4.4 Concepts and guidelines for risk communication
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Introduction

Social conflict resolution about technologies or other human activities involving risk requires the use of factual evidence for assessing the validity and fairness of each groups's claim and to assure political acceptability of the proposed action. For this purpose, risk analysis is a convenient method to provide evidence about the relative safety or danger of a proposed measure and thus plays an integrative role in two different ways. First, the results of such analyses allow comparisons with other risk situations and therefore provide an indirect measure of the relative disadvantage for the group of risk bearers. Second, the quantification of the results enables the conflicting groups to define different degrees of safety and develop compromises along the spectrum of potential risk reductions instead of being trapped in a deterministic 'yes or no' decision that renders one group winner and another loser. Both major tasks of risk assessments in facilitating conflict resolution rest upon the capability of the involved parties to communicate their risk assessments or risk perceptions to one another (Covello, Slovic, von Winterfeldt 1986, pp. 175/176; Davies 1987, p. 104; see also the critical remarks in Zimmermann 1987, p. 132).

One of the most outstanding German sociologist, Niklas Luhmann, claimed in his recent book on ecological communication that the debate about risk will not only affect future policies about technologies and hazard management, but may influence the path of societal evolution, determine the self-image of modern societies, and transcend the traditional structures of our legal and economic system (Luhmann 1986, p. 134). This view may be overstated, but reflects the eminent position of risk communication as a powerful agent to shape future policies on hazard management and technological choices. The capability of societal institutions to tame powerful natural sources for economic purposes and reduce the concomitant risks of potential side effects to human health and environment depends largely on communication among institutions and social actors in society and the formation of specialized risk or danger cultures (Beck 1988; Rip 1985).

As a consequence of this prominence, interest of public institutions and academia in risk communication has considerably grown during the last five years. Accordingly, risk communication has become a popular topic in the literature. Although originally conceptualized as a follow-up of risk perception studies, the work on risk communication has surpassed the limited boundaries of giving public relation advice for information programs on risk, but extended its focus on the flow of information between subsystems of

society (Jasanoff 1987, p. 116; Zimmermann 1987, p. 131; Kasperson 1986, p. 275).

Definition of risk communication

For this paper, I decided to adopt the definition of risk communication suggested by Covello, von Winterfeldt, and Slovic (1986, p. 172): "*Risk communication is defined as any purposeful exchange of information about health or environmental risks between interested parties. More specifically, risk communication is the act of conveying or transmitting information between parties about (a) levels of health or environmental risks; (b) the significance or meaning of health or environmental risks; or (c) decisions, actions, or policies aimed at managing or controlling health or environmental risks. Interested parties include government agencies, corporations and industry groups, unions, the media, scientists, professional organizations, public interest groups, and individual citizens*".

Two aspects of this definition require further explanation: First, is it necessary to limit risk communication to purposeful communication; and second, should the risk concept be confined to probabilistic consequences for human health and the natural environment?

All social communication is usually defined as a purposeful exchange of information between actors in society based on shared meanings of the transferred messages (DeFleur, Ball-Rokeach 1982, p. 133). A purpose is required to distinguish the sending of a message from noise in the communication channel. The intentions of the sender may or may not be part of the message, hidden agendas may obscure the stated goal in the message, and the intended meaning may not be understood; but actors in social communication send out information as a means to obtain a specific personal or institutional goal. The term "message" implies that the informer intends to expose the target audience to a system of meaningful signals, which in turn may change the perception of the issue or the sender.

The second question of whether to define risk in a broad or narrow sense is purely a matter of personal discretion or professional convention. I prefer the narrow definition for three reasons:

1. There is a broad agreement among risk analysts to confine risk consequences to adverse effects on health and environmental quality (National Research Council 1981; 1982; Rowe 1977; Renn 1985).

2. The broader the risk concept is defined the more difficult it is to draw a formal distinction between risk analysis and other impact assessments,

such as technology assessment, social impact analysis, future studies, and others.

3. Because the structure of social systems and their interactions with the physical environment are characterized by a degree of complexity and dynamics that any scientific model is never capable of reproducing or simulating, simplification is essential and a limitation in range seems more appropriate than one in depth. A confinement to health hazards and environmental quality promises more valid results than expanding the range of impacts to all imaginable probabilistic consequences.

The limitation to health and environment does not exclude the study of secondary social and political effects (based upon the communication on health and environmental risks), and of the circumstances, qualitative characteristics, and social arenas of risk communication. The same understanding of risk communication is also expressed by Fiskel and Covello in their listing of elements of risk communication (Fiskel, Covello 1987, p. 90).

Objectives of risk communication

Since risk communication was defined as an intentional information transfer, we have to specify what kind of intentions and goals are associated with most risk communication efforts. The literature offers different sets of objectives for risk communication, usually centered on a risk management agency as the communicator and groups of the public as target audiences (Covello, von Winterfeldt, Slovic 1986, p. 172; Kasperson, Palmlund 1987, p. 4; Zimmermann 1987, pp. 131-132). Some controversy exists as to the general purpose of risk communication: Should it aim at changing behavioral responses or should it be confined to the exchange of information about pending dangers and potential remedies? (Wilkins, Patterson 1987, p. 80).

Most authors are clearly in favor of the former proposition (Covello, von Winterfeldt, Slovic 1986, p. 172; Sandman et al. 1987, p. 95; Lee 1986, p. 151). Hence, the list of legitimate objectives, so the common accord, should include intended behavioral changes of individuals as well as intended changes in social group responses. Accepting this premise, risk communication can serve many purposes. The most frequently mentioned objectives for risk communication are listed in Table 1.
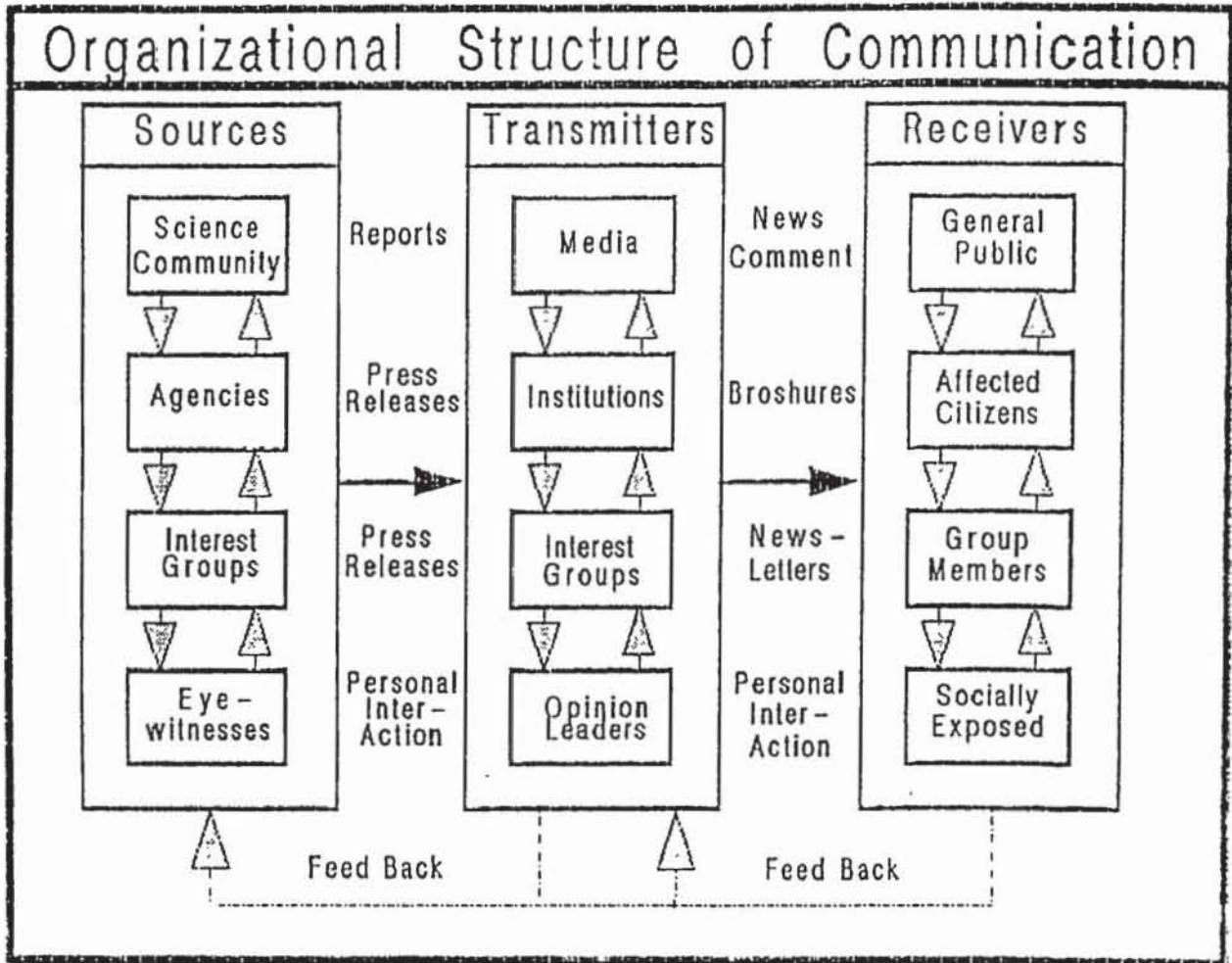
Table 1: Objectives of Risk Communication

FUNCTION	DESCRIPTION
enlightenment function	to improve risk understand among target audiences
right-to-know function	to disclose information about hazards and potential dangers
attitude change function	to legitimize risk related decisions and improve the acceptance of a specific risk source or to challenge those decisions and increase the non-acceptance
legitimation function	to explain and justify risk management approaches and enhance credibility
behavioral change function	to encourage adequate protective actions by individuals
risk reduction function	to enhance public protection by giving information about potential risk reduction measures
emergency preparedness function	to provide guidelines for emergencies or messages during emergencies
public involvement function	to educate decision makers about public concerns and perceptions
participation function	to assist in reconciling conflicts about risk-related controversies

The sender-message-receiver model

The best conceptual framework to study and analyze risk communication is the traditional communication model of information transfer between sources, transmitters and final receivers. Although the model was basically developed in the late 1940s (Shannon, Weaver 1949; Lasswell 1948), it is still the most popular framework for communication studies up to date. In a recent review of 31 communication textbooks, P.J. Schoemaker (1987, p. 120) concluded that nearly half of the books used the Shannon and Weaver model. The second, most popular approach was the transactional view which emphasizes the creation of shared meaning among senders and receivers. Both approaches can obviously be combined.

Figure 1

Organizational Structure of Communication

Sources		Transmitters		Receivers
Science Community	Reports	Media	News Comment	General Public
Agencies	Press Releases	Institutions	Broshures	Affected Citizens
Interest Groups	Press Releases	Interest Groups	News-Letters	Group Members
Eye-witnesses	Personal Inter-Action	Opinion Leaders	Personal Inter-Action	Socially Exposed

Feed Back — Feed Back

Ǫganizational Structure of Communication: In risk communication one can identify the major actors in each step of the communication process. Primary sources ars usually related to scientific communities or agencies; secondary sources are political institutions and interest groups. Both organizational types of sources may compete with eyewitnesses of harzardous events. The tranmitters are dominated by the mass media, but also groups in society act frequently als information brokers. The receivers of information are substructured in the general public, usually the target of mass media, affected citizens, members of social groups, and socially exposed individuals. The effect of the message depends on the targeted audience and its special amplification mechanisms in recieving and processing information.

Figure 1 shows the major actors of risk communication as part of the classical communication model. Sources for risk-related information are basically scientists or scientific institutions, public agencies, such as EPA or FDA, interest groups such as industries or environmentalists, and in the case of hazardous events (physical changes caused by hazardous activities) eyewitnesses. Theses primary sources code information in form of reports, press releases, or personal interviews and send them to transmitters or occasionally directly to the final receivers. (Renn, Kasperson in press).

The second step of communication is the coding and re-coding procedure at the transmitting stations. The media, other public institutions, interest groups, and opinion leaders are potential transmitters for risk-related information. A press release from EPA may stimulate industry to hold a press conference or to write an open letter to the agency. Interaction among social groups, in particular among adversaries, often takes place through the media and not through direct communication. The goal is to mobilize public support and to initiate public pressure (Peters 1986, pp. 3-4).

The communication process among sources or between sources and different transmitters is like staging a play with the general public as audience or sometimes as referees. The more applause each group of actors receives, the more they will be inclined to ask the producer for more resources, usually on the expenses of others. If for example the environmentalists gained enough social support for their messages, they would exert pressure on the administration or political institutions to meet their claims. These claims may contain a transfer of money from industry to pollution control. Thus industry will be equally eager to influence public opinion in order to prevent this transfer of resources. Gaining public support and influencing public opinion may not be the only factor by which resources are distributed among groups for different purposes, but in democratic, in particular adversarially structured, societies it is one of the most influential ones. Thus, communication between the key actors is likely to occur in front of the public because this increases the chance (but also the risk) of gaining (or losing) additional momentum through public support.

The last step is the processing of the re-coded messages at the receiver. Again, it is helpful to distinguish between different types of receivers. The media usually serve the general public, but many journals are targeted to specific audiences within the general public. Specialized journals are either appealing to professional standards (science communities, business circles, risk assessors), avocational activities (culture, sports, travelling etc.), or value groups (environmentalists, religious groups, political camps etc.). The infor-

mation will be framed for each audience in a different manner to assure their attention and to please their expectations.

The sources of messages

The first stage of communication is the framing of a message by an information source. As Peters has pointed out, topics can only be brought and sustained on the public agenda if the mass media report about the topic and a social institution or group adopts the topic as part of its own agenda (Peters 1986, p. 9).

Indoor radon is a good example of this mechanism. In spite of good relationships with the national press, Joel Nobel, a physician of Philadelphia, who detected a concentration of 55 pCi/l (nearly 14 times the benchmark of 4 pCi/l often regarded as "safe" level) in his private home in 1981, was unable to gain more than cursory attention of public institutions and the press because he could not interest an agency or social group to share his concern (Mazur 1987, p. 89). Not before the State of Pennsylvania, alarmed by another even more dramatic case in 1985, acknowledged the problem and initiated a state-wide survey program, did the national press cover the topic in length and triggered more attention of federal agencies, such as EPA (Mazur 1987, p. 90; Fisher 1987, p. 27-28).

In addition to the social support a message receives, the components of the message themselves play a vital role for the effectiveness of the communication effort. For example, communication studies have revealed that symbols present in messages are key factors in triggering attention of potential receivers and in shaping the decoding process (Hovland, 1948, pp. 371; Kasperson et al. 1988). If for example the information source is described as a group of Nobel laureates, the content of the message may well command public attention. Messages from such sources may successfully pass through the selection filters of the transmitters and receivers and be viewed as credible. A press release by the nuclear industry, by contrast, may command much less credibility unless other aspects of the message compensate for doubts about the impartiality of the source.

Sources or transmitters can amplify the different components of the message by taking advantage of the symbolic connotations. Assume an industrial spokesperson provides the information that a specific chemical substance has been leaking from a waste repository for two years. One journalist may comment this incident by using phrases such as "leak in waste disposal of a high-tech-park" or "state of the art technology for monitoring emissions", while another journalist may describe the same incident by using phrases

such as "air pollution by toxic waste dump" and "poisoning the air we breath and the water we drink".

The primary sources of risk communication

Nature and technology are both sources for hazardous events, such as earthquakes, fires, explosions, pollution or radiation. Scientific analysis attempts to determine the physical impact of such events or to hypothesize about the magnitude and the probability of potential impacts for extremely rare events for which statistical data is not (yet) available. Observation and analysis of actual events and simulation of potential events lead to an estimate of the magnitude of the impacts, the probability of their occurrence, and the distribution of these impacts over time, space and population subgroups. These estimates can only be coded in form of signals, i.e. in scientific reports or studies. Figure 2 is an attempt to illustrate this process using the major stations of the communication model (Renn, Kasperson, in press).

The selection of what types of signals are collected from the physical event or the hypothetical simulation of this event involves individual or group judgments about relative importance. To restrict one's attention to probabilities and magnitude reflects the strategy of abstracting typical and universal characteristics from a unique event as a means for comparing this event with other similar events or designing measures for reducing the risk of future similar events. Scientific risk assessment are hence motivated by the purpose to provide information about the relative potential of hazardous events to produce adverse effects based on past experience. Events, such as earthquakes or chemical spills, are scanned for signals that are valuable to construct probability distributions of adverse effects. Other signals about human sufferings, responsibility for the disaster, inequities in the experience of risk, and political implications are deliberately excluded from the signal collection process.

A second pathway of conflictual or parallel signal selection and transformation is the experiences of eyewitnesses or affected persons. These individuals produce anecdotal evidence of the hazardous event which is coded in communication signals and conveyed to other individuals or transmitters. Anecdotal evidence competes with the systematic and abstract evidence provided by physical phenomena, whereas the information about them are reflections of different social groups (scientists and eyewitnesses, for example) that are governed by personal impressions (eyewitnesses) or professional conventions (equal weight for probability and magnitude in risk equations, for example).

Figure 2:

INFORMATION FLOW MODEL FOR RISK COMMUNICATION

Information Flow Model for Risk communication: Primary sources for risk communication are scientific communities and in the case of hazardous events eyewitnesses. Through observational analysis of actual impacts of past hazardous events or through simulation of such impacts for potential hazardous events, scientists select a special set of signals, amplify them and code them into communicative signals. Eyewitnesses are also selecting signals, but operate under a different selection rule. While scientists focus on the typical and general aspects of a hazardous event, eyewitnesses focus on the uniqueness of the situation and the concrete sufferings experienced in a tragedy. Secondary sources, such as agencies or social interest groups function as a second amplification station by selecting and intensifying those signals that shed positive light on their own performance or help them to find public support and to gain social resources. At this stage the selection process has inevitably produced controversial messages which will be picked up together with the eyewitnesses' reports by professional transmitters who will make the controvercy itself to the main subject of their message. Thus the receiver will be confronted with information emphazising conflict, dissent, interest driven interpretations, and controversy.

Primary sources therefore collect and select signals from the physical world, re-code them into verbal signals and assign them different degrees of significance and often symbolic value. Special properties of the risk situation may cause specific attention, while others may easily be overlooked. Scientific conventions focus on specific aspects of risk. They help to identify the typical elements of all covered risk situations, but may obscure the uniqueness of the specific event or hazard under consideration. Likewise, anecdotal evidence seems to center on the uniqueness of the situation and the specific circumstances of the event and to neglect the typical patterns that characterize risk in general. One major problem of risk communication is therefore the integration of scientific and anecdotal evidence, a problem which is aggravated by the stochastic nature of risk.

The secondary sources of risk communication

Secondary sources are either scientific institutions, management agencies, or interest groups (Renn 1988). They pick up the information, which is frequently collected by in-house members or at least sponsored by the institution. Scientific investigations focusing on dose-effect relationships and probabilities of adverse events will be the prime material for the formulation of the risk message. Eyewitness reports may also be included, but will probably get less attention as institutions want to concentrate on the general message of the respective incident just like the scientific community.

The main objectives of the concerned institutions are to forecast, analyze or manage the hazard. They want therefore to draw generally applicable conclusions from the events or studies. This is also likely to be the subject of their risk communication. Often, however, are transmitters and the public more interested in the specific circumstances of the one incident reported or the consequences of a single hazard event. The intention of the source to communicate the common lessons and to put the risk in perspective conflicts with the interest of the receiver to learn more about the incidence and the real or potential victims.

Furthermore, each source will likely collect and pass on information that relates to the designated service of the institution and that also provides good arguments to legitimize its existence and performance as well as its share of social resources (money, prestige, and power). A variety of secondary sources with different interests and purposes compete for these resources. Thus they will differ in the selection and processing of signals stemming from primary sources. This difference in interpretation may be aggravated by different competing risk assessments which reflect adversarial science camps or

result from scientific advocacies within interest groups. But even if all these sources relied on the same primary sources or cited the same evidence, the messages would still look like they were drawn from completely unrelated data bases.

Industry, regulators, scientists and environmental watchdogs focus on different aspects of the problem, amplify signals that each of them regards as confirmation of their basic philosophy, and that emphasize their role and function in the assessment and management of the respective risk. Although not necessarily so, the difference in messages is usually not a product of misinformation, manipulation or even lying. Every communicator has a different perspective in perceiving and evaluating the issue and is interested in conveying that perspective to the outside world. Fragmentation of information is therefore an inevitable side effect of plural interest articulation. The process of signal reception and re-coding in this stage is less related to the properties of the hazard, although this information may be packaged within the message, but rather to the efforts of the institution to assess, analyze or manage the respective risk.

The receiver of risk information

The reception process of communications differs between individuals in their role as private citizens and in their role as employees or members of social groups and public institutions. Therefore it is essential do deal with both reception modes separately. With respect to the individual receiver as private citizen, one may analytically divide the reception process in seven steps (in reality those steps are integrated). The seven steps are described in Table 2.

The seven step process of receiving signals and transforming them into beliefs is an analytical model of the cognitive procedure by which individuals articulate an opinion and gradually form an enduring attitude. The decoding and evaluation process determines the selection of information that the receiver regards as significant. The components of the decoded message that are inconsistent with previous beliefs or contradict values to which the receiver feels attracted, are ignored or attenuated. The signals are intensified if the opposite is true.

The formation and articulation of attitudes generate a propensity to take actions. As known from many attitude studies, the willingness to take actions is only partly related to overt behavior (Allport 1935; Rokeach 1978; Fishbein, Ajizen 1981; Wicker 1979). A positive or negative attitude is a necessary, but not sufficient step for corresponding behavior. A person's decision to take action depends on many variables other than attitude, such as behavioral norms, values, and situational variables. Hence, the communication process will influence the receiver's behavior, but due to the multitude of sources, the plurality of transmitters and the presence of situational forces on personal behavior, the effect of a single communication activity is almost impossible to measure, not to mention to predict.

In principle, the same process takes place in individuals in their roles as members or employees of social groups or institutions. But the decoding process of signals is co-determined by the following factors:

1) professional standards and rules (characteristic for scientific communities, interest groups, media editors, political institutions, etc.);

2) institutional interest, functions, and foci;

3) rules and role expectations pertaining to the specific position of the receiver;

4) interpretation of those role expectations by the holder of the position.

The role-specific reception factors are internalized and reinforced through education and training, identification with the goals and functions of the respective institution, belief in the importance and justification of the produced output, and positive rewards (promotion, salary increase, symbolic honors) and negative punishments (downgrading, salary cuts, disgracing). Occasionally, conflicts between personal convictions and institutional obligations evoke psychological stress which may further lead to segregation from the institution.

Role and functions of the transmitters in communication

The transmitter has two roles in the communication process: first, transmitters receive information from sources and process this information similar to the final receiver. But in addition to personal selection filters and evaluation strategies, professional and institutional rules govern the selection of received signals and their interpretation. Journalists, for example, follow specific professional guidelines such as hearing both sides in a controversy, as well as

Table 2: The seven steps of individual reception of information

STEPS	DESCRIPTION
passing of attention filters	to select and further process signals from the environment or social actors
decoding of signals	to decipher the meaning of the signals (investigating factual content, sources of information, explicit or implicit inferences, value statements, overt and hidden intentions of information sources and transmitters, and cues to assign credibility of information and information source)
drawing one's own conclusions	to come to conclusions about the allegedly inferences, revealed intentions of the source and the transmitter, to employ intuitive heuristics (common sense reasoning) for generalizing the information received and to use symbolic cues for judging the seriousness of the information
comparing the decoded message	to analyze the meaning of the message with other messages in the light of related messages from other message sources or previous experience
evaluating messages	to rate the importance, persuasiveness and potential for personal involvement on the basis of the perceived accuracy of the message, the potential effect on one's personal life, the perceived consistency with existing beliefs (to avoid cognitive dissonance), reference group judgments (to avoid social alienation), and personal value commitments
forming specific beliefs	to generate or change beliefs about the subject of the message or to reassure previously held beliefs
propensity to take	to generate intentions for future actions that corresponding actions are in accordance with the newly formed beliefs.

institutional rules such as the required editorial style and the expectations of the perceived target audience of the respective medium.

Second, the transmitter acts as an information source by sending signals to the final receiver. The re-coding of messages involves conscious or unconscious changes of the original information material. Messages from several sources may be integrated into one new message or comments may be added. Obviously, both processes take place simultaneously, i.e. understanding and re-coding the incoming message is an integral part of the transmitting process.

The transformation process of messages during transmission has been a popular topic of communication research. From a theoretical point of view, many different concepts about the nature of this transformation have been suggested in the literature (Sood et al. 1987, p. 30; Peters 1984; Shoemaker 1987, p. 125; Peltu 1985, pp 129-130; Peltu 1989; Lee 1986, p. 175). The basic differences between these approaches may be confined to two major dimensions: First, are the media creating new messages or are they reflecting existing messages and second, how biased are news-media in their coverage visa-vis culturally internalized values and socially externalized pressures? Both questions have not found a final answer yet (Peltu 1985, pp. 140-141; Mazur 1987, p. 86; Lichtenberg, MacLean 1989, pp. 33-48).

With respect to the first question, the literature suggested a strong influence of the media on public opinion in the early years of communication research. Through extensive testing, however, this hypothesis was later substituted by the hypothesis that the media set the agenda, but do not change the attitudes or the values of the audience with respect to the issues on the agenda (Peltu 1985, p. 140; Lichtenberg, MacLean 1989). Only in long term have media a lasting effect on the attitude and value structure of their consumers.

With respect to the second question evidence has been gathered to support almost all possible viewpoints. Political and commercial pressures have been detected in media coverage as well as courageous news reports in conflict with all vested interests. Cultural biases within the journalistic community have been found, but also a variety of different political and social attitudes among journalists. Some journalists perceive their job as a mere translation of events into signals while other believe they should play a more active role in shaping and explaining the issue (cf. the controversy about the studies of Kepplinger in the review by Lichtenberg, MacLean 1989, pp. 37-45).

In short: the extremes that media are mere reflectors of reality or that they are docile instruments of social pressure groups may occasionally be true, but are not the rule. In reality, the situation is more complex: Media coverage is

neither dependent on external pressures nor an autonomous subsystem within society (Lowry and DeFleur 83; Raymond 85). It reflects internalized individual values, organizational rules and external expectations. It depends on the issue itself, the institutional context and the political salience of the issue which of the three factors is likely to dominate the signal transformation process. A universal theory of how this transformation takes place is therefore not likely to evolve (Peters 1980, p. 13).

In essence, all transmitters convert the original message into a new message according to institutional rules, professional standards, role requirements, anticipated receivers' interests, and personal preferences. The final product is a mix of original and re-coded message, thus leaving it to the final receivers to distinguish between the signals of the source and the additions or deletions undertaken by the various transmitters when making inferences about the underlying intentions of each signal processing station.

The transmitters of risk-related information

Is there any evidence about specific media treatment of risk-related information? The media collect information from direct eyewitnesses of hazard events (anecdotal evidence), they have usually access to the primary scientific reports (scientific evidence), but may prefer to use its popular derivations (such as articles in popular science journals), and they will be bombarded with press releases and other information from managing institutions or socially relevant groups. This abundance of material has to be collected, selected, digested, and finally re-coded.

The diversity of different perspectives on the nature of the risk and its best management approach will be one of the major issues carried on by the transmitter, in particular those serving the general public. The widely accepted rule of fairness in news coverage demands equal treatment for all points of views. While conflict resolution rests on "true" evidence in science communities, and on the majority vote in democratic decision making, conflicts are usually not reconciled in the media; rather the different sides are merely presented regardless how much scientific evidence they are able to present and how many adherents they are able to document. Transmitters in a pluralistic society tend to reinforce diversity, dissent and relativity of values (Rubin 1987, p. 53). Even specialized journals tend to focus on controversies as long as they fit into their general philosophy. Thus dissent and ambiguity are inevitable and irreversible parts of risk information in addition to the uncertainty of the consequences.

The nature and the magnitude of the original hazard is not the major point of interest for most transmitters, rather the way institutions handle risks and communicate about their activities. Empirical studies demonstrate that neither the number of victims in an event nor the expected fatalities as a result of risk studies are correlated with the volume and intensity of media coverage (Singer, Endremy 1987, p. 14; Wilkins, Patterson 1987, p. 84; Adams 1986, p. 113; Sood et al. 1987, pp. 36-37).

As Singer and Endremy point out, the media emphasize hazards that are relatively serious and relatively rare; it is the combination that gives them their punch (Singer, Endremy 1987, p. 13). For example, the Chernobyl accident with 31 acute deaths cases received 129 minutes of CBS News coverage while the 1976 Tandshan earthquake leaving 800.000 people dead received less than 9 minutes on the average TV evening news (Sood et al. 1987, p. 37).

The literature contains endless lists of factors that are assumed to determine the attractiveness of risk-related signals for transmitters. Such factors include: technologically induced hazard (versus natural hazard), possibility to blame someone for the outcome (Sandmann et al. 1987, p. 195), cultural distance from the place of occurrence (Adams 1986), human interest component, drama and conflict, exclusiveness of coverage (Peltu 1985, pp. 137-138), proximity to politically hot issues, prestige of information source, and degree of conflict among stakeholders (Peters 1984).

Reviewing the abundance of theoretical suggestions and partially confirmed empirical results, one may come to the conclusions that the information processing in the media is almost random or at least void of any systematic pattern. But some insights have been gained as a result of the media studies undertaken so far. The major components of risk studies, probabilities and magnitudes, seem to play only a minor role in the media coverage; they are hence attenuated. Intensified, however, are signals relating to conflicts among social groups, contradictions between primary and secondary sources of information, risk events that could have been prevented or mitigated, and the involvement of individuals or organizations with high prestige and political influence.

Specific Guidelines for Risk Communication

On the basis of risk perception and risk communication studies, several authors have developed guidelines for designing and evaluating risk communication (Kasperson, Palmlund 1987; Covello et al. 1986; Zimmermann 1987; Renn 1988; Kasperson, Kasperson, in press). These guidelines are not all substantiated by empirical research, but rely partly on common sense and

personal experience. They provide, however, useful criteria to develop an effective and consistent information and communication program. The following guidelines were adopted and re-edited for this paper from a book chapter of the author written in 1988:

1. Be clear about your intentions and make them the central message of your communication effort.

As obvious as this may sound, many risk information attempts are clear violations of this principle. Many agencies are forced to react before they have made up their mind about an issue. Sometimes different departments voice different opinions and the text of the information constitutes a poor compromise between the diverse viewpoints. If a fast reaction is required, the message of the first response may be that there is still too much uncertainty about risk to produce sound judgments and that the institution needs more time to assess the data. Although this message may not be very attractive, it still is better than pretending to have a degree of certainty which is unjustified and may need correction later. Clarity and unequivocality are two major conditions to pass the attention filter of the respected audience.

2. Simplify your message as drastically as you think you can do without being inaccurate.

Messages will be simplified regardless how well written the text may be. Rather than have the transmitters and final receivers simplify the text their way, the sender may perform a more accurate simplification which is also in accordance with his/her original intentions. Simplification is a very delicate job and needs careful editing and re-editing. Factual information should be made as simple as possible, but information about the decision process, the values that were used to make trade-offs, and the remaining uncertainty should not be omitted, as this information is crucial for building credibility and trust.

3. Place your simple messages in the beginning of a text and gradually add the more complex issues.

Although simplicity is a virtue for the whole information process, it is advisable to start with the simple and easily understandable messages and add more complex and detailed information at the end. This structuring of the information serves two purposes: gaining the attention of the peripherally interested audience and at the same time pleasing the well-educated audience which expects detailed argumentation and sufficient evidence. The only way

to please both audiences (aside from splitting the information) is to give the general information first and add the specifics later.

4. Anticipate the interests of your target audiences and design your communication program to match their needs.

This guideline is the most often violated rule in risk communication. Experts in institutions have the irresistible tendency to package a whole education program in each attempt to communicate with the public. But most people have neither the desire nor the time to become nuclear engineers, immune system specialists, or experts on radon. Most people want to know the consequences of a risk, the circumstances of its occurrence, the possibilities to mitigate the risk and the management efforts by the respective institutions. Depending on the desired level of the risk debate, the communication should focus on the scientific evidence, the management record of the institution, or the world views and philosophies that govern the institutional performance.

5. Devise different communication programs for different target audiences.

In addition to structuring texts, a communication program can operate with different packages containing the same message, but using different channels for transmission. A message to the national wire services should contain only the basic facts and some general conclusions, a press release to daily newspaper may also incorporate some discussion of the results, anecdotal evidence if suitable and reference to actual events (otherwise it will not pass the selection filters of these transmitters). Manuscripts for science supplements in newspapers or specialized journals should be more problem oriented and offer a novel or interesting perspective in the analysis of the issue.

6. Allocate enough time for packaging your message, but do not change your message in order to make the package more attractive.

The packaging of the message is important for the success of the communication effort. A good package implies that the formal requirements for a news story are met and that the message contains the relevant clues that are attractive to your target audience. But packages are not ends in themselves. If the message has been simplified and tailored to the needs of the receiver, it should not be further compromised by adjusting it to the most attractive package. This is the major difference compared to advertisement where people do not expect truthful information, but entertaining persuasion. Risk communication is based on different expectations: most receivers expect honest, clear, and complete information. This kind of information may gene-

rate trust in the communicating institution. Advertisement for margarine may be entertaining or even silly, but information on risks is expected to be serious.

7. Be honest, complete, and responsive in the composition of your message.

Honesty is a vital condition for gaining credibility. Honesty will not automatically be rewarded, but dishonesty will certainly create negative repercussions among transmitters and final receivers. The same effect will take place when sources withhold relevant information or tell only one side of the story. The goals of honesty and completeness include another, often overlooked aspect. Institutions with vested interests should put their cards on the table and justify their position. Credibility is often assigned by speculating about the true motives of the source. If profits or other vested interests are obvious motives, it is better to address these issues and make clear that such interests do not automatically preclude public interest or the common good. Industries could for example make the argument that companies with a good risk reduction and control program are more likely to attract better qualified personnel, to enhance their corporate reputation, and to avoid costly litigation.

8. Place risk in social context and report numerical probabilities only in conjunction with verbal equivalents.

The functioning of the intuitive heuristics and biases in processing probabilistic information mandates a verbal explanation of numerical probabilities since most people have difficulties in understanding the meaning of probabilities and tend to focus on the maximum perceivable consequences. This verbal explanation should attempt to put risk in perspective to other risks. But risk comparisons create often confusion and are likely to be rejected by the audience if they do not match their own mental concept of comparable risks. Therefore a few rules for using these comparisons are appropriate:

First, risk comparison should rely only on risks that are perceived as comparable by the public. Risks with identical benefits are certainly better suited to risk comparisons than risks with divergent benefits. It has also been suggested to base comparisons on the situation with and without the cause of risk or include only risks that lead to an identical set of consequences (Covello 1987). But the major point is the purpose of risk comparison. Comparisons should only serve the purpose of illustrating the meaning of abstract probabilities. Risk comparisons for the purpose of suggesting judgments about acceptability should be avoided because they are neither logically defensible nor convincing in the eyes of the public (Covello 1987).

Second, risk communication must address the basic qualitative properties of different risks and explain how deficiencies in those qualities have been compensated or will be compensated.

Third, it may be useful to insert anecdotal evidence or report about identifiable victims when communicating about familiar and unspectacular risks, such as radon or high blood pressure. Attention is almost assured if the receivers perceive the risk as a potential threat to themselves or their primary group. Dramatic, unfamiliar, and technological risks with high catastrophic potential are likely to be overestimated. Instead of emphasizing the low probability of severe accidents, communication should focus on the technical and organizational structures (such as the multi-barrier system or redundancy in safety devices) to prevent such accidents and demonstrate the preparedness of the community in the unlikely, but not impossible, event of an accident.

Last, it seems advisable to link numerical probabilities with verbal expressions of likelihood or risk comparisons. The perception of probabilities is characterized by so many biases that it is almost impossible to convey their meaning in risk analysis and risk management to a larger audience. Still they should be mentioned because they are the most accurate indicators for the relative seriousness of the risk, thus a vital component of all risk policies. In addition, the more interested and well-educated audience demands such information and will suspect an attempt to hide relevant facts if the numerical data is withheld.

9. *Try to escape from role expectations by using a personal approach and by framing the communication to the personal experience of the addressed receiver.*

Receivers, in particular peripherally interested persons, are inclined to select information that contains surprises or unexpected insights. Even if the material of the message does not offer anything new, a communicator can attract attention by avoiding the stereotypes of his or her role and by personalizing the message. This is particularly effective in face-to-face interactions, press conferences or talk shows. Without denying their home institution, communicators may report about their personal feelings when they first heard about the risk source and what kind of actions they took to protect themselves. They even may convey their own feelings and show compassion for the anxieties and fears of the addressed audience. Past research has shown that the potential to identify with a communicator is a major agent for attitude change. In addition, avoiding role stereotypes confronts the audience with some cognitive dissonance which may be resolved by accepting the new mes-

sage. But honesty is an absolute condition for such an attempt because most people have developed a good sensitivity for acting and fake feelings.

10. *Messages should be distributed on different channels and feedback communication should be stimulated and encouraged as much as possible.*

A good communication program should not only address different audiences by using different transmitters, but should also take advantage of the different available channels. Press releases are one major medium for communication, but press conferences, participation in talk shows, appearance in hearings and public events, letters to the publisher, and direct mailings are often complementary ways of conveying a message. Press conferences and talk shows allow immediate feedback from the transmitter so that the information can be better tailored to the needs of the receiver. Sending out brochures with reply envelopes is another method of collecting information about the communication needs of the public and bypassing the transmitters. Models for public involvement have been proposed and tested to assure constant feedback from the risk bearers or bystanders. Such models rely, however, on the willingness of the communicator to learn from the involved public and revise decisions in accordance with publically expressed preferences.

In addition, monitoring the process of re-coding (through content analysis of media messages) and of receiver's responses (through evaluating letters to the editor or direct survey methods) provide valuable information about the comprehensibility of the original information and its effects on the receiver. The credibility of a source can only be affected if the communicator uses all channels of communication to get the message across and to systematically collect and evaluate the feedback from the target audiences.

The guidelines should not be regarded as recipes, but as normative suggestions of what to take into account when approaching the public with risk-related information. Social interaction is too complex for designing "foolprove" guidelines. Different hazards and risks demand different approaches. But the most important reservation is that the best communication process will not lead to any success if it is meant to compensate shortcomings or failures in the task performance of the communicator or to hide management mistakes.

Conclusions

By carefully framing the information, by tailoring the content to the needs of the final receivers and by conveying a clear, honest, and appealing message, risk communication can convey a basic understanding for the choices and constraints of risk management and thus create the foundations for trustworthy relationship between the communicator and the audience. Although many receivers of risk information may not agree with the actual decisions institutions have made in setting priorities or selecting management options, they may realize that these decisions are results of open discussions and painful trade-offs.

But even if all these suggestions are followed, risk communication may not work. External influences, the overall climate of distrust, management failures in the past, and specific incidents can transform risk communication into a never ending frustration. But there is no alternative to communication. "If you fail to 'be credible' you will virtually guarantee peoples opposition" is the key sentence of a brochure of the New Jersey Department of Environmental Protection (New Jersey 1988). The functioning of decision making in a democratic society relies on public scrutiny and on the consensus of at least the majority of people. To gain the necessary public support, communication is essential. The more these communication programs are inspired by openness and accuracy, the better the democratic concept will work. The ideal customer of risk communication is not the person who readily accepts all the information given, but who processes all the available information to form a well-balanced judgement in accordance with the factual evidence, the arguments of both sides, and his/her own interests. Risk communication should constitute a platform that provides the right information in the right format to serve this purpose.

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