Vincent Covello and John Slavick (Chemical Manufacturers Association, Washington, DC 1989).

Who Gets Selected for Focus Groups?

About 10 people were selected for each of the focus groups. A trained moderator initiated and directed discussion.

All of the participants lived within one-half mile of a company expected to be reporting under SARA guidelines. This proximity makes this subgroup of the "general public" the most likely to be affected by emissions. These plant neighbors were perceived as having a high priority for risk communication efforts for several reasons:

- their residence
- the meaning and implications of toxic substance emissions
- their low awareness of the new reporting requirements
- their relatively low levels of concern for personal/family safety (the focus groups confirmed these two alarming assumptions)
- high levels of frustration about the nearby residents' ability to obtain, understand or trust emissions information

These were the assumptions going into the study. The focus groups confirmed the final three, somewhat alarming, assumptions.

Awareness/Attitudes

Focus group questions elicited information about the participants' awareness and attitudes. It was determined that:

- No one in the groups had heard of SARA Title III reporting requirements. When informed, though, their response was positive.

- Awareness of community emergency planning and procedures was low.

- Respondents held misconceptions about permitted emissions and tended to believe <u>any</u> emissions were illegal. When told some emissions are legal, participants were critical of laws allowing emissions.

- Participants expressed very little curiosity about levels or length of exposure, or other factors affecting risk. In fact, the few questions raise suggested that these participants might have difficulty both in articulating questions about toxic substances and understanding the answers.

- Participants were very unaware of specific toxic substances, their uses and risks.

- Most participants did not distinguish between toxic chemicals and other pollutants, like sewage or automobile exhaust.

- Generally, focus group respondents perceived EPA as "on the side of big business." The did not seem to believe that regulations to date have favorably affected environmental quality.

- Attitudes toward industry were mixed. Those living in a community where chemical companies are the main employers were inclined to menton that companies are "better than they used to be" about emissions and clean-up.

- Generally, participants believe that the responsibility for environmental quality belongs to "someone else." There was no incentive, benefit or compelling reason for them to become involved.

- Some participants remarked at the close of discussions that the focus group had heightened their interest in the issues raised. Generally, interest and awareness was low.

Concerns/Behaviors

Focus group discussion tried to address the level of the participants' concern about chemicals and their behavior based on those concerns. The focus groups found:

- Most respondents were concerned about environmental pollution. But they were equally concerned about all kinds of contaminants, including toxic chemicals, garbage and pesticides.

- Many people did not mention concern for personal or family health. Many had lived in their communities for a long time and accepted emissions as "a fact of life."

- Many participants thought there is little they can do to change things like pollution from nearby plants.

- In one community where pollutants in drinking water had been publicized, however, many participants said they were using bottled water. This shows that in a case where individuals feel there is a specific action they can take, they may act.

- Some participants said they had sought information about a perceived environmental problem and were discouraged by their inability to get answers.

- Participants were skeptical that the new reporting requirements would yield them accurate data or prompt enforcement of emissions laws.

Information Sources/Distribution Routes

The focus groups elicited information about how people learn about environmental issues. If indeed the participants are representative of the community (as they should be in a professional, well-designed focus group), the data can be used to help tailor a more effective, efficient risk communication program. These six focus groups found:

- Most people got information about environmental issues from the media.

- Those who described frustrating experiences with information-seeking efforts said they had called a local government agency or the company. No successful experiences with these contacts were described.

- When asked by the moderator where else they might seek information, the only source mentioned by all six focus groups was the police. No one mentioned the fire department, the 911 emergency number, health departments, elected officials, libraries or other sources.

- When asked which environmental groups they could contact for information, answers included Common Cause, Greenpeace, Sierra Club, and Ralph Nader. No one mentioned a local group or a local chapter of a national group.

- Environmental groups were the only sources cited as credible.

- EPA, companies, and elected officials were consistently viewed as the least credible sources of information.

- Asked where they would like to obtain information about the environment, participants most often mentioned the places they frequent. The best places to distribute information therefore might be supermarkets, drugstores, malls and other public places.

Risk Communication Strategies

The focus groups generated basic, useful information to help the nearby plants design risk communications programs.

- There must be a personally relevant need for risk information for someone to be motivated to learn more. Participants said a need might arise if they see evidence of emissions and water pollution. They said protection of their health and their children's health might motivate them.

- Protecting property value was not considered a motivator for seeking information.

- When information-seeking or other actions are perceived as needed or beneficial and the participant feels that he or she can have an effect, the participants will probably be more likely to act.

- Although printed information may help, one-on-one interaction may be required to truly inform people.

- There must be an information source who is easily accessible, knowledgeable and credible if the target audience is to be expected to become more interested and informed.

Risk Communication Message and Materials

Comments from the focus groups enable the moderator to suggest realistic steps for better risk communication.

- Members of the audience targeted by the focus groups are more likely to be less affluent and less educated than the general public. Information targeted for them therefore must be simple, clear and easy to read and understand.

- Materials should be pre-tested with the intended audience to assure that they meet these criteria and that they respond to the requirement for a need to read and a benefit from reading.

- Information should be prepared to:
  - explain why some releases are permitted;
  - explain what effects regulations are having in improving the environment;
  - explain why some emissions are more hazardous than others and what the hazards are;
  - cite the differences between emission and exposure;
  - cite other health risk factors;
  - explain what SARA Title III is intended to do and why it is relevant, useful and important;
  - provide a reliable, accessible information source and how he or she can be reached;
  - use a question-and-answer format to help the reader understand the issues;
  - tell the reader what to ask or what personally relevant action to take in the event of an emergency
  - provide a glossary.

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uest Editorial

Focus Groups and Risk Communication: The "Science" of Listening to Data

William H. Desvousges[1] and V. Kerry Smith[2]

1. INTRODUCTION

Focus groups are old hat in market research. These small group discussions are commonly used to help companies learn how consumers feel about various products or services and to develop survey questionnaires. Researchers interested in understanding how people respond to environmental risks have tly begun using focus groups because they offer ights into how people process information or an-wer questions.

Focus groups can also make risk communication more effective by helping communicators listen to "consumers" of risk messages. Too often, risk communicators are more concerned with educating the public, rather than first listening to them and then developing communication policies. Focus groups allow the consumers of risk messages or communication programs, to provide critiques and feedback to their designers. Using feedback from focus groups, researchers can gain qualitative insights on how people perceive risk, as well as evaluations of the perceptual or cognitive effects of the risk information format. Such feedback is crucial to communicating risks more effectively.

To develop our arguments, we have drawn on our experiences with focus groups over the past five years. We suggest six applications in which using focus groups can make risk communication more effective. We also offer some rules of thumb for conducting focus groups, based on what has worked and what has not. Finally, we develop some general implications for the role of focus groups in risk communication.

2. FOCUS GROUPS: AN OVERVIEW

Focus groups are informal discussions in which a skilled moderator probes people's attitudes and opinions on a specific topic. Usually lasting about two hours, the group are relatively small. The ideal group size is eight to ten people. The objectives for a session may range from learning about consumers' reactions to a new snack cracker to discovering homeowners' attitudes toward a high-level nuclear waste repository. In general, focus groups allow people who must convey information or market products to test their concepts on consumers before making a final decision.

Over a one- to two-week period, organizers recruit participants to attend the session at a convenient (for the participants) location. Participants are recruited to represent either a specific target group—e.g., health care professionals or retirees—or the general population in an area. They can be randomly recruited by telephone or by working through civic, religious, social, or professional organizations.

Effective moderators are crucial to the success of the session. Using an agenda, they open the discussion with questions and keep it on track by selec-

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tively focusing on various respondents' comments. The most difficult task for a moderator is to stimulate discussion without biasing participants' responses. Moderators can work alone or lead the session together. It is especially important that moderators not be perceived as experts because people will quickly turn to them for answers, rather than discuss topics among themselves.

The focus group format is very flexible. On risk-communication topics, participants can be asked to write down their answers to survey questions and then discuss them. Or, they can be asked to critique public service messages for radio, television, and newspapers. However, sessions can also be designed to promote relatively free-flowing discussions about how people perceive the risks from exposure to some hazardous substance. Tasks or exercises are often used to stimulate discussion or evaluate (qualitatively) how people process certain types of information.

3. FOCUS GROUPS: THEIR ROLES IN RISK COMMUNICATION

Despite their widespread use in market research, focus groups have only recently been considered in risk communication. Drawing from experience in marketing research and more limited experience in risk studies, we have identified the following six areas for using focus groups:

- Exploring risk perceptions.
- Evaluating perceptual cues and information processing.
- Pretesting risk-communication materials.
- Selecting risk-communication channels.
- Designing risk-mitigation policies.
- Assessing risk-communication effectiveness.

3.1. Exploring Risk Perceptions

Focus groups can be especially effective in exploring people's perceptions of risk. Our focus groups on hazardous waste risks and radon risks have yielded several important insights into how people perceive each of these risks that would have been hard to detect with conventional survey procedures. For example, we found that people form concrete images of hazardous waste. These images are associated with rusted barrels of chemicals, or empty houses from the well-publicized experiences at communities such as Times Beach, Love Canal, or Woburn. In contrast, people could not easily form images of radon, which made it difficult for them to evaluate their risks from radon. One focus group participant's comment was especially revealing: "It's easy to put off because you can't see or smell it. The health risk takes a very long time."

We also found that people had difficulty relating government regulations to risks from hazardous waste exposure. Over the course of several sessions, we tried several ways to make the connections clearer. Ultimately, we used concrete examples to show linkages between regulations, exposures, and potential health effects.

In addition to probing risk perceptions, focus groups provide an opportunity to evaluate how those perceptions are linked to personal attitudes and characteristics. We were able to develop ideas about how age, or experience, may affect risk perceptions. These ideas led to hypotheses that were explored more formally in surveys.

Focus groups also highlighted differences between technical risk assessments and people's risk perceptions. Some technicians argued that, if people only understood that the probabilities of dying from exposure to hazardous wastes are much smaller than the probabilities of dying from an automobile accident, then we could communicate risk more effectively. They placed primary (if not complete) weight on the importance of the magnitude of the probability estimate. In contrast, the lay public appears to use multiple criteria—the probability, the potential consequences (e.g., cancer or birth defects), the extent of individual control, the time to resolution, and others—to rate the risk. More definitive answers about how these factors influence individuals' responses to risk will require more systematic research.

Focus groups also permit evaluations of visual aids (e.g., scales or formats) for eliciting risk perceptions. Within these group sessions, the analyst can observe directly how people use a scale or how the group discusses their reactions after the scale has been presented.

3.2. Evaluating Perceptual Cues and Information Processing

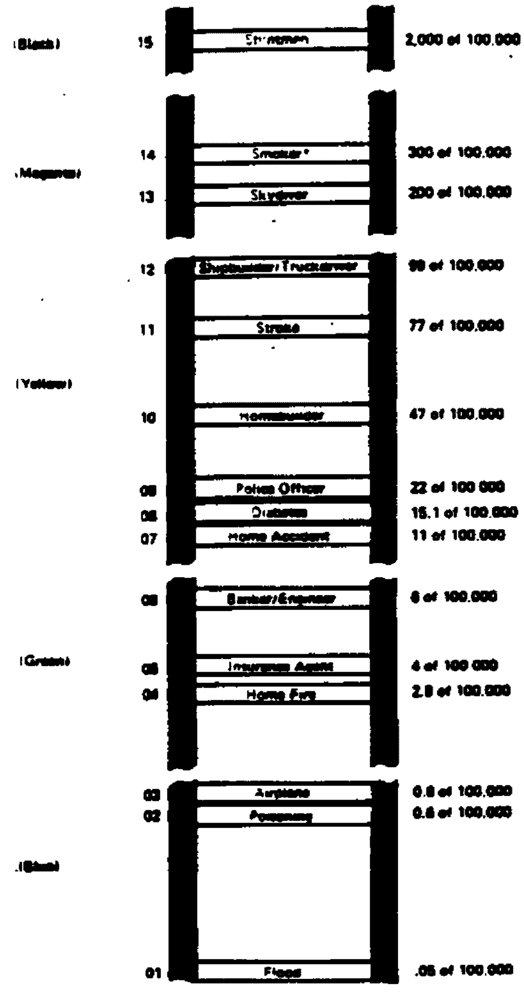
Focus groups are a convenient setting for exploring an array of perceptual cues related to how people interpret and use risk information. By using a sequence of several sessions with progressive modificating materials, we found that some people preferred verbal explanations of the risks from hazardous waste exposure while others preferred the visual representations provided by the probability wheels (risk circles) we had adapted to illustrate the probabilities. Still others preferred representation in mathematical terms: the percentage of cases experiencing the outcome. When we used multiple cues to characterize the same risk concept, we learned that many people used the representation they found most comfortable and ignored the others.

The process leading to our decision to include both fractions and percentages to explain risk together with the risk circles illustrates the value of the focus groups. After conducting several sessions using these circles without the percentages, we noticed when we collected the visual aids that many people had calculated the percentages. In the next focus group in which we also provided the percentages, people discussed how they used and interpreted either the fractions, percentages, or both in evaluating the risk information.

3.3. Pretesting Risk-Communication Materials

Focus groups offer an excellent method to pretest risk-communication materials. We have used them with both well-defined, homogeneous target groups and more heterogeneous collections of individuals. For example, homeowners in high radon areas provided useful suggestions for simplifying the language and organization of several radon brochures. Participants drawn from a more heterogeneous range of experiences had trouble recognizing the messages in several radio public service advertisements because of distracting background music. The same group, however, found that background sounds (people rustling newspapers or placing coffee cups in saucers) made other ads seem more realistic. These comments were reflected in changes made in the final ads.

Our experience with focus groups suggests that they can be quite valuable in evaluating different ways to present risk concepts. In several focus groups, we used risk ladders to elicit the perceived risk from hazardous waste exposure. Participants in a progressive sequence of sessions taught us that our first ladder did not offer sufficiently diverse risk information. They wanted more coverage of the lower risks



* At least one pack per day.

Fig. 1. Final version of the risk ladder.

and wanted to find out about risks that were more likely related to their specific occupations. They also suggested several changes in the ladder that resulted in one consistent visual focus on the center of the ladder. Their comments indicated that breaks in the ladder would help us to present a wide range of values while keeping the scale and transition between levels understandable. We also found the use of colors along the ladder helped reinforce the differences. Figure 1 shows our final ladder.

The focus group reactions to the different versions of the risk ladder also highlight an important limitation on using risk ladders. People found the ladder useful in trying to think about their own situations. However, they emphasized that the ladder would not have worked as a communication device for convincing them the risks from hazardous waste would be acceptable because it includes risks with very different characteristics. (We had included these alternatives to provide the wider coverage of risks requested by the earlier sessions.) Clearly, improving risk ladders, or other indices, is an area for further research in which focus groups may continue to be a valuable tool.

The messages from focus groups are often negative—here's what is not communicating. For example, we learned that putting the risks from aflatoxin in peanut butter was a disastrous risk-communication idea. We lost control of a focus group as participants heatedly debated for over an hour why it was included. In this case, hazardous wastes and peanut butter did not mix. The comparison gave very mixed signals which led to confusion, not communication. Clearly this comparison was a mistake, but it would have been more serious had it taken place in the actual survey, or in a broader risk-communication setting.

3.4. Selecting Risk-Communication Channels

Focus groups are useful in selecting the potential channels to be used for communicating risk information. With radon, we found (perhaps not surprisingly) that no single channel was superior. For example, several participants had obtained considerable information about radon from listening to the radio. Others listened to the radio, but changed the station whenever they recognized something as an "ad." Some participants seldom listened to their radios at all. However, some members of this last group had followed the radon issue closely in their newspapers. Overall, these sessions emphasized the importance of using multiple communication channels and adapting the message to meet the specific needs of each channel—two basic tenets of the risk-communication literature.

3.5. Designing Risk-Mitigation Policies

Focus groups provide preliminary feedback on policies that government or industry might consider for mitigating risks. For example, we asked focus group participants to rate the potential effectiveness of various strategies for mitigating the risks from transporting high-level nuclear wastes. The participants consistently named several strategies, particularly those emphasizing state and local participation, while they consistently regarded others as ineffective. These patterns allowed us to narrow our attention and focus on fewer alternatives to be used in the subsequent survey research. Because the findings from focus groups cannot be generalized to a new set of conditions or an entire population, they are especially effective when combined with other research methods, such as surveys.

3.6. Assessing Risk-Communication Effectiveness

One of the most important, and often neglected, aspects of risk communication is assessing communication effectiveness. Focus groups can play two useful roles in the evaluation process. As mentioned earlier, they are helpful in pretesting the messages. But they can also help in designing survey questionnaires used to evaluate effectiveness of the communication program itself. Our experience suggests that focus groups can reveal problems in question wording, order, and format for these questions. They may also generate unanticipated ideas for measuring effectiveness. If the survey involves in-person interviews, focus groups can provide especially good ideas for developing visual aids.

There is an important caveat to our overall support for the use of focus groups. *Focus groups alone are insufficient for evaluating the effectiveness of a risk communication program*. The findings from these groups are qualitative. They need to be buttressed with quantitative measures of effectiveness. Moreover, focus group findings cannot be reliably generalized to a population because their sample sizes are too small or their sample selection is nonrandom. Thus, it is important to recognize that evaluation provides one area where focus groups may be abused.

4. SOME LESSONS FOR IMPLEMENTING FOCUS GROUPS

To help others learn from what worked and what didn't, we list some rules of thumb on implementing focus groups:

- Work with civic groups, church organizations, and social organizations to reach target segments. Giving guidelines to organization contacts can help control group composition. By making a modest contribution to the group ($100), people feel a greater sense of responsibility for attending and contributing to the session.

- Keep the groups relatively small. We have found that groups of eight to ten are most effective.
- Send people a confirmation letter and a brochure about your organization to reduce anxiety about intentions. People invariably brought the materials with them and mentioned after the session that they were less concerned about being targeted for a sales pitch.
- Make sure the moderator is represented as a nonexpert in the risk area. Having people ask the moderator questions severely reduces the effectiveness of the session. We have also found that, after observing several sessions, it is often possible, and indeed desirable, for a member of the research team to assume the moderator role. This allows for more flexibility in following up unanticipated areas of discussion that are germane to the research objectives.
- Don't try to hold focus groups with respondents who might have difficulty with a topic. Generally, we found these to be the least informative sessions because the participants were unable to verbalize why they were having difficulty or simply felt uncomfortable in a group setting. One-on-one in-depth interviews may be a better alternative for targeting these individuals.
- Make sure the organizational structure of a group knows about the session and its objective. No one showed up for a session involving high school teachers because the teacher helping with the arrangements did not clear the session with the school principal. After learning of the session, the principal had threatened to censure teachers if they attended.
- Arrange for multiple records for each session. Videotaping, audiotaping, or having analysts directly observe the sessions had no effect on the quality of the session. When possible, videotape the sessions, as this provides an effective way for reviewing the sessions later.
- Have clear objectives and a written agenda to keep the sessions on track and to ensure that all important topics are covered.
- Select a relaxed setting with an informal format. Community halls, church halls or local meeting places all work well. Refreshments help to break the ice.
- Keep the session to two hours. While a break is generally unnecessary, a short one can sometimes help reorient the discussion if people are tending to pursue extraneous matters and offers a natural opportunity to shift gears and review issues in a different way.
- Remain at the location for some time after the session. Remember discussions of important or controversial topics can influence people after they leave the session. So attention to informal opportunities for discussion can alter impacts and ease anxieties.

These ideas are based solely on our experiences and not the result of a systematic, formal evaluation. Nonetheless, they are generally consistent with the principles found in marketing applications.

5. OVERALL IMPLICATIONS

Our experience suggests that focus groups can be valuable tools in making risk communication more effective. They provide an opportunity to listen to the everyday language people use to discuss risks, as well as to observe people using probability information. This is just the beginning of the new uses of focus groups in risk communication and related studies. As more and varied objectives are tried, we will learn more about what works and what does not in communicating risks. We may also find new communicating ideas as focus groups are used in related areas—e.g., the theory and practice of health education. The most important issue for risk communicators is how to use the technique effectively. To provide an adequate answer more research is needed.

Fruitful areas for future risk-communication research include applying focus groups to new facets of risk communication (e.g., new risks such as those from biotechnology), as well as finding more systematic ways of getting people to reveal how they process risk information. Interactive research combining focus groups with laboratory experiments and surveys offers the prospective for providing the needed insights. Clearly, there is a need for more research findings on how to organize and conduct the groups.

Although focus groups can be a valuable risk-communication tool, they are not a substitute for more systematic quantitative research. They cannot provide valid statistical results that can be generalized to a target population. Because they are inherently qualitative, focus group findings need to be buttressed with carefully executed quantitative analysis from either laboratory or field (survey) research. Nonetheless, they can be effective complements to more quantitative research methods. Focus groups improve the quality of information ultimately acquired in surveys; suggest hypotheses for testing with those data; and, equally important, provide a wealth of insights (and anecdotes) that can vividly illustrate the findings from the quantitative results.

PLANNING DIALOGUE WITH COMMUNITIES: A RISK COMMUNICATION WORKBOOK

June 1989

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NOTE TO READERS

Although we have received comments from a number of reviewers, we would like feedback from those who actually *use* this workbook to plan their communication with the public. The comments of both reviewers and users will guide the development of another draft of this workbook.

After you have used the workbook, we would appreciate your taking some time to fill out the accompanying questionnaire and send it back to us at the Environmental Communication Research Program (ECRP), 122 Ryders Lane, Cook College, Rutgers University, New Brunswick, NJ 08903. If your copy *is not* accompanied by a questionnaire, please contact ECRP at (201) 932-8795 and we will send you one. Or you may simply send us your comments. Either way, we thank you for your feedback.

We would like to thank the Division of Science and Research, New Jersey Department of Environmental Protection, which funded the preparation of this workbook.

TABLE OF CONTENTS

I. INTRODUCTION

As agency staff look toward improving their communication with those outside the agency, they often ask for step-by-step instructions to guide them through the process. Although experienced communicators often follow their intuition, those with less experience want and deserve a more systematic approach.

Agencies do not have the luxury of allowing only staff with years of experience to communicate. In fact, technical and policy staff who have little communication training or experience often need to serve as spokespeople because of their knowledge of the technical and policy aspects of complex environmental problems. Communication specialists can help formulate policy, coach from the wings, act as liaisons, and train other staff, but they cannot replace the important interchange between "the experts" and the public.

While some people are "born communicators," others can be made. This workbook assumes that a key to effective communication is effective planning. Even those with extensive communication experience may improve their communication efforts by improved planning. The hope is to replace last-minute, poorly conceived communication efforts with thoughtful ones. In essence, this workbook makes explicit the thinking which communication professionals use when developing programs.

Improving Dialogue with Communities: A Risk Communication Manual for Government (and the shorter overview, "Improving Dialogue with Communities: A Short Guide for Government Risk Communication") laid out a framework for understanding how communities perceive risk. The manual argued that agency effectiveness will increase and unwarranted tension with communities will decrease when agencies listen to concerned publics.

This workbook, which was developed with funds provided by the Division of Science and Research, New Jersey Department of Environmental Protection, suggests how agency staff can apply guidelines introduced in the manual and short guide. While the manual suggests *why* two-way communication is essential to explaining risk, this workbook gives more detail on *how* to promote such dialogue. An understanding of risk communication principles explained in the manual (or short guide) is essential for using this workbook.

The manual, short guide, and additional copies of this workbook are available from the Environmental Communication Research Program, Rutgers University, Cook College, 122 Ryders Lane, New Brunswick, New Jersey 08903.

Why Plan?

Although agencies understand the need to develop sampling plans, risk management options, and timelines for policy proposals, communication planning is too often overlooked. The result is resource-intensive attempts to put out communication fires that might have been averted through effective planning.

"There's not enough time" is the most common reason for skipping the planning stage. In fact, ad-hoc communication efforts often take far more time than carefully planned ones. Staff will often find themselves playing "catch-up," developing informational materials and holding meetings that might have been unnecessary if planning had occurred. Just as scientific sampling without planning can slow down an assessment due to the need to rethink and resample, it is ultimately more wasteful and time-consuming to develop a brochure or fact sheet without thinking through how it will further your communication goals. Meaningful planning can help agencies:

- integrate communication efforts with agency risk assessment and management;
- increase the effectiveness of communication programs;
- allocate appropriate resources to communication efforts;
- increase dialogue and reduce unwarranted tension with those outside the agency.

How to Use This Workbook

Before beginning this workbook it is essential that you read *Improving Dialogue with Communities* in the form of the manual or short guide. As explained previously, an understanding of the basics of risk communication is essential to using this workbook.

This workbook is divided into sections that help you develop different pieces of a communication plan. While it might be tempting to work through a specific section of this workbook when you feel the need for it, this type of piecemeal planning should be avoided. You are far better off reading the chapter on the planning process and methodically working through all the sections. Then you can go back and revise particular sections as needed.

You may want to photocopy sheets of the workbook before you use them so you can use the workbook again for your next planning effort. It may be easiest to complete the sections of the workbook in planning meetings. Or you may find it easier to assign someone to complete the workbook and then present the completed sections for discussion with other staff. Regardless, it is critical that all the staff who are involved in the project understand and accept the communication plan. The completed workbook gives you the outline of a plan, which you can then develop into the form of a memo, if needed. (See "The Planning Process.")

The first time you use the workbook it may take a while to complete. However, the planning process should go more quickly as you become familiar with it.

A Final Note

Developing an effective plan is an important first step. But turning a plan into reality hinges on factors other than the effectiveness of the plan. Involvement, support, and encouragement of agency management is critical to ensure that communication planning is integrated into agency practice. Managers may want to refer to "Encouraging Effective Risk Communication in Government: Suggestions for Agency Management," available from the Environmental Communication Research Program.

II. THE PLANNING PROCESS

No matter how small your communication effort, planning can help. Experienced communicators consciously think through their goals before they pick up a phone or write even a brief memo. They know that forethought can save them a great deal of time. When time is particularly tight, communication professionals know that planning is particularly important; they plan how to cut corners rather than cutting out planning.

Despite their emphasis on planning, skilled communicators are not slaves to elaborate plans with intricate timelines. Effective communication is often situational, requiring both sensitivity and flexibility. But having a road map makes it easier to take detours. Without such a guide, you may spend a lot of effort and still fail to reach your goal. Planning can also increase your sensitivity by helping you think through audience concerns ahead of time.

When to Plan

If you fail to plan your efforts until you run into problems, you then spend time trying to overcome obstacles that might have been averted. Consequently, planning seems difficult and time-consuming. Instead, it's easier to plan *before* you begin your communication effort.

Because communication should complement agency scientific, risk management, and regulatory efforts, planning for your communication effort should be integrated with project planning rather than started after a project has gotten off the ground. For example, NJDEP's Bureau of Water Quality Standards and Analysis planned ways to solicit input from those outside the agency *before* drafting regulations. Development of the communication timeline went hand in hand with the timeline for drafting of regulations.

Who Should Plan

In order for communication plans to mesh with agency efforts, communication planning must involve project staff other than those who will be involved in the communication effort. For example, planning for development of a brochure should have input not only of the person writing the brochure but also of those involved in the effort the brochure describes. Because the public often needs to hear from "the experts," the experts need to plan for that interaction. Therefore, although planning may be easier if communication staff can help, technical staff are essential to communication planning.

Experience suggests that some of the best communication plans come from a team effort involving staff with differing perspectives. In fact, public relations firms usually hold brainstorming sessions to spark planning ideas. On the other hand, writing plans by committee can be very time-consuming. You might want to try assigning one person to coordinate development of a plan with input of other staff. Or you may want to develop a planning team which assigns responsibility to staff for different sections of this workbook. Regardless, developing a consensus about the communication plan will be important to effective implementation.

Planning Steps

This workbook is divided into chapters which represent different steps in the planning process. If you move through the workbook completing each chapter in sequence, you should have a comprehensive plan at the end.

Determining Your Goals: Clarifying your communication goals should help clarify how to get there. This chapter suggests a variety of goals that may shape your plans.

Overcoming Communication Constraints: The best way to overcome communication problems is to anticipate them *before* they happen and figure out ways to avert or minimize them. This checklist suggests potential communication problems and ways to overcome them.

Identifying Audiences: Before deciding what to say, you need to think through to whom you will be saying it. Identifying those people who may want to have input into agency efforts may be a key variable in developing your plans.

Identifying Audience Concerns: Successful communication often hinges on knowing what your audience's concerns are. Although you will want to talk with people about issues at are important to the agency, effective o-way communication will be determined by whether you communicate about what is important to your audience.

Designing Your Message: Deciding what to say is often easiest when you have addressed your goals, audiences, and audience concerns. After completing this chapter, you will have the basics of a working communication plan, and the following chapters will help you structure your approach.

Methods of Reaching People: Once you have determined your goals, the audiences you want to reach, and what their concerns might be, you can think through ways to reach them. This chapter suggests both traditional and innovative ways to communicate—including approaches to increase your interaction with the public.

Preparing for Meetings with the Public: If your communication plan includes meetings with those outside the agency, reviewing this checklist should help make sure you cover the important bases, from logistics to process con- rns.

Planning for Evaluation: This checklist can help you plan to get feedback on your communication efforts so you can make mid-course corrections, if necessary.

Developing Timelines: Once you know what you want to do, it is critical to plan when you are going to do it. A well-developed timeline can help keep your plan on course.

Developing a Planning Document

After you have completed these chapters, it should be relatively easy to draft a formal communication plan. You might want to write a memo organized by headings similar to the chapters of this workbook, based on your responses to the checklists. This memo, including a timeline, can then be reviewed to ensure that it reflects the views of those involved in the project. It can also be a useful document for discussions with agency managers. Just as important, a comprehensive, well-articulated plan may help solicit resources.

Although planning documents are often filed and forgotten, your responses to the checklists and your timeline can be essential tools to keep your communication effort on track. When problems come up, it may be useful to go back to your checklist of goals to help sort out possible options. The timeline should guide the efforts of all the staff who are involved. Hopefully, instead of "reinventing the wheel" at various stages in the communication effort, the plan will help you move forward with assurance.

III. DETERMINING YOUR GOALS

The overarching goal of just about every agency program is to protect the environment by coping appropriately with the environmental problem under consideration.

But the *communication* goals of a program can vary considerably. And achieving the agency's overarching environmental goal often depends in large part on specifying and achieving its communication goals.

Often agency staff launch a communication effort without thinking through their communication goals—sometimes without quite realizing that they should *have* communication goals. Even the simplest communication activity, such as a telephone call to a citizen leader, is ideally aimed at a specific goal. Yet one agency representative recalled that his sole goal for a particular public meeting was "to survive." Without clear communication goals, unfortunately, agency spokespeople can hope to do little better than survive. Setting more specific communication goals can lead to a more successful (and less stressful) interaction with the community, and thus can help achieve program goals as well.

The purpose of this checklist is to help you think through which communication goals are most important to the particular program at hand *before* you begin your detailed planning.

The checklist is subdivided into four categories: informational goals, organizational goals, legally mandated goals, and process goals. As you go through the list, it may help to put a "1" next to those goals that are top priorities for this particular program. Put a "2" next to the goals of moderate priority. If you have goals in mind that are not listed, space is provided to add them.

The checklist will be most useful if you identify **no more than four** top-priority goals and four second-priority goals. You do not necessarily need to choose a goal in every category. However, it will help to remember that agency staff often tend to underestimate the importance of process goals. (See *Improving Dialogue with Communities.*)

Because consensus on goals is essential to developing an effective communication effort, you may find it helpful to work through the checklist jointly with other staff in your program, or to compare answers after you have worked it through separately. You may also want to check that your sense of the program's goals coincides with your supervisor's sense.

Once you have determined your goals, they can become a key to your planning process. At each stage of the program, you can look back over your list of goals to see if there are any you may have neglected and need to give more attention. You can "test" each proposed communication activity against your list of goals, asking yourself whether that activity will help achieve the goals you have set. You may also want to reconsider from time to time whether your choice of goals should change as the program develops.

Informational Goals

_____ To give people the data they need to understand better the extent of the risk.

_____ To tell people what the agency has done, is doing, and plans to do about the problem, and what it cannot do, and why.

_____ To answer questions that have arisen and respond to concerns in the community.

_____ Other:____

Organizational Goals

____ To build and maintain the credibility of the agency in the minds of all affected publics.

____ To coordinate actions within the agency and with other agencies so the governmental response is consistent and effective.

____ To maintain agency efficiency by avoiding unnecessary conflicts with the public.

____ Other:____
____

Legally Mandated Goals

____ To provide appropriate advance notice and an appropriate process for public input and agency response.

____ Other:____
____

Process Goals

____ To involve affected parties as early as possible. (See checklist of potential audiences in Chapter V.)

____ To provide maximum opportunities for public input, including where appropriate a chance to help make and carry out key decisions.

____ To keep people routinely informed throughout the process, so they do not feel abandoned and do not lose their sense of what the agency is doing.

____ To make only promises that can be kept, and to keep the promises that are made.

____ To build a relationship with the community that is personal as well as bureaucratic, that incorporates feelings as well as data.

____ Other:____
____

IV. OVERCOMING COMMUNICATION CONSTRAINTS

The best way to reduce major problems in a communication effort is to anticipate them and find ways to avoid them. In general, it is far easier to plan for a problem than to confront it as an emergency that can derail your communication effort.

Below are some of the areas that may pose obstacles and some potential ways to overcome them. They are not meant to be all-inclusive but rather to trigger your thinking. Check the problem, then the solutions you plan to try.

Resources

Communicating with those outside the agency who are affected by agency decisions may determine whether the decisions are implemented or become mired in controversy. Despite this, agencies rarely allocate sufficient resources to communication efforts.

Potential constraints

____ Insufficient staff.

____ Insufficient funding for printing, subcontracting, etc.

____ Other: ______________________________

____

Potential solutions

____ Plan more rather than less. (Rushed planning will often result in increased implementation time.)

____ Set clear goals and priorities. (It is far easier to decide how to reduce your effort when you are very clear on where you want to go.)

____ Plan development of written materials in advance, rather than at the last minute, so that key pieces of literature can serve several functions.

____ Train technical staff so that some aspects of communication can be integrated into their day-to-day work.

____ Involve leaders of your key audiences in outreach efforts to their members.

____ In extreme situations, consider borrowing staff from other efforts.

____ Remind management: A communication effort in time saves nine. Proactive attempts to communicate are usually less labor-intensive than putting out communication fires.

____ Other: ______________________________

____

Time

Although the agency may feel that there is insufficient time to communicate with people or to involve them in decision-making, failure to communicate may, in fact, delay your efforts even further.

Potential constraints

____ Pressure from inside or outside the agency to act quickly.

____ Mandated deadlines.

_____ Extended timelines needed for outreach.

_____ Other: ____

Potential solutions

_____ Plan communication efforts early so they can be integrated into agency timelines. (For example, it is easier to involve the public in decision-making if the involvement happens as part of rather than after the agency's process. See Chapter XI.)

_____ Use short cuts, if necessary. (For example, speak with the leadership of organizations by telephone when there is insufficient time to meet with their constituency.)

_____ Use agency "down time" for communication efforts. (For example, work on communication while proposals are moving through the approval process.)

_____ Develop streamlined processes within the agency. (For example, instead of redrafting materials many times, involve key people in planning the materials. Consider conducting editing meetings rather than circulating and recirculating drafts, etc.)

_____ Plan for informal, smaller-scale outreach efforts rather than large-scale events that need a great deal of lead time.

_____ Investigate desk-top publishing and other methods to speed production of materials.

_____ Recycle your efforts. (Keeping organized lists of contacts, files of materials, and records of past efforts can speed your work tremendously.)

_____ Other: ____

Legal

Legal concerns can be a constraint but can also be a convenient excuse for failing to communicate. Agencies too often use legal problems as barriers to hide behind, causing more problems than they solve.

Potential constraints

_____ Liability.

_____ Confidentiality.

_____ Unwieldy procedures.

_____ Other: ____

Potential solutions

_____ Examine statutory language rather than assuming the barriers exist.

_____ Explain your plans and ask legal staff for help to overcome any potential legal problems, rather than asking whether there are barriers. (This may result in a very different response than a question posed essentially as "We can't do this, can we?")

_____ Incorporate legal requirements (such as notification, public hearings, etc.) into communication planning.

_____ Be clear with your audiences from the outset about your legal constraints.

_____ Other: ______________________________

Management Support

The success of a communication effort, as with any other effort, can hinge on support from those above you.

Potential constraints

_____ Failure to approve or support communication plans and materials. Or delays in approval that reduce the effectiveness of your effort.

_____ Failure to respond to public input.

_____ Public statements that contradict the communication program.

_____ Failure to allocate sufficient resources.

_____ Lip service to communication that is not accompanied by a commitment to recruit, train, and reward staff for communication skill.

_____ Other: ______________________________

Potential solutions

_____ Develop well-articulated plans, with rationales in terms that management can respond to.

_____ Document community feedback. (See Chapter X, "Planning for Evaluation.")

_____ Build models of success to point to.

_____ Build alliances within and without the agency.

_____ Other: ______________________________

Attitudes of Those Outside the Agency

Agencies sometimes are concerned that those outside the agency, determined to stir up conflict, will "sabotage" any communication effort. Or agency staff may feel that nothing they say will be listened to.

Potential constraints

_____ Political agendas.

_____ Lack of knowledge about environmental issues, risk, etc.

_____ Demands for certainty.

_____ Failure to appreciate limitations of resources, science, etc.

_____ Hidden agendas.

_____ Other: ______________________________

'otential solutions

This problem is covered in more depth in *Improving Dialogue with Communities.*

- ___ Involve people in decision-making. (It is particularly important to involve those who are most likely to be angry or invested. See Chapter V, "Identifying Audiences.")
- ___ Listen to those outside the agency.
- ___ Give people background on the issues so they can understand.
- ___ Be forthright.
- ___ Other: ____

V. IDENTIFYING AUDIENCES

The success of a communication effort can hinge on early identification of audiences to reach. Although it may be tempting for agencies to aim for communicating with "everyone," communication efforts that aim too broadly may not reach key people. Communicating with everyone is a near impossibility. Reaching key audiences can save you a great deal of time and resources that might otherwise be diffused by trying to communicate with the elusive "general public."

Because of the potential controversy surrounding many environmental health issues, identifying audiences is particularly important. For an agency, audiences are not just people who might want to hear what you want to say; they are also people who want to tell you things. People tend to resent decisions that are made without their input. In fact, making decisions for people will virtually guarantee their opposition. In addition, getting input from outside the agency can sometimes help solve complex environmental problems. Because agencies cannot get input from everybody about everything, careful identification of audiences can ensure that the agency is listening to those most likely to be interested. Just as important, careful audience identification reduces the possibility of anger at the agency for failing to involve people in the decision-making process. (For guidelines about dealing with different audiences see Chapter IV in *Improving Dialogue with Communities.*)

Identifying audiences is largely a process of thinking through as specifically as possible who should be involved in a dialogue with the agency. The following steps may be helpful:

1. Answer the questions listed in the following section "Questions to Help Identify Key Audiences." They might trigger your thinking of additional questions tied to the issue with which you are grappling.

2. Talk with others in the agency who have dealt with similar issues or review records of public hearings about related concerns for ideas about interested audiences.

3. Review the list of potential audiences that follows the list of questions. Select the audiences that are appropriate to the questions.

4. Determine which audiences are most important for you to communicate with. **Often the audiences that are most difficult to deal with—and the ones you might be hoping to avoid—are the ones you most need to communicate with.** It may help to prioritize your audiences by dividing them into three categories:

   a. The inner circle—those most likely to be very concerned and very interested. They must be contacted and involved to the greatest extent possible. To a certain degree this circle is self-selecting. If people want to be very involved, they should be very involved.

   b. The middle circle—those who have less concern or are more peripheral but are apt to be upset if not contacted. They should be contacted, invited to be involved, and kept informed. This group is also self-selecting to a certain extent. People decide for themselves if they want to make the commitment of the middle circle to occasional input and progress reports.

   c. The outer circle—those who are less likely to be concerned. This often includes the "general public." Less effort should be directed to these audiences than the other two, and the effort should be aimed at involving them in the middle circle.

5. As you contact people, ask them if they know of others you should be contacting.

A. QUESTIONS TO HELP IDENTIFY KEY AUDIENCES

The following questions may help identify audiences for you to reach among those suggested on the "List of Potential Audiences," which follows. There is room under each question for you to list audiences that are important for you to deal with. Those groups that are relevant to more than one question are particularly critical for you to reach. Although you may feel like avoiding groups or individuals who may be difficult to deal with, these are often the most likely to raise issues if they are not consulted early. In fact, if you would prefer not to hold a dialogue with a group because it is hostile or otherwise problematic, that group should be at the top of your list to contact. Otherwise, your effort will be even more vulnerable to criticism because you have failed to address that group's concerns.

1. Which groups have been previously involved in this issue? (Newspaper clippings, discussions with other staff in the agency, and transcripts of public meetings can help with finding this out.)

2. Which groups are likely to be affected directly by the agency's policy, regulation, or action?

3. Which groups are likely to be angry if they are not consulted with or alerted to the issue?

4. Which groups would be helpful for you to consult with because they might have important information, ideas, or opinions?

5. Which groups should you involve to ensure that the agency has communicated with a balanced range of opinion on the issue?

6. Which groups may not especially want input, but do need to know what the agency is doing?

B. LIST OF POTENTIAL AUDIENCES

The following list is meant to trigger your thinking rather than to be exhaustive. As you go through the list, it may help to put a "1" next to those audiences that are top priorities for this particular program. Put a "2" next to audiences of lesser priority. Use the lines on the right to fill in names.

Government

____ Your division

____ Other divisions ____________________

____ Other federal, state or local agencies ____________________

____ County agencies ____________________

____ Municipal agencies ____________________

____ Federal, state, or local elected officials ____________________

____ Legislative committees ____________________

____ Quasi-governmental agencies overseeing specific functions
- ___ sewerage authorities ____________________
- ___ regional planning commissions ____________________
- ___ environmental commissions ____________________

____ Emergency responders ____________________

____ Other: ____________________

____

Geographical Neighbors

____ Local residents ____________________

____ Local businesses ____________________

____ Other: ____________________

____

Environmental

____ National groups ____________________

____ State-wide groups ____________________

____ Local groups ____________________

____ Groups related to specific issues:
- ___ Superfund ____________________
- ___ Siting ____________________
- ___ Hiking ____________________
- ___ Fishing ____________________
- ___ Watersheds ____________________
- ___ Natural features (e.g. swamps, lakes, oceans, forests, etc.) ____________________
- ___ Gardens ____________________
- ___ Other: ____________________

____ Groups with specific functions:
- ___ Legal ____________________
- ___ Lobbying ____________________
- ___ Research ____________________
- ___ Organizing ____________________
- ___ Other: ____________________

____ Other types of environmental organizations: ____________________

Civic Organizations

____ League of Women Voters ____________________

Associations such as Kiwanis, Rotary, etc. ____________________

____ Associations of senior citizens ____________________

____ Ethnic groups ____________________

____ Other organizations or individuals who have stature in the community and influence opinion: ____________________

Professional and Trade Associations

It is particularly important to reach those industries and occupations that
1) might benefit from an action;
2) might "lose" from an action;
3) have relevant expertise; or
4) will be important to secure cooperation during the implementation phase.

____ Health
- ___ Health officers ____________________
- ___ Doctors ____________________
- ___ Nurses ____________________
- ___ Other: ____________________

____ Technical
- ___ Labs ____________________
- ___ Sanitarians ____________________
- ___ Water purveyors ____________________
- ___ Consultants ____________________
- ___ Planners ____________________
- ___ Other: ____________________

____ Business
- ___ Realtors ____________________
- ___ Chambers of Commerce ____________________
- ___ Industrial groups ____________________
- ___ Other: ____________________

____ Agricultural ____________________

____ Other trade-related: ____________________

Educational and Academic Organizations

____ Colleges ____________________

____ Agricultural extension ____________________

____ Public and private schools ____________________

____ Other: ____________________

Religious Organizations

Other Organizations

VI. IDENTIFYING AUDIENCE CONCERNS

Unless you have a great deal of familiarity with the issue and the audiences involved, you can create misunderstandings by assuming you know people's concerns—or by assuming they are the same as yours. Thus, identifying people's concerns before you speak with them will greatly reduce communication frustration. Because different constituencies have different concerns, it is crucial to deal with key audiences when identifying concerns.

Listed below are some ways of identifying audience concerns. With the exception of polls, these approaches will not yield statistically significant data. They will, however, provide you with a snapshot of people's concerns. Because they may not give you the full picture, the approaches below should be seen as preliminary assessments rather than final analyses. If you use two or more of these approaches, and the information seems consistent, your "snapshot" is more likely to be an accurate reflection of the full picture. If the information conflicts, you should ideally keep investigating. You can feel fairly secure that you understand audience concerns when you no longer identify new ones.

Before identifying audience concerns it may be helpful to imagine what those concerns might be. Although this is no substitute for asking, it may be a useful first step to orient your thinking.

Taking one of the approaches listed below is better than none. Taking several is better still. The more potential for controversy, the greater the number of these approaches you might want to take. (Those marked with "*" are described in more detail in the report *Evaluating Risk Communication Programs: A Catalogue of "Quick and Easy" Feedback Methods*, by Mark Kline, Caron Chess, and Peter M. Sandman of the Environmental Communication Research Program, Rutgers University. This report is available from the Environmental Communication Research Program.)

You may want to number the approaches you intend to take in the order in which you intend to take them and note the date by which you hope to accomplish each task. This information can then be used to develop your timeline. (See Chapter XI, "Developing Timelines.")

____ Review newspaper clippings about the issue. *
(This is a good way to get a quick overview.)
Date: ____________

____ Discuss audience concerns with other agency officials (perhaps including those in other states) who have dealt with similar issues.
(This can give you a sense of the concerns that have arisen in similar situations.)
Date: ____________

____ Meet informally with those interested in the issue.
(Informal meetings or telephone contacts can give you a first-hand idea of both substantive concerns and the feelings about those concerns.)
Date: ____________

____ Send a letter to potentially interested people and organizations asking them to send you a list of their questions and concerns. *
(This can be a very useful way to initiate a dialogue that involves a greater number of people.)
Date: ____________

____ Develop a survey (which you can give to people through a door-to-door effort, at meetings, or in mailings) that asks people about their questions and concerns. *
(This more formal approach must be developed with care so that people feel they can articulate their concerns, not merely respond to yours.)
Date: ____________

____ Brainstorm questions and concerns at the beginning of a meeting. Or ask people to write their questions on index cards that you distribute and collect.
(Often you will want to know people's concerns in advance of a meeting, but this approach can be very useful for ensuring that you meet your audience's concerns and for showing the audience that you are doing so.)
Date: ____________

____ Brainstorm questions and concerns at the end of a meeting. Or hand out index cards at the end of the meeting in preparation for the next.
(The audience may not be the same people, but this is still a good tool where there are continuing contacts.)
Date: ____________

____ Consult advisory committees.
(In order to be useful advisory committees must be representative of the audience you will be communicating with.)
Date: ____________

____ Conduct a poll. *
(Polls are useful to obtain a little bit of information from many people. They are less useful to obtain in-depth or qualitative information about people's concerns.)
Date: ____________

____ Conduct a focus group. *
(Focus groups are informal meetings of people representative of your audience. The groups, which are guided by a trained moderator, are used to elicit attitudes, ideas and feedback.)
Date: ____________

____ Other: ____

____

Date: ____________

A. QUESTIONS FOR AGENCIES TO RAISE WHEN IDENTIFYING CONCERNS

Now that you have identified some ways to solicit the concerns of your audience, this checklist suggests questions you might raise during this process.

The following questions are meant to be generic ones that probe topics that are usually of concern to people. You will probably want to adapt and build on these questions to suit the situation with which you are dealing. In fact, some of the questions below might lead you to ask a series of more specific questions. For example, the question concerning the type of interaction people would like to have with the agency could raise the issue of how often people would like to have meetings and of what sort.

In some cases you will want to ask about most of these topics. In others, one or two topics will be of primary concern. Place a "1" by those questions that you feel are most critical to ask and place a "2" by those of secondary importance.

_____ What type of interaction would you like to have with the agency?

_____ How do you feel about your interaction with the agency thus far?

_____ What questions do you want answered?

_____ What kind of technical information (scientific studies, etc.) do you want to know?

_____ Do you have comments and suggestions that you want to put on the record? What sort of response, if any, will you want from the agency?

_____ What objections do you have?

_____ What else can you tell me that will help the agency be more responsive to your concerns?

B. QUESTIONS AUDIENCES MAY ASK OF YOU

It is problematic to generalize about the kinds of questions people may raise to agencies because they vary from situation to situation. Questions raised by an advisory group to development of regulations will differ greatly from those of people living near a Superfund site. Because agencies tend to have a great deal of difficulty anticipating the concerns of those who are potentially exposed to an environmental contaminant, the following list suggests *some* of the questions specific to such situations.

In general, the types of concerns people will have over such an issue will fall into four categories:

(a) Health and lifestyle concerns (How will this affect me/my family?);
(b) Data and information concerns (What is this stuff?);
(c) Process concerns (How am I being treated?);
(d) Risk management concerns (What is the agency going to do about this?).

All four types of questions may be represented in any one community.

The following checklist represents some common concerns you might expect to hear when you ask the questions in the previous checklist. **We provide it to familiarize you with the types of community concerns you may face, not as a substitute for identifying the community's concerns.** We cannot overemphasize that each situation is different and each community has its own set of specific concerns. Indeed, each individual *within* a community has his or her own concerns.

It may be helpful for you to check off these questions you anticipate. You may want to review the list again after you have contacted communities about their concerns. Finally, this checklist should be referred to when you are determining the content of materials or presentations. (See Chapter VII.)

Health and Lifestyle Concerns

_____ What is the danger to my health and that of my family?

_____ Can I drink the water, eat the vegetables in my garden, etc.?

_____ What can I do to find out if my health has been affected?

_____ What can I do to reduce the damage already done?

_____ What can I do to prevent further damage?

_____ What about my children? (Concerns about children are often primary and quite specific about the implications of exposure and whether certain behaviors will increase their risk.)

_____ We are already at risk because of X. Will Y increase our risk?

_____ How will this affect our quality of life—property values, the stigma of X attached to our community, trucks on our local roads, etc.?

_____ How will we be protected in an accident?

_____ How will we be compensated for the loss of value of our homes?

_____ Other: ____

Data and Information Concerns

_____ How sure are you?

_____ What is the worst case scenario?

_____ What do these numbers mean and how did you get them?

_____ How do we know your studies are correct?

_____ What about other opinions on this issue?

_____ How do our exposures compare to the standards?

_____ You say X can't happen. Why not?

_____ Other:

Process Concerns

Although agencies tend to focus on data, communities may be very concerned with issues other than the data. (See Chapter I of *Improving Dialogue with Communities*.)

_____ How will we be involved in decision-making?

_____ How will you communicate with us?

_____ Why should we trust you?

_____ How and when can we reach you?

_____ Who else are you talking with?

_____ When will we hear from you?

_____ Other:

Risk Management Concerns

Concerns about how the risk will be handled are often more important to people than details about the data.

_____ When will the problem be corrected?

_____ Why did you let this happen and what are you going to do about it?

____ What are the other options? Why do you favor option X?

____ Why are you moving so slowly to correct the problem?

____ What other agencies are involved and in what roles?

____ What kind of oversight will we have?

____ Other: ____

VII. DESIGNING YOUR MESSAGE

Whether you are making a presentation at a formal public hearing, writing material for a handout or a brochure, or simply talking informally with a group of homeowners, you will want to do some thinking about what you will say and how you will say it. Much of what you do say will depend on the informational, organizational, legally mandated, and process goals you have outlined. (See Chapter III, "Determining Your Goals.")

Whether written or spoken, presentations that consider and address audience concerns—and at the same time cover the relevant technical information in lay terms—will be the most useful to your audience. Such communications are less likely to be thrown in the trash because they are too confusing, "hooted down" by a frustrated community, or met with a barrage of non-technical questions that leaves you wondering whether you were heard at all.

The following is some guidance for developing the content of your message. The first section will help you decide what are the most important things to include when you obviously cannot include everything. The second section will help you to fine-tune your content.

One word of caution: If you are giving a spoken presentation, try not to become so invested in it that you will become unglued if in the middle you are required to change gears slightly. Interactions with the public—particularly those involving controversial environmental issues—require flexibility and the ability to incorporate the needs of your audience as much as possible. While you should prepare thoroughly and put forth your best effort, it is a far greater and more useful skill to be able to sense and respond to an audience's immediate needs if they turn out to be different from those you anticipated. If you are writing a brochure or other informational piece, make sure you get feedback from potential audiences before it is finalized and expect to make changes down the road based on feedback you get after it is released. (See Chapter X, "Planning for Evaluation.")

Content - What Your Material Should Cover

The following categories may help you to define what material you should cover in your communication.

1. List the three items you would most like your audience to learn from your talk or written material.

   a. ______________________________
   ____

   b. ______________________________
   ____

   c. ______________________________
   ____

2. List the three items you feel your audience wants to learn from you.

   a. ______________________________
   ____

   b. ______________________________
   ____

   c. ______________________________
   ____

3. What three additional background points do you feel your audience needs to know so they understand A and B?

   a. ____

   ____

   b. ____

   ____

   c. ____

   ____

4. Finally, list the three most likely points your audience will misunderstand or get wrong unless you stress them and explain the possible misunderstanding.

   a. ____

   ____

   b. ____

   ____

   c. ____

   ____

Other Things to Consider

After you have completed the above exercise and decided on the content of your materials, the following checklist may help you in completing your materials or presentation.

____ Look again at your goals (Chapter III). Does your presentation or materials advance them appropriately? Are there any goals you have not addressed and should?

____ Have you put technical terms in language that lay people can understand?

____ Are you using graphics where appropriate to illustrate your points?

____ If you are using graphics, are they clear? Are they simple enough to be useful or cluttered and confusing? If you are using slides or overheads, can they be read from the back of a room?

____ Is your presentation/materials too long? Too short?

____ Have you pretested your presentation or materials? (See Chapter X, "Planning for Evaluation.")

____ Are there obvious places in your spoken presentation to stop and answer questions?

____ Can you handle the questions that may arise from your talk? If not, have you invited the appropriate colleague or other expert to assist you? Have you incorporated into your written materials the questions that people are most likely to have?

____ If the material is for a spoken presentation, does it leave room for change? Does it summarize at the end?

VIII. METHODS OF REACHING PEOPLE

The approaches you use to reach people will vary depending on the issue and the audiences. For example, while a pamphlet might be a very useful approach to inform those who own wells about new water regulations, it would probably not be as useful to elicit feedback from them. Nor would it be satisfactory for those who are directly affected by the regulations (e.g. industries with discharge permits), who would need more in-depth materials.

There are no real rules for choosing the right methods to reach people. But the list of options which follows may help you think through a variety of approaches. The type of approach you use should be determined not only by what you are most comfortable with but also by the best methods for the audiences you are trying to reach. For example, people who are very angry or frightened may need the interaction provided by an informal meeting as well as an information line they can call with further questions. A booklet about the subject, while possibly a useful addition, may be less successful in dealing with people's emotional concerns. When choosing the appropriate methods of outreach, it helps to take into account the following factors:

1. Resources available.
   (A limited budget will limit your choices.)
2. Lead time to prepare an outreach effort.
   (It helps to develop a realistic timeline. For example, a pamphlet will take far more time to produce than a letter. Planning an informal meeting takes less time than forming an advisory committee.)
3. Audience needs.
   (This is a key factor that is often overlooked. Although you may want to provide people with written data, they may want a meeting.)
4. Degree of interaction needed.
   (Complexity, emotional distress, and other factors may suggest an interactive question-and-answer approach supplemented by written materials rather than a one-way approach using only written materials such as fact sheets.)
5. Degree of controversy.
   (The more controversial an issue, the more likely it will require person-to-person interaction and input from people outside the agency. Controversy also suggests the need for small rather than large meetings. See Chapter IV of *Improving Dialogue with Communities*.)
6. Distribution.
   (It is critical that you think through how you will distribute audio-visual and written materials before you produce them. Similarly, consider your mailing list before you plan a mailing.)
7. How much detail needs to be communicated.
   (In general, more detail requires more written communication.)
8. Legal requirements.
   (There may be legal stipulations about timing of notification or agency response to public comments. But do not assume a particular approach is legally required just because it has become customary in the agency.)

The following methods, which are meant to trigger your thinking rather than to be comprehensive, are divided into four categories:

1) Written or audio-visual communication;
2) Person-to-person communication;
3) Communication via the mass media; and
4) Approaches particularly useful for eliciting input.

Approaches marked with "*" are those that agencies might want to consider using more frequently, either because they tend to be overlooked or because they can be particularly useful in dealing with controversy.

It may be helpful to check off your top five choices for the situation at hand and discuss their strengths and weaknesses with other staff. In many cases, you will want to use more than one method of reaching people. For example, you may want to talk to some people in advance of an informal meeting, mail them a fact sheet, and have a handout at the meeting.

The approach you use should vary from situation to situation. In fact, always relying on the same approach time after time is probably missing the same people time after time. If this is the case, rethink what is new about the situation at hand and what approaches are suggested by that uniqueness.

Written or Audio-Visual Materials

____ Pamphlets

____ Letters

____ Postcards

____ Legal notices
(While these fulfill legal obligations, they do not effectively reach many audiences.)

____ Newsletters

____ Periodic updates *
(These are less formal and less work than newsletters.)

____ Articles or announcements in other organizations' newsletters *
(These can often reach a greater audience than your own materials.)

____ Displays

____ Fact sheets

____ Flyers

____ Door-hangers

____ Curriculum materials

____ Comics

____ Handouts

____ Question-and-answer sheets *
(These are very useful when they directly address audience concerns.)

____ Posters

____ Placards in mass transit

____ Inserts sent with utility bills or other mass mailings

____ Videos

____ Slide shows

____ Audio tapes

____ Other: ____
____

Person-to-Person Approaches

____ Presentations
___ at your own events or meetings
___ at others' events or meetings

_____ Availability sessions or "out-of-office hours" *
(These give you a chance to talk with people on their turf, meet people who might never travel to a meeting, and address people personally.)

_____ Public hearings

_____ Informal meetings *
(These are more useful to create dialogue than public hearings or large meetings.)

_____ "Open" working meetings

_____ Open-door days, when agencies are open to the public and events, lectures, discussions, etc. are scheduled.

_____ Workshops

_____ Advisory committees

_____ Networking

_____ Telephone trees

_____ Information telephone lines

_____ Events
- ___ Celebrations
- ___ Child-focused events
- ___ Improvement-focused events (e.g. clean-ups)
- ___ Conferences

_____ Courses

_____ Other: ____
____

Mass Media Approaches

In addition to responding to inquiries from reporters, agencies can initiate contact with the media and take a pro-active approach to getting the word out. Do not overlook local media, such as weekly newspapers, that are often widely read in communities.

_____ News conferences

_____ News releases

_____ Letters to the editor

_____ Talk shows

_____ Call-in shows *
(These have potential to create a dialogue.)

_____ Op-ed columns

_____ Advertisements

____ Feature articles

____ Other: ____

____

Approaches for Eliciting Input

All of the following are starred because they encourage the agency to listen to those outside.

____ Informal meetings *

____ Questionnaires *

____ Advisory groups *

____ Brainstorming *

____ Interactive workshops *

____ Polls *

____ Evaluations of agency process *

____ Suggestion boxes *

____ Dividing large meetings into small groups *

____ "Dialogue" telephone lines *

____ Other: ____

____

IX. PREPARING FOR MEETINGS WITH THE PUBLIC

Many agency practitioners have a fear of meeting with the public that is based on past experiences with angry and frustrated community members at large public meetings. There is a general sense that a meeting with the public is an "anything goes" situation, and that agency representatives can never know what is going to happen until they're in the meeting.

As a result of these experiences, agency people very often brace themselves for the battle, their only hope being to "come out alive." While the following checklists cannot shield you from communities' understandable anger over certain situations, they can help you (a) do some thinking beforehand about why a community may react a certain way; (b) see yourself and your agency from the community perspective; (c) avoid angering the community unnecessarily; and (d) prepare to respond to public reaction.

A. ASSESSING THE CLIMATE

Before you prepare for the meeting (whether it is a large public meeting or a small informal gathering), you should consid-r the general climate or mood of the commu-ty. First, you will want to find out people's concerns. (See Chapter VI, "Identifying Audience Concerns.") But beyond that, try to go one step further and assess how their concerns might affect people's response to you in your role as an agency representative.

The following list of questions might help you to better characterize the climate. (See also Chapter IV of *Improving Dialogue With Communities.*) It may be helpful to you to do some thinking about these questions and the exercise that follows with a colleague who has also been involved with this situation, to compare his or her impressions with yours.

1. How are you seen in this situation? What is your role and the role of your agency?
2. What is the history of the situation? Has your agency (or have you) been involved previously? Favorably or unfavorably?
3. Have community concerns been a factor in previous agency decisions regarding this issue? How does the community see its role in the situation? Does the community have a role in the decision-making, or is it simply being informed of the agency's decision?
4. How great is the interest in the situation? Are people angry? Apathetic? What kind of reactions have you seen (or heard about from colleagues, contacts, or news coverage) up until now?
5. Are there hidden agendas? Are there elected officials or groups that are involved in building support over this issue?
6. What kind of media attention has the issue received locally, regionally, and nationally? Are there likely to be reporters present at this meeting?
7. How many people do you think will attend the meeting? A large number? Only a few? How long do you think the meeting will last?

Based on the answers to the above questions, try to characterize the type of meeting you might expect, using the checklist below.

Choose two terms that you feel will best describe the meeting tone:

____ controversial
____ frightened
____ angry
____ unemotional
____ apathetic, uninterested
____ informal
____ introductory
____ questioning and information-seeking
____ interactive and problem-solving
____ other: ____________________

B. THINGS TO DO BEFORE A MEETING

Regardless of your initial assessment of the tone of the meeting, which you have indicated on the preceding checklist, you can still have an effect on the tone either positively or negatively. Although you will rarely dramatically change its nature, you can shift it somewhat. For example, it is difficult to turn a controversial meeting into one without conflicts, but you can affect the way conflict is handled in a meeting, and how angry the meeting gets as a result of the conflict.

The major areas for concern when preparing for a meeting with the public include process, content, logistics, and trouble-shooting (explicitly thinking through potential problems in order to avoid them). Attention to all of these areas is important; neglecting to think about any one of them may lead to a less than favorable outcome. For example, if you have failed to provide parking at the meeting, or if you have neglected to invite an interested and affected group, people may be angry at you even before you give your well-prepared presentation.

The following checklists represent many items under these four headings—you may think of others.

Process

_____ Have you talked with affected people ahead of time? (See Chapter VI, "Identifying Audience Concerns.")

_____ Have you done appropriate outreach to see that those who should be there—and who want to be there—are invited?

_____ Have you arranged for appropriate spokespeople (including technical experts, decision-makers, and officials of other agencies, if appropriate)?

_____ Have you chosen an appropriate chairperson? (Think about the implications of a community, agency, or neutral person.)

_____ Have you picked a suitable location for the meeting? (A neutral location may be more appropriate than somebody's "turf.")

_____ Have you developed an agenda that provides a structure for the meeting that is appropriate to deal with both the agency's and the audience's concerns?

_____ Have you gotten input from your audience(s) about the agenda?

_____ Have you reviewed the timing of the agenda and allotted realistic times for items?

_____ Have you considered how you will handle conflict if it arises?

_____ Have you appointed a notetaker? (Someone should write down promises agency representatives make and follow up on them.)

_____ Have you made sure documentation (e.g., tape recorder, newsprint, or notetaker) is available, if necessary?

_____ Have you considered how you will get feedback on the effectiveness of the meeting? (See Chapter X, "Planning for Evaluation.")

_____ Other: ____

____

Content

_____ Have you gone over your list of possible questions in advance? Are you prepared to respond to them? Or better yet, have you integrated the answers into your presentation? (See Chapters VI and VII.)

_____ Have you prepared background material and handouts?

_____ Have you gotten feedback on your presentation from someone not involved with the issue?

Have you gotten feedback on the materials you have developed? (See Chapter X, "Planning for Evaluation.")

_____ Has the agency examined possible actions and policies that respond to people's concerns? Have these actions been taken or policies adopted?

_____ Other: ____

____

Logistics

_____ Big enough room?
_____ Right shape for presentation?
_____ Room temperature controlled?
_____ Both building and room wheelchair-accessible?
_____ Directions available to meeting location?
_____ Convenient location?
_____ Sufficient parking?
_____ Signs in building that point to room?
_____ Appropriate time—i.e., evenings or weekends for working people?
_____ Childcare available?
_____ Microphones for speakers and audience?
_____ Podium or table?
Enough chairs? Are they arranged?
Food and beverage available?
_____ Flip chart and newsprint?
_____ Markers, chalk, etc.?
_____ Masking tape and/or push pins to hang newsprint and other visuals on the walls (and permission to do so)?
_____ Audio-visual aids tested and ready? Extra bulb, extension cord, remote control switch, etc.?
_____ Name tags for speakers?
_____ Sign-in sheet?
_____ Notebooks?
_____ Other: ____

____

Trouble-shooting

You also might want to do some thinking *before* the meeting about how you will react and respond *during* the meeting. Some things you may want to be prepared for are:

_____ Going over the agenda at the beginning of the meeting and, to the extent possible, making changes that people suggest.

_____ Changing gears in your presentation based on audience reaction.

_____ Dealing with outside groups you hadn't invited or counted on.

_____ Being prepared to respond to suggestions, concerns, requests.
_____ Being prepared to stay after the meeting to answer individual questions.
_____ Handling conflict if it erupts.
_____ Dealing with *more* people than you expected to attend.
_____ Dealing with *fewer* people than you expected to attend.
_____ Dealing with someone in the audience who starts giving a speech.
_____ Dealing with people who monopolize the meeting.
_____ Dealing with the media.
_____ Other: ____
____

X. PLANNING FOR EVALUATION

Agency practitioners recognize that improving their communication requires a conscious effort to find out more about what is working and what is not–preferably while there is still time to change direction as appropriate. In fact, feedback is essential to ensure that your communication effort is working and may save you time by helping you make mid-course corrections in your plans. But in practice, evaluation is often neglected in the press of other, more urgent tasks–especially if it has not been planned for in advance.

To make it easier for agency people to elicit feedback on their communication efforts, the Environmental Communication Research Program at Rutgers University (funded by NJDEP's Division of Science and Research) has written a report that describes "quick and easy" tools an agency can use to get feedback on their communication efforts. These "quick and easy" methods are most appropriate for small-scale risk communication efforts for which statistically reliable, more resource-intensive evaluation methods are not suitable. Agency staff looking for ways to evaluate their communication work should consult *Evaluating Risk Communication Programs: A Catalogue Of "Quick and Easy" Feedback Methods*, by Mark Kline, Caron Chess, and Peter M. Sandman.

The checklist that follows is designed to help you integrate the recommendations of that report into your communication planning. Like the report itself, the checklist is divided into four sections, "Audience Analysis," "Message Pretesting," "Assessment of Communicator Style," and "Outcome Assessment." For each category, check one or more evaluation tools that seem like they might be appropriate for your project. Read the relevant sections of the report to determine which are actually the most appropriate. Then indicate when in the communication process it will be suitable to use each of the tools you have identified.

You may well find it difficult to select appropriate evaluation methods if you have not read the "Quick and Easy" report. If risk communication is a small part of your job (and communication evaluation a smaller part), you may find it more efficient to seek advice on which evaluation tools to use from someone else in the agency who is already familiar with the report's recommendations. The first chapter of the report also provides a brief summary of all the tools discussed in detail later. The important thing is to make sure evaluation is not omitted from your communication planning.

Audience Analysis

_____ 1. Policy Profiling Questionnaire (to identify stakeholders in an issue and organize agency perceptions of them)

_____ 2. Audience Analysis Matrices (to identify relevant audiences and organize agency perceptions of their reactions, involvement, or position in a communication effort)

_____ 3. Audience Information Needs Assessment (to gather questions from relevant audiences in advance of public meetings so a response can be organized and presented)

_____ 4. Analysis of News Clippings (to identify audiences and their concerns; to develop some historical knowledge of a community to help in planning future phases of a communication effort)

_____ 5. Public Opinion Polling (to assess audience opinion or reaction; to find out what people see as important problems; what issues and events they are aware of, and how they evaluate social and political institutions)

_____ 6. Public Opinion Polling/Pollstart (to organize and analyze polling data on personal computers available within the agency)

_____ **7.** Qualitative Questionnaires (to collect information from people whom agencies have involved in a communication effort)

_____ Other tools ____

____

When will you use each tool? ____

____

____

____

Message Pretesting

_____ **1.** Rightwriter (to review documents written on computer word processing programs for errors in grammar, style, usage, and punctuation)

_____ **2.** Smog Readability Grading Formula (to evaluate the level of reading comprehension a person must have to be able to understand a piece of written material)

_____ **3.** Signaled Stopping Technique (to examine how readers process information as they read written materials and through this procedure to get feedback on those materials)

_____ **4.** Self-Administered Pretest Questionnaires (to get feedback on pretest materials)

_____ **5.** Central Location Intercept Interviews (to get feedback on pretest materials or to examine an audience's attitudes and opinions)

_____ **6.** Theater Testing (to get feedback on visually presented pretest materials)

_____ **7.** Focus Groups (to get feedback on and generate ideas about pretest items; to get a "feel" for the attitudes and beliefs of the target audience)

_____ Other tools ____

____

When will you use each tool? ____

____

____

____

Assessment of Communicator Style

_____ **1.** Myers-Briggs Type Indicator (to provide feedback on the communication styles of agency staff)

_____ **2.** Strength Deployment Inventory (to identify the strengths of agency staff and suggest ways these strengths can be used to communicate more productively with others)

_____ **3.** Conflict Management Survey (to provide feedback about a respondent's approach to conflict)

_____ **4.** Communication Style Survey (to provide feedback on the respondent's style of interpersonal communication)

_____ Other tools ____

____

When will you use each tool? ______________________________________
____
____
____

Outcome Assessment

____ **1.** Meeting Reaction Form (to get feedback about participants' reactions to a public meeting)

____ **2.** Verbal Meeting Feedback (to get direct feedback from participants at a meeting)

____ **3.** Speech Evaluation Checklist (to get feedback on how a speech or presentation went)

____ **4.** Observation and Debriefing (to get feedback on speeches and presentations)

____ Other tools______________________________________
____

When will you use each tool? ______________________________________
____
____
____

XI. DEVELOPING TIMELINES

Most of the checklists and tools in this workbook are designed to help you figure out *what to do* to make your communication effort a success. The essence of a timeline is to help you decide *when* each step needs to be done.

A timeline is the key to getting from a mere list of things you hope to accomplish to a *plan* for accomplishing them. The more thoroughly you work through the other parts of this workbook, the more ambitious a communication program you design, the more need you will have for a timeline. When an agency does not use a timeline, key elements of its communication strategy are likely to be implemented ineffectively or abandoned entirely simply because essential preliminary steps were not taken; by the time the agency got around to focusing on the element in question, it was too late.

Using a timeline, in other words, forces the agency to consider when it will hold that meeting with local farmers (for example), what it must do to get ready for the meeting (find a hall, send out a mailing, prepare a handout, discuss a possible agenda with representative farmers, etc.), and when it will take each of these preliminary steps. Because the agency used a timeline, the meeting with farmers is more likely to happen and more likely to be a good meeting.

Timelines also serve other purposes in communication planning:

1) They facilitate the assignment of tasks to particular staffers, so everyone's responsibilities are clear.

2) They help identify overcommitted periods (suggesting a need for extra staff, rescheduling, or some other solution) and slack periods (suggesting an opportunity for additional communication efforts and a possible problem if the agency hopes to maintain momentum).

3) They make it easier to see gaps in the communication plan—particular audiences that will not be reached, for example.

4) They help the agency respond to changing conditions (adding elements to the timeline in response to new concerns, moving elements forward or back in the timeline as needed.

But their key role is that they clarify what needs to be done when, and thus make it less likely that important deadlines will go unnoticed.

Steps in Building and Using a Simple Timeline

1. Draw a literal "timeline"—a long line (horizontal or vertical) that represents calendar time. Start with the current date. Choose an appropriate ending date—one year later, the next fiscal year, the deadline for completing the new regulations, etc. Divide the timeline into months (or weeks if the period covered is relatively brief).
2. Insert all relevant dates that have already been determined and cannot be changed, including those determined by external forces—the date of a scheduled referendum, for example, or a legally mandated deadline.
3. List the major elements in your communication plan so far—the questionnaire you want to distribute, the groups you intend to meet with, the public hearing you must have, etc. Choose an appropriate date for each and add it to the timeline.
4. For each element identified in #3, list all the steps necessary to make sure that element is successful. Think about preliminary contacts with affected audiences, logistical preparations, substantive preparations, handouts and other materials, liaison with other programs and other agencies, pretesting and evaluation, etc. Do not forget follow-up steps—sending out the minutes of a meeting, for example, or calling key people who could not come. It will be helpful to involve other staff members in brainstorming these steps so that you do not miss any important ones. Choose an appropriate date for each step and add it to the timeline.
5. Now examine the timeline for completeness, feasibility, and efficiency. Is there anything you ought to be doing that is not there? Is there anything there that cannot be done in the time allotted with the resources available? Are there slack periods when there will be little to be done? Adjust the timeline as appropriate.

6. If several people are involved in the communication effort, copy the timeline onto a blackboard, poster paper, or some similarly visible medium, and put it where all staff members can see what needs to be done. Make sure the medium you use permits changes.
7. Decide jointly with other affected staff members how the timeline will be kept up to date—a procedure for adding, abandoning, and moving items in response to changing conditions. Make sure everyone understands that the timeline is a planning tool—it should be neither forgotten nor followed slavishly. For example, if it becomes clear that a particular step cannot be completed on deadline, the staff should think through the problem and adjust the timeline.

More Complex Timelines

For complex communication programs, a simple timeline is likely to provide inadequate. Too many elements and steps, organized only according to date, are likely to crowd each other and make it difficult to follow the overall communication strategy and to tease out the principal threads. In such cases, the timeline be a more valuable planning tool if it is organized more complexly.

One way to improve a complex timeline is color-coding, by means of colored chalk, marking pens, underliners, and the like. If it is crucial to keep track of which staff member is responsible for which items, for example, each person's responsibilities can be in a different color. Or a different color can be used for each audience—efforts to reach local government in blue, interactions with environmental activists in red, etc. Or a different color can be assigned to each communication element and its various steps. Or you may want to color-code by format—blue for meetings, red for publications, etc.

Another way to organize the timeline is to create an "array" of parallel timelines, all representing the same period but with each timeline assigned to a different aspect. The top line is usually reserved for the calendar and external events. Meetings and meeting preparations can be on the second line, publications on the third, etc. Or—depending on which organizational principle is most significant for the particular communication effort—each staff person, each audience, or each element can have its own timeline.

If you use both color-coding and multiple timelines, of course, you can organize by two aspects at once.

At the start of a communication program, a timeline may seem like more work that it is worth. But halfway through the program, the timeline will have proved its worth as a way of keeping track of what needs to be done when.

Evaluating Risk Communication Programs[1]
A Catalogue of "Quick and Easy" Feedback Methods

Mark Kline, Caron Chess, and Peter M. Sandman

Agencies that deal with environmental health issues are paying greater attention to how they can communicate with the public more effectively. There is also an increasing body of literature directed to agency practitioners, suggesting how risk communication principles might be translated meaningfully into reality.

As these principles are integrated into practice, agencies should also be evaluating their efforts. Communication efforts, like technical ones, can improve with feedback. The lack of such feedback may lead the agency to repeat the same communication mistakes and fail to duplicate successes.

Unfortunately, it may be difficult for agencies to identify evaluation strategies that are practical, useful, and affordable. The term "evaluation" has multiple meanings, including making critical judgments about the worth of a program. Therefore, evaluation activities may seem threatening to agencies already immersed in "crisis" communication efforts, usually with limited resources. In addition, some forms of evaluation may seem too elaborate and difficult to implement in this context.

The goal of this catalogue, which was funded by a contract from the Division of Science and Research of the New Jersey Department of Environmental Protection, is to identify and recommend specific evaluation methodologies with the greatest potential for agency use in small-scale communication efforts where a full-scale evaluation may not be feasible. These tools are also likely to have application in risk communication efforts by industry and advocacy groups.

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[1]Submitted to the Division of Science and Research, New Jersey Departmant of Environmental Protection, September 22, 1989, by the Environmental Communication Research Program, New Jersey Agricultural Experimental Station, Cook College, Rutgers University, 122 Ryders Lane, New Brunswick, New Jersey 08903; this paper summarizes the full report.

Strengths and Limitations of Quick and Easy Evaluation

In its most general sense, the term "evaluation" refers to a process of interpreting and judging events, a process that human beings engage in much of the time. Evaluation ranges along a continuum, from informal, subjective impressions at one end, to formal, scientifically conducted and controlled evaluation research at the other (Rossi and Berk, 1988). In the middle of this continuum are assessment and feedback methods that are more structured and systematic than subjective impressions, but less rigorous than evaluation research. Because these intermediate methods require much less time, resources, and expertise than evaluation research, we call them "quick and easy" methods. In our view when most people think of evaluation they tend to think of approaches that give an overall assessment of a program's worth. Such approaches, including "summative evaluation" (Rossi and Berk, 1988) and "impact evaluation", lie at one end of the previously mentioned continuum.

Many programs go without any evaluation whatsoever because impact evaluation is seen as the only form of evaluation and these efforts are beyond agency capabilities and resources. Practitioners may be left with only their own impressions of how they fared in a communication effort, with no basis beyond intuition and guesswork for correcting communication errors and repeating communication successes.

Evaluation experts have generally accepted this state of affairs because of their conviction that data from poorly designed evaluation research studies can be misleading. Rossi (1988) has noted that a bad evaluation can be worse than not doing one at all. Proponents of rigor have seen less rigorous research badly abused, leading them to conclude that agencies are better off knowing nothing than obtaining questionable feedback.

We believe that partial feedback can be better than none at all if the strengths and limitations of this feedback are fully understood. Agencies should not, for example, rely on feedback from "quick and easy" approaches for impact evaluation. Drawing reliable causal inferences about the effects of a communication effort requires scientific evaluation research.

This catalogue focuses on approaches that we feel are useful when practitioners face limitations on time, expertise, and other resources. These approaches can be practical for less resource- intensive communication efforts, where impact evaluation is not appropriate or possible.

In lieu of formal impact evaluation, agencies can rely on feedback from quick and easy approaches to guide the development of their risk communication programs. This is called "process evaluation," and it examines the ongoing processes and procedures of a risk communication effort. "Formative evaluation" techniques, which assess the strengths and weaknesses of materials before full implementation of a program, can also be adapted to suit less resource-intensive communication efforts. Some techniques used in "outcome evaluation," which explores the reactions of audiences after a phase of a communication effort, can also be adapted for quick and easy use. Since the use of "quick and easy" methods generates feedback which is more systematic and disciplined than that found in typical practice, the use of these methods creates programs that may be ultimately more amenable to rigorous impact evaluation, should resources become available.

If "quick and easy" approaches are viewed as a means of obtaining a snapshot—rather than a full picture—they can provide useful input to agency risk communication efforts. Practitioners can use quick and easy strategies to gather some information that will inform their practice in the absence of a full study. In particular, quick and easy strategies can yield information that can lead to mid-course corrections and bring new ideas into the process. This feedback can be even more critical to agency efforts than retrospective analyses. (It may be ultimately more useful for practitioners to know they are about to light communications fires than to evaluate their firefighting efforts.) Information gathering of this type is common in the public relations field, where it is viewed as "developmental" input for generating hypotheses rather than as conclusive data that are reliable and generalizable.

Feedback can be viewed as an opportunity to turn bad news into good. Agencies can use feedback suggesting that a program is off-course to put the program back on track. Even scathingly negative remarks can be fodder for making a program more effective. When viewing feedback as information to succeed rather than as justification, superficial praise about a meeting or brochure may be less useful than critical remarks that include suggestions for change. The latter provide the agency an opportunity for improving its materials and the added benefit of being responsive to the public.

Agencies should not abandon rigor entirely when gathering information. Quick and easy methods can be more valuable if agencies attempt to be as rigorous as possible within the constraints of their resources. For example, keep in mind basic principles of objective data gathering, carefully defining target groups, choosing representatives typical of the target groups, and asking questions in a consistent and unbiased manner. More rigorous methods increase the strength of conclusions that can be drawn from feedback. Awareness of the need for rigor can also allow agencies to refrain from drawing sweeping and misleading conclusions from developmental feedback.

Barriers to the Use of Quick and Easy Evaluation

We believe these strategies can help communicators develop and maintain an open channel to those outside the agency. However, even the best feedback is of little value if it is not heeded. Audiences may already be skeptical about whether agencies will use their input and respond to their needs. If practitioners gather evaluative feedback, they must be open to using it. Furthermore, they should be prepared to assess how the feedback was used—what role it played in the decision that was ultimately made—and also to demonstrate any positive effects to the public. Agencies, in short, should be accountable not only for getting input from the public, but also for using it and showing that they used it. If audiences sense that their time and effort have gone to waste, they may be even more disenchanted with agencies than they would have been if no feedback had been solicited.

Agencies that operate as closed systems may have little organizational investment in this kind of feedback. In such an agency, decisions are made on the basis of an internal process. Staff are accountable to their supervisors who are in turn accountable to higher-ups. Communication efforts may be designed to take into account this internal input and keep things running smoothly. Staff who attempt to bring in new ideas based on public input may not be supported. Agencies of this kind may attempt to lend an occasional ear, pass out an occasional survey, and make an occasional telephone call in an effort to solicit public input, but the system's incentives make it unlikely that such input will be used constructively.

Even the best evaluation tool can be subverted by this sort of agency process. For quick and easy tools to function well in maintaining an open channel, they must be supported by agency management and policy. Without this support, front-line practitioners may gather information only to have it ultimately ignored, leaving them with an even more irritated public than in the first place.

Part of quick and easy evaluation involves agency management encouraging staff to be creative in opening the channel with the public—even when what emerges from the channel is critical of the agency staff members conducting the communication program.

Agencies, therefore, must be prepared to turn bad news into good. Critical feedback provides an opportunity to improve a communication effort and a chance to be responsive. Agencies that are not willing to make mid-course corrections in response to feedback from the public will have little use for these tools. Agencies may be tempted to use quick and easy strategies to justify what they did rather than to find out what they can do differently. Aside from being a tedious exercise, using these tools in this way defeats their very purpose—to introduce new ideas and feedback through an open channel.

Risk communication and quick and easy evaluation are both value-laden processes. The values and climate of an agency can have great impact on whether these tools help open the door to the public or help keep it shut. We have attempted to identify tools that support commonly accepted risk communication principles, hopeful that agencies will use them in the spirit of an open, ongoing dialogue with the public.

Development of This Catalogue

This investigation took the form of a scavenger hunt. Through telephone and personal interviews, literature reviews, networking, and a computer database literature search, we attempted to identify feedback approaches that we could recommend for agency practice. We looked for techniques that:

- Are easy to use
- Can be implemented inexpensively
- Yield results quickly
- Are relatively non-threatening to both the audience and the agency
- Give feedback which translates to behavioral change
- Reinforce commonly accepted risk communication principles

Our search was intensive but by no means exhaustive. We talked to a large group of people, including risk communication practitioners, those with evaluation experience, consultants, public relations specialists, industry practitioners, and academics. We looked into their suggestions and reviewed literature they recommended in addition to literature we were unearthing. From this rich mix of sources, we identified the evaluation methods and instruments reviewed in this catalogue.

We recognize that we may have missed some instruments, though our networking efforts did yield confirmation of many of the tools we describe from a variety of different sources. This catalogue is not intended to be the final word on quick and easy evaluation strategies. We encourage agencies to continue to look for and develop tools for this kind of feedback.

How to Use This Catalogue

Our review of quick and easy evaluation methods is not in the form of a quick and easy evaluation manual. After agencies have some experience with the instruments we recommend, development of a step-by-step guide may well be appropriate. We assume this catalogue will be of most interest to those who have a fair amount of commitment to and expertise in risk communication. We hope they will use the catalogue as a resource for assisting policy-makers and technical staff with evaluation. Nonetheless, we recognize that most agency staff may not have the time to read a full review of each tool before deciding which one will be useful to their risk communication efforts. The following summaries of twenty-two tools give a brief overview of each. Readers can use these summaries to decide which tools might prove useful to their communication effort. However, readers will want to review the detailed reports about instruments that interest them in order to get more in-depth information. (See the full report, as listed on page 45.) These reports include a) detailed descriptions, including examples of how the instruments have been used; b) discussion of strengths and limitations; and c) how to order the instruments.

OVERVIEW OF EVALUATION METHODS

I. Planning

The key to effective risk communication is effective planning. Just as scientific research without planning can slow down an assessment due to the need to rethink and resample, it is ultimately more wasteful and time consuming to develop a brochure or presentation without planning.

It is quite difficult, if not impossible, to evaluate a risk communication effort unless you have planned a program so that you know what you want to achieve and how you are going to achieve it. Because planning is so critical we have developed a separate document on planning entitled, *"Improving Dialogue with Communities: A Risk Communication Workbook"* (Hance et al., 1988). This workbook, available in 1989 from NJDEP's Division of Science and Research or the Rutgers Environmental Communication Research Program, includes checklists and worksheets to help those with little communication background to identify communication goals, audiences, audience concerns, methods of reaching people, key content points, and other components of successful planning.

Our research for this evaluation catalogue did locate some comprehensive planning systems (Green, 1980; National Cancer Institute, 1989) that could have application in risk communication efforts, but they are not "quick and easy" tools appropriate for this catalogue. Other planning tools we located needed significant modification to be useful in agency settings.

2. Audience Analysis

One of the keys to successful communication is understanding your audiences in advance. Agencies need to identify the audiences involved in their communication efforts and get a sense of what groups already know, what they need and want to know, and what they expect from the agency. Audience analysis tools provide a means for practitioners to clarify their perceptions of audiences in organized ways or to solicit feedback from key audiences before, during and after a communication program. Such feedback can help practitioners maintain an open channel between the audience and the agency throughout the communication effort. These strategies are common in public relations and advertising practice, where ongoing feedback from an audience is important to respond to changes rapidly.

2A. Conceptual/Organizing Techniques

These techniques do not involve any data collection from audiences. Rather they are frameworks to help communicators systematically organize and analyze their impressions about different types of audiences.

2A-1. Policy Profiling Questionnaire

Purpose:	To identify stakeholders in an issue and organize agency perceptions of them.
Lead Time:	Low
Staff Time:	Brief—might include a meeting of involved staff.

Budget:	Low

This tool helps agencies assess their perception of the potential impact that important actors can have on a decision or course of action. Agency staff identify stakeholders and numerically rate each of them in three categories: issue position, power, and salience. These ratings allow a calculation to determine whether the stakeholder might oppose, support, or be neutral toward a decision. This tool guides the agency's internal assessment of relevant stakeholders and involves no formal data collection. It is a means for organizing and comparing perceptions of stakeholders to anticipate reactions to a decision or issue. However, the ratings are based solely on the perceptions of agency staff and are only as valuable as those perceptions.

2A-2. Audience Analysis Matrices

Purpose:	To identify relevant audiences and organize agency perceptions of their reactions, involvement, or position in a communication effort.
Lead Time:	Low
Staff Time:	Brief
Budget:	Low

Matrices are developed which identify relevant audiences and cross-reference the audience with another important variable— such as issue position, anticipated reactions, or issue importance. These matrices allow a graphic representation of groups in a communication effort while also encouraging greater awareness of the specific audiences and their qualities. These matrices are based only on the perceptions of agency staff—they involve no data collection. The instrument may be limited by the degree of knowledge, intuition, and sensitivity present within the agency.

2B. Preliminary Audience Feedback

These techniques involve collecting information about an audience in advance of communicating to help anticipate the audiences's needs and interests.

2B-1. Audience Information Needs Assessment

Purpose:	To gather questions from relevant audiences in advance of public meetings so a response can be organized and presented.
Lead Time:	Moderate to high—requires a number of weeks to mail out inquiry, receive responses, and organize the information. Lead time may be decreased if telephone contacts are used instead of mailed inquiry.
Staff Time:	Moderate
Budget:	Low to moderate

Questions from an audience are gathered in advance of a public meeting so agency staff can develop a meaningful response. The agency response may involve both written and verbal answers to the questions. This approach, which helps agencies meet community needs, establishes a precedent of listening to the audience and responding to its concerns. However, it may require too much lead time for a crisis situation, and the answers generated in advance may still meet with disagreement and dissatisfaction from the audience.

2B-2. Analysis of News Clippings

Purpose:	To identify audiences and their concerns. To develop some historical knowledge of a community to help in planning future phases of a communication effort.
Lead Time:	Variable, depending on how far back in time the analysis goes.
Staff Time:	Variable, depending on the extensiveness of the review.
Budget:	Low

Background information about on-going issues is obtained by locating appropriate newspapers and clipping articles relevant to the issue in question. The clippings can be analyzed for a variety of factors, including perceptions of prior agency behavior, public concerns, principal actors, key events, and community mood. While a useful source of input and background information, news clippings may reflect media biases, journalistic sensationalizing, and the inaccuracies of the rush of daily reporting.

2B-3. Public Opinion Polling

Purpose:	To assess audience opinion or reaction; to find out what people see as important problems, what issues and events they are aware of, and how they evaluate social and political institutions.
Lead Time:	Moderate, depending on how formal a poll is required.
Staff Time:	Moderate
Budget:	Moderate to high—may involve contracting with a polling firm to obtain useful results. A low estimate for a very brief formal poll with a relatively small sample is about $2000. Informal telephone surveys may require fewer resources.

Polling can give agencies a sense of public attitudes and perceptions so the agency can better target its communications. Carefully constructed polls can help prevent surprises and provide a baseline for the later evaluation of the communication effort. Agencies may hire firms to design and conduct polls on specific issues. These polls benefit from careful development of the polling questionnaire and random sampling to increase the reliability of the data. They may also be quite expensive. Informal telephone surveys involve briefer questionnaires and smaller samples. Informal surveys may be more practical and less expensive, but also less reliable. Polls and surveys tend to consist of closed-ended questions that limit the richness of the data and can fail to convey the complexity of public perception.

2B-4. Public Opinion Polling/Pollstart

Purpose:	To organize and analyze polling data on personal computers available within agencies.
Lead Time:	Moderate to high, depending on extensiveness of the poll, expertise in polling design available, and knowledge of personal computers.
Staff Time:	Moderate—depends on previous expertise and skills.
Budget:	Moderate. Pollstart software costs $98.00; Public Opinion Polling, a book that guides use of the software, costs $19.95.

Pollstart is a piece of computer software which allows agency staff to tabulate and analyze polling data on a typical office personal computer. The manual for Pollstart provides step-by-step guidance on how to encode the data within computer files and how to generate "frequency reports" and "cross-tabulations." Public Opinion Polling provides useful background on polling and a useful outline of the steps in planning and developing a poll. The book was written as a companion volume for the software. While this system provides an excellent review of polling issues, it does not make the reader a survey design expert, and less experienced readers may still have difficulty designing appropriate surveys. The software is also not capable of doing more complex data analysis.

2B-5. Qualitative Questionnaires

Purpose:	To collect information from people whom agencies have involved in a communication effort.
Lead Time:	Low to high, depending on the complexity of the questionnaire and the time needed to develop it. May also require at least two weeks to receive responses to mailed questionnaires.
Staff Time:	Low to moderate—depends complexity of feedback to be tallied.
Budget:	Low to moderate

Questionnaires are developed, usually in-house, to assess audience positions on issues or responses to agency process. Because they may involve a small sample, the feedback may not be statistically accurate or generalizable. These questionnaires can still provide early input about specific directions an agency might take, or reasonably rapid assessment of audience reactions. Questionnaire development, distribution, and tallying can take considerable effort.

3. Message Pretesting

Agencies can obtain useful feedback on written materials by having them reviewed (pretested) in advance of production and distribution. This input can significantly improve materials so they are more easily understood and communicate the intended message more effectively. Message pretesting may involve surveys and questionnaires, discussion groups, and/or reviews of the language used in a document. Agencies can assess whether the document is too complicated for the intended audience, the amount of jargon, and other aspects of the writing style. We found the work of the National Cancer Institute (1984, 1989) to be of great value in exploring and assessing these techniques.

3A. Brief Approaches

These techniques give feedback in a short amount of time.

3A-1. Rightwriter

Purpose:	To review documents written on computer word-processing programs for errors in grammar, style, usage, and punctuation.
Lead Time:	Low
Staff Time:	Low
Budget:	Rightwriter software currently costs $95.00.

Rightwriter reviews documents on computer and creates a "mark-up" copy, including feedback on grammar, style, usage, and punctuation in the text, as well as a summary of the analysis. This summary includes a readability quotient, a strength index, a descriptive index, a jargon index, and a sentence structure analysis. The summary also includes a list of words which readers might find difficult to understand. The program is easy to use and quite rapid. While it can provide a useful feedback mechanism for written materials, Rightwriter does not "understand" the content of the text and can give no feedback about tone or appropriateness. In addition, some Rightwriter feedback may be confusing, difficult to understand, or irrelevant.

3A-2. SMOG Readability Grading Formula

Purpose:	To evaluate the level of reading comprehension a person must have to be able to understand a piece of written material.
Lead Time:	Low
Staff Time:	Low
Budget:	Low

This approach involves reviewing a sample of text from a written piece and performing some simple mathematical calculations to obtain a SMOG grade, which represents the reading grade level a person must have reached in order to understand the text. The higher the grade level, the more sophistication is necessary to understand the material. Assessment of readability, along with a knowledge of the target audience's level of sophistication, can allow agency staff to produce materials that will be more accessible to their audiences. Readability quotients are useful as a "first cut" in reviewing drafts of materials for the public, but they give no feedback on style, format, tone, or content. In addition, frequent use of long terms that may be necessary in scientific reports may inflate the SMOG grade.

3A-3. Signaled Stopping Technique

Purpose:	To examine how readers process information as they read written materials and through this procedure to get feedback on those materials.
Lead Time:	Low
Staff Time:	Low
Budget:	Low

In this approach, respondents read through a document and put slash marks where they stop. They are then provided with a coding scheme to notate why they stopped at each slash. These reasons for stopping provide feedback to the writer. Respondents may stop due to being confused, needing to re-read, having a question, wanting to think about the idea, or agreeing or disagreeing with the writer. This technique can help writers recognize confusing or controversial statements within a piece of text and consider revisions, but its value may be diminished if the reader is unmotivated or uninterested.

3B. More Extensive Feedback Methods

These methods give richer feedback but also take more time to administer.

3B-1. Self-administered Pretest Questionnaires

Purpose:	To get feedback on pretest materials.
Lead Time:	Moderate—allow at least two weeks if questionnaire is mailed.
Staff Time:	Moderate
Budget:	Low to moderate

Questionnaires about written material are developed to elicit both quantitative and qualitative feedback from readers representative of the intended audience. The questionnaire may include questions about format, comprehension, reaction, interest in the materials, and any other relevant opinions. Questionnaires may include open-ended or closed-ended questions, depending on the items being pretested and type of feedback desired. The approach may be limited by low response rates to mailed questionnaires and the amount of follow-up time needed to insure a meaningful response.

3B-2. Central Location Intercept Interviews

Purpose:	To get feedback on pretest materials or to examine an audience's attitudes and opinions.
Lead Time:	Moderate
Staff Time:	Moderate to high
Budget:	Low to moderate

Interviewers are stationed at a place frequented by a target audience. They recruit participants who review materials and then respond to a series of multiple-choice or closed-ended questions. The structured interviews provide feedback that can be summarized quantitatively. Careful planning when using this approach can increase the reliability and generalizability of the data, but central location interviews typically reflect a non- random sample weighted in favor of those who are able to get to the particular site. In addition, the necessity of using closed- ended questions may deprive the agency of richer feedback from a more extended discussion.

3B-3. Theater Testing

Purpose:	To get feedback on visually presented pretest materials.
Lead Time:	Moderate
Staff Time:	Moderate
Budget:	Moderate to high

Films, public-service announcements, slide shows, or other audio-visual materials are observed by a group of respondents in a theater or auditorium. After watching the film, participants fill out a pretest questionnaire to provide the agency with feedback. While very useful to improve visually presented messages, this approach may require a great deal of time and logistical arrangements, in addition to design of the message itself and the questionnaire.

3B-4. Focus Groups

Purpose:	To get feedback on and generate ideas about pretest items. To get a "feel" for the attitudes and beliefs of a target audience.
Lead Time:	Moderate to high
Staff Time:	Moderate
Budget:	Moderate to high

A focus group is a discussion session run by a trained moderator. It may include six to twelve participants, who discuss pretest materials or issues of importance to a communication effort. Areas covered in a focus group discussion are outlined in the moderator's guide, which is developed before the session. Focus group discussions generally yield qualitative feedback as summarized in a report by the moderator. These reports can give an in-depth sense of participants' language, their reactions to the materials, and suggestions for improvement. Formal focus groups require careful planning and moderation and may therefore be too resource-intensive for the average agency. "Target audience meetings," involving brief informal discussions with a neutral moderator, a group typical of the target audience, an agenda planned in advance, and some procedure for note-taking, can be useful and less expensive.

4. Assessment of Communicator Style

Although agency staff may traditionally focus on "facts" as opposed to relationships, conflict in styles can lead to tremendous frustration as well as impasses in a given communication. Armed with the facts alone, practitioners may be doomed to skirmish with audiences whose very style of perceiving the world and communicating about it differs from theirs. Tools in this category can help communicators examine what they bring to the communication process. Most of these tools are self-assessment surveys that are completed and then scored, providing a profile of the respondent's style, type, and/or motivational pattern. This profile provides a model for understanding communication situations, which in turn can help practitioners gain flexibility within their own style, recognize their strengths and limitations, identify the communication styles of people in their audiences, and recognize and deal with communication impasses resulting from a clash in styles.

4-1. Myers-Briggs Type Indicator

Purpose:	To provide feedback on the communication styles of agency staff.
Lead Time:	Moderate to lengthy, due to time needed to secure services of consultant.
Staff Time:	Low
Budget:	Moderate

The Myers-Briggs Type Indicator (MBTI) is a self-report inventory consisting of 126 questions. It provides feedback on respondents' communication styles in terms of four scales: Extraversion-Introversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving. The profiles generated in terms of these four scales include feedback about communication strengths and weaknesses. Communicators can become aware of their own strengths and weaknesses while learning to recognize differing communication styles in their audiences. The MBTI model has been used in consultation with risk communicators and has helped foster flexibility in communication style. However, the psychological theory of type underlying the tool may not fully capture the diversity of personality styles, and the feedback from this tool is of limited value without a consultation to set it in context.

4-2. Strength Deployment Inventory

Purpose:	To identify the strengths of agency staff and suggest ways these strengths can be used to communicate more productively with others.
Lead Time:	Moderate to lengthy, due to time needed to secure services of contractor.
Staff Time:	Low
Budget:	Moderate. Each Inventory form costs $3.45; consultation is additional.

The Strength Deployment Inventory (SDI) consists of twenty questions, some of which refer to situations where things are going well, and some of which refer to situations where things are going wrong. The SDI is self-scoring, and respondents identify whether they are characterized by any of seven style patterns, each of which implies different strengths, weaknesses, and motivations which may be reflected in interpersonal communication. The inventory is easy to complete and provides quick feedback about an individual's style. The SDI model is one way of understanding differences in personal styles and their impact on communication. A consultation should accompany the tool for maximum benefit.

4-3. Conflict Management Survey

Purpose:	To provide feedback about a respondent's approach to conflict.
Lead Time:	Moderate to lengthy, due to time needed to secure services of consultant.
Staff Time:	Low
Budget:	Moderate. Each survey form costs $5.60 and consultation is additional.

The Conflict Management Survey presents scenarios in each of the following areas: personal views of conflict, interpersonal conflicts, the handling of conflict in task groups, and conflict in relationships among groups. Respondents note how they would respond to each conflict scenario, and after a self-scoring exercise, a style preference is determined, which represents the respondent's preferred mode of managing conflict. Through consultation, respondents become able to understand the implications of their style preference and develop the flexibility to use other styles if situations dictate this. Feedback from this tool may seem threatening if not accompanied by a good consultation.

4-4. Communication Style Survey

Purpose:	To provide feedback on the respondent's style of interpersonal communication.
Lead Time:	Moderate to lengthy—surveys need to be mailed to Chicago for scoring, and a consultation should be arranged.
Staff Time:	Low
Budget:	Moderate—standard fee of $140 per person which is negotiable

The Communication Style Survey consists of a self-assessment form and "other-assessment" forms to be filled out by people who know the respondent well. The survey involves choosing among a set of words the term that most aptly describes the respondent. The data are processed to yield an assessment of communication style as some combination of Analyzing, Facilitating, Advocating, and Controlling. This Style Profile is accompanied by feedback on the respondent's oral communication competency and adaptability. Consultation is needed to help respondents understand the strengths and weaknesses of each communication style and develop flexibility.

5. Outcome Assessment

Agencies typically view evaluation as a means of finding out whether what they did worked or not. As suggested earlier, carefully designed scientific evaluation research is required to draw these kinds of conclusions. When agencies have little time and few resources, however, they may still need to find out how audiences have reacted to phases of the communication effort and to the effort as a whole. The outcome tools we recommend provide strategies for getting feedback on audience reaction and communicator performance.

5A. Audience Reaction

Audiences are asked what their reaction is to a presentation.

5A-1. Meeting Reaction Form

Purpose:	To get feedback about participants' reactions to a public meeting.
Lead Time:	Low to moderate, depending on whether the form developed by the Environmental Communication Research Program needs modification for specific agency use.
Staff Time:	Moderate—includes preparation of form, distribution, and data analysis.
Budget:	Low

The Environmental Communication Research Program has developed a form for distribution at public meetings which examines whether information was understood, whether presenters were perceived as honest, whether people felt their concerns and issues were understood, whether people felt their input would be used in decision-making, etc. Other relevant issues can also be addressed. The particular form described in this catalogue was designed to get feedback from various constituencies involved in a public participation program run by the Bureau of Water Quality Standards and Analysis (BWQSA) of the New Jersey Department of Environmental Protection. While it provides a quick, easy, and inexpensive way to get feedback about a public meeting, the form is not standardized or scientifically validated and some feedback could be difficult to interpret.

5A-2. Verbal Meeting Feedback

Purpose:	To get direct feedback from participants at a meeting.
Lead Time:	Low
Staff Time:	Low
Budget:	Low

Time for a structured feedback discussion is planned in a meeting agenda. The meeting chairperson actively solicits and may even record this feedback on a chart for everyone to see. Participants should feel free to comment on any aspect of the meeting, and conflicting statements are allowed. The goal is to generate as many idea as possible rather than going into detail on any one idea. This approach is highly dependent on the skill of the chairperson in creating a comfortable environment for feedback and inviting participation. Less verbal members may not be heard, and it is difficult to know whether this kind of feedback is in any way representative of the views of the group as a whole.

5B. Performance of Presentation

These techniques provide feedback more specific to how the communicator performs than how the audience reacts.

5B-1. Speech Evaluation Checklist

Purpose:	To get feedback on how a speech or presentation went.
Lead Time:	Low to moderate—depending on design of form.
Staff Time:	Low
Budget:	Low

The Speech Evaluation Checklist is a simple form to get feedback on a speech or presentation. It may include statements about the physical setting of the speech, the speaker's appearance, rapport, comprehensibility, and other important areas. The forms can be completed by one or a number of evaluators who observe the speech. Alternatively, a speech can be audio- or video-taped for use for scoring by the presenter. The form is not intended as a "report card," but as a chance to get some input on a speech that will improve future presentations. This approach can provide immediate, relevant written feedback, but the perceptions of other agency staff may differ markedly from the perceptions of the audience.

5B-2. Observation and Debriefing

Purpose:	To get feedback on speeches and presentations.
Lead Time:	Low to moderate—time needed to develop an observer checklist.
Staff Time:	Low
Budget:	Low

One or a number of observers attend a presentation and take organized notes, using their perceptions of the event and some kind of observer checklist based on the goals of the presentation. An informal verbal debriefing session may be held after the presentation to review important strengths and weaknesses with regard to both the speaker's performance and the audience's reactions. The presenter can also use an audiotaped or videotaped version for self-assessment. While this is a quick and easy way to provide feedback on a speech, it should not substitute for finding out the audience's actual reactions, and it can be uncomfortable for the observers or the presenter depending on their roles within the agency.

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