

BRIEFING PAPER: CONSUMER SCIENCE IMPLICATIONS FOR THE INTERFACE OF RISK ASSESSMENT AND RISK MANAGEMENT

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Abstract

This paper aims to summarise current thinking on how public perception and values should be incorporated into the decision-making process. The importance of understanding risk perceptions associated with different hazards is discussed. The relevance of such perceptions to risk management and risk communication is assessed. Individual differences in perceptions and information needs imply that inter-individual and cultural factors must be taken into account. Failure to do so may reduce public trust in the motives of regulatory and scientific institutions, and industry. One societal response has been to increase transparency in risk analysis systems, which may increase public confidence. This has also provided society with information about the potential for societal or institutional values to influence all stages of risk analysis, militating against further "functional separation" of risk analysis activities. Finally, suggestions for further research priorities are made.

1. Background

Traditional approaches to risk perception and communication have argued that risk assessment should be isolated from risk management and societal issues. Recent research suggests that it may be both pragmatic and expedient to acknowledge that societal issues should be taken into consideration through the whole of the risk analysis process. Specifically, models of risk analysis have assumed that risk communication follows on from risk management, which, in turn, is the outcome of risk assessment. More recent frameworks have assumed some integration between these three elements of risk analysis (for example, FAO / WHO, 1998). However, the decline in public confidence in those institutions and

industries with responsibility for risk management continues unabated, raising further questions as to how the science and society interface might be more integrated into the process. This briefing paper seeks to identify some of the key issues driving societal responses to current risk management practices, and to suggest future directions for more integrated research activities focused at developing public confidence through more effective risk analysis.

2. Public representations of risk

People's risk perceptions determine how they react to different hazards. Some factors (for example, whether a hazard is voluntary in terms of exposure or technological in origin) predict people's responses across different hazard domains. Other factors are domain specific. It is important to address people's perceptions in the process of risk management and communication, otherwise the activities of risk managers are likely to be considered as detached from a society, and the motives of risk managers will be distrusted by the public.

Woolgar (1996) has discussed assumptions associated with scientific "neutrality". These assumptions relate to the ways in which science and the social world are often viewed as independent of each other. In particular, there is discussion of how social factors are discounted as having any importance in the development of regulatory policy associated with risk management in particular and science policy more generally.

People's responses to different risks are *socially constructed*. In other words it is those psychological elements which are important in influencing people's responses to a particular hazard. In contrast, the technical risk estimates traditionally provided by experts do not influence people's behaviours and responses in the same way as their risk perceptions. For example, a risk that people perceive to be involuntary in terms of their personal exposure is more threatening than one that they choose to take, even if the probability of harm is the same, or possibly even less. For similar reasons, naturally occurring risks are less threatening than hazards which are technological in origin, and people fear potentially catastrophic hazards more than those which effect a similar number of individuals but at different times (see Katsuya 2001 for examples from the nuclear area; Slovic, 1993 for examples contrasting technological and natural risk). Other concerns are very specific to particular hazard domains (for example, see Miles and Frewer, 2001). For this reason, public perceptions of risk have often been

dismissed on the basis of “irrationality”, and have tended to be excluded from policy processes by risk assessors and managers. In other words, the application of arguments associated with rationalist interpretations of scientific evidence has permitted elite groups to dismiss such public reactions as inappropriate and irrelevant. However, it is these public concerns (and of course associated risk behaviours) that have direct consequences for human health, food safety and security, economic expansion and international regulation. Otway (1987) has observed that effective risk management involves structuring decision-making processes in such a way that they can accommodate social concerns and provide institutional forms in which these social concerns can be discussed. In particular, societal priorities for risk mitigation activities may not align with those identified by expert groups. However, dismissing the former as irrelevant may result in public outrage, and increased distrust in the motives of regulators and industry. Awareness and understanding of public concerns is also the basis for the development of an effective risk communication strategy, as these concerns should be explicitly addressed as part of the communication process. Finally, many potential hazards are associated with benefits both for individuals and society. However, there may be disagreements between different sectors or society as to what constitutes a desirable benefit, and this should also be understood as part of the risk management process (for example, see Frewer, 1999). It is important to be able to assess whether these are important and desirable to the extent that they offset negative risk perceptions associated with a particular hazard (Alkhami and Slovic, 1994; Bauer 1995).

There is also a public perception of cost/benefit balance, which is not necessarily the same as risk/benefit trade-off. For example, when considering the balance of ethical cost / benefit, as in the case of human embryo research, animal research and so forth, the issue to assess is whether the potential benefits of an activity are justified on ethical grounds.

Early research into public risk perceptions focused on the nuclear industry and issues of power plant safety and radioactive waste management. Public negativity and resistance to the nuclear industry in Europe and North America has been well documented, and is paralleled by increased public concern about emerging technologies in general (Bauer 1995). From this early research, public risk perceptions

have been shown to be particularly important determinants of public responses to different hazards in various areas. These include, for example, food safety (Fife-Schaw and Rowe, 2000; Verbeke and Viane, 1999; Verbeke, 2002; Frewer and Salter, 2002), the biosciences, (Frewer *et al*, 1997 b), and possible unintended negative environmental and health impacts of technology (Levidow and Marris 2001). Other areas (for example, health risk from naturally occurring radon, and other natural hazards) have also been considered (see, for example, Sandman *et al*, 1987; Slovic 1987).

In the area of human health and behaviour, much effort has been directed towards health education initiatives, with the aim of persuading people to adopt healthy lifestyle practices. There is a considerable literature to indicate that people are unduly optimistic about their own risks from an unhealthy lifestyle choice. This is the case particularly when they have perceived personal control over exposure to the risks, as in the example of healthy food choices or dangerous driving (Miles and Scaife, in press; Weinstein, 1987; Weinstein, 1989).

3. Public or publics?

The public is not homogenous with respect to their risk perceptions and risk communication needs. The process of risk analysis must acknowledge and incorporate these societal differences if harmonisation of risk management at a global level is to occur, although policy must be flexible to permit some local variation in, for example, targeted risk communication practices. In particular, different cultures may have different priorities for risk assessment.

There has been a great deal of emphasis on institutional and cultural differences in risk (Turner and Wynne, 1992) although individual differences in perceptions are also important, particularly under circumstances where risk exposure is perceived to be involuntary (Barnett and Breakwell, 2001). Affective factors, such as “worry”, may also influence perceived risk (Baron *et al*, 2000), as may personality correlates such as “anxiety” (Bouyer *et al*, 2001). Differences in perceptions of risk and benefit associated with various hazards exist between different countries and cultures, between different individuals within countries, and within different individuals at different times and within different contexts (Berger *et al*, 2001, Frewer *et al*, in press b). For example, gender is one of the best predictors of higher risk perception for a range of health and safety issues, (Dosman *et al* 2001). In particular, white middle class men, in

broad terms, tend to perceive less risk from different technological and health-related hazards compared to members of other demographic groups (Flynn *et al*, 1994; Fincucane *et al*, 2000; Johnson 2002). For any particular individual, there can be variation in risk perceptions at different times and within different contexts (Dosman *et al*, 2001; Frewer *et al*, in press b). National and international differences in risk perceptions must be identified and incorporated into the process of risk management if the development and application of regulatory frameworks is to be harmonised in a world where trade and communication is increasingly global (Frewer, in press). What is acceptable to one demographic or cultural group may not be acceptable to another. Finally, for the risks of a technology to be acceptable to the public, the benefits from a technology must be perceived to accrue to people exposed to the risks, or to the environment, (Frewer, 1999) and not to industry or producers. Differential exposure of disadvantaged groups (for example, children or people in developing countries) may result in a risk being evaluated more negatively than if this was not the case.

Risk information which does not address all the concerns of the people to whom it is directed, and which does not take account of the social context in which the information is embedded, may be discounted by the person receiving the information (Marris *et al*, 1997).

4. Public trust in information sources and regulatory institutions

Developing public trust in information sources and institutions is important. In risk communication, it is important to develop messages that address public concerns as well as technical risk assessment. Trust in institutions can only be developed through the implementation of transparent and inclusive risk management decision processes. This implies that societal values cannot be excluded from any part of risk analysis, suggesting that some reform of institutional structures is required to facilitate participatory processes. How this should be done would be a useful topic for future research.

Increasing public distrust in science, regulation, and associated institutions has, not unsurprisingly, been of concern to regulators and politicians. (Public distrust in science has perhaps, historically, been less of a concern to the scientific community, who, of all the institutional actors, appeared the most unprepared for the public negativity associated with science and risk management). This increased distrust has been linked to a public “decline in deference” or a “crisis in confidence” associated with scientific and

regulatory institutions (Laird, 1989). Uncertainty and public dispute in many areas of science have rendered the automatic belief in the accuracy of scientific conclusions less tenable. Indeed, this longstanding decline in the public's trust in science has resulted in the legitimacy of scientific judgement being regularly questioned by the public (House of Lords Select Committee on Science and Technology, 2000; Frewer and Salter, 2002).

Frewer and Salter (2002) have also observed that various factors have contributed to this process. These include the rise of the "consumer citizen" and informed choice making at the level of consumer choice, the diminished role of the "expert" as a result of the wide availability of specialist information, and broad shifts in the national (and in some cases international) political culture towards more open forms of government. Increased transparency in regulation is often presented as a "trust increasing" factor (Lang, 1998; HM Government, 2002). However, public distrust in risk assessment is likely to arise under circumstances where uncertainties in risk assessment become open to public scrutiny through increased transparency, but are not explained explicitly as part of the risk communication process (Frewer *et al*, 2002; Frewer *et al*, in press a).

Broadly speaking, research into public trust and distrust in risk management has focused on trust in information sources (which has theoretical origins in social psychology and communication studies) and trust in regulatory institutions (which has origins in socio-political theoretical approaches). The former primarily has implications for the practice of risk communication, the latter primarily for the structure of institutions and the development of risk management policy, although the two are not independent of each other. A further issue relates to uncertainty, and how this is made transparent and/ or is communicated. Failure to disclose uncertainty where it exists will increase public distrust in information sources and regulatory institutions. Each will briefly be considered in the current paper.

4.1 Trust in information sources and risk communication

McComas and Trumbo (2001) provide an overview of research that has attempted to develop methods to assess the drivers of trust and distrust in risk information sources. Typically, research in risk

communication has theorised that trust and credibility were multi-dimensional. In general terms these dimensions are comprised of items assessing different information source characteristics. That is, the extent to which the source is perceived to possess knowledge and expertise, to be open and honest with the information it provides to the public, and primarily concerned about public welfare (see also Covello *et al*, 1992; Kasperson *et al*, 1992; Peters *et al*, 1997). Alternative approaches to understanding the drivers of trust and distrust have employed combined qualitative and quantitative methodologies to generate respondent (rather than experimenter) generated credibility constructs (Frewer *et al*, 1996). In this research, truthfulness, honesty and concern for public welfare were associated with trust, but distrust was associated with concern about the motives of the information sources in providing the information to the public (see also Kasperson, 1986). It may be concluded, however, that trust appears to be associated with perceived concern for public welfare as well as openness and transparency.

A key question for developing effective risk communication is whether trust in information actually influences risk perceptions and associated behaviours. The elaboration likelihood model, or ELM, has been proposed as a model that can predict whether persuasion or attitude change following a communication about a particular issue will occur (Petty and Cacioppo, 1986). The impact of source characteristics on responses to risk messages provides a framework in which such effects might be systematically investigated. The ELM proposes that people may adopt attitudes for reasons other than their understanding and evaluation of persuasive arguments contained in a message. That is, attitude change may occur in the absence of argument scrutiny (for example, because of an individual's beliefs about information source characteristics), particularly under circumstances where personal involvement or interest in the subject of the message is also low (Priester and Petty, 1995).

Research conducted within the framework of the ELM has been inconsistent. People are likely to utilise trust as an important cue as to the merits or otherwise of the information for lifestyle hazards (such as microbiological contamination of food) where they believe they personally are at rather low risk from the hazard. Under these circumstances, risk attitudes are more likely to change if the information source is trusted (Frewer *et al*, 1997 b). For technological hazards, the results are equivocal. For example, in the

case of genetic engineering applied to food and agriculture, trust appears to co-vary with attitude rather than to predict it (Eiser *et al*, in press). If the message contained in the information does not align with already well-established attitudes held by the message recipient, the result will have negative impacts on both the perceived honesty and expertise of the information source. Under these circumstances, the information content influences perceptions of the motives of the information source (Frewer *et al*, in press b). From this, it can be concluded that *getting the risk message right* is as important as getting the message receiver *to trust the originator of the message*. Using messages that may be perceived as biased may influence perceptions of the source. Once the source is distrusted, this may have subsequent impacts on all of the messages provided by the same source.

4.2 Trust in institutions

The issue of trust in institutions is more complex. Trust is likely to be particularly important under circumstances where people feel that they have very little personal control over potential hazards. For example, Siegrist (1999) reports that trust in institutions with responsibility for regulating gene technology and its products decreases perceived risk and increases perceived benefit. Other examples of potential hazards where trust in regulatory institutions is likely to be particularly important include the nuclear industry, environmental and human health risks from pesticides and other chemicals (for example, potential endocrine disrupters) or other areas where the public perceive there is potential for promotion of vested interests at odds with those of the public. Societal responses to emerging and / or potentially transformative technologies (nano-technology, for example) may reflect increased public distrust unless institutions and organisations act to develop and maintain public confidence in their risk management practices. While public trust is, to some extent, contingent on institutional transparency, other factors, such as institutional reactivity to public concerns and involving the public in the risk management decision-making process itself, are also important. If people perceive that they are empowered in decision-making process through consultation or actual direct involvement in final decisions, this may result in greater acceptance of both process and outcome. There is an extensive literature on how best to involve the public in the decision making process (Rowe and Frewer, in press). However, public trust in public participation may actually decrease if the activity is not independently evaluated as to their effectiveness

in terms of how the exercise is conducted and its subsequent impact on policy development (Rowe and Frewer, 2000). Furthermore, the way in which the results of the exercise are incorporated into the policy process needs to be communicated in an effective way to both the participants in the exercise and the general public. Again, the process assumes that societal concerns be included explicitly in the whole risk analysis process. If the results are not used to develop policy, the reasons must be made clear to participants and the general public.

5 Risk communication

Even as late as 2001, researchers were advocating a comparative risk approach as a method to “correct” the “erroneous” perceptions of the public. For example, Williams and Hammitt (2001) report that North American consumers perceive high levels of risk to be associated with conventionally grown products compared to those produced using organic production methods. The researchers recommended that relative risk estimates of the impact of consumption on human health be used in order to “correct” these perceptions. No assessment was made of perceptions of the risks of unintended effects to either health or to the environment, which may have contributed to consumer fears, nor of other factors (for example, green values or self identity, Von Avelsleben, 2002) which may be influencing consumer risk estimates. Conventional analyses of this type are not very helpful to the risk communication and risk management process. The origin of this approach appears to be “top down” from risk assessment to risk communication. Consumer decision making, however, is likely to be based on a variety of factors including perceived risk, although this is far from an exclusive determinant of consumer decision making.

Garvin (2001) has argued that there are important issues of epistemology inherent in the process and practice of risk communication. She specifies that there are three groups of key players in understanding risk – scientists, policy makers and the public. Arguably “each group employs different, although equally legitimate, forms of rationality”. For scientists, rationality is constructed in scientific terms. For members of the policy community, the basis of rationality is political and expedient. For the third group, the public, rationality is essentially social, taking account of risk context, cultural factors and local conditions. Garvin notes that each form of rationality has a legitimate input into how risk management is operationalised, and

increased institutional recognition of this may reduce the polarity of view observed between the different sectors. Indeed, most risk communication research has tended to assume that people are passive risk perceivers, who need to be informed about the implications of a particular hazardous event. However, Lion *et al* (2002) have found that people prefer information which they can use to determine the personal relevance of the risk confronting them.

The most important factor in developing effective risk communication appears to be developing messages that are personally relevant to the recipient (Frewer *et al*, 1997 b). If, for example, research into risk perceptions associated with a particular pesticide indicates that people are concerned about unintended environmental effects, and the risk message is actually about effects on human health, the receiver of the message may dismiss the information as irrelevant. When communicating about health-related behaviours, it is important to target information to groups of individuals effected (using multiple communication strategies to target different groups if necessary). In this case, the intent of the communication is to encourage people to compare themselves to individuals at similar risk to themselves (Miles and Scaife, in press).

6 Communicating scientific uncertainties

Best practice in risk communication means that the actual concerns of the public must be addressed. Due acknowledgement should be made of the uncertainties and variabilities inherent in risk assessment if public confidence is to be developed and maintained. In addition, it is important to communicate about emerging and potentially unidentified risks as well as about risks already established.

Risk management decisions may be particularly difficult under conditions of ambiguity, uncertainty about the occurrence of hazards and potential consequences of hazards should they occur (Kunreuther 2002). Perhaps it the difficulty associated with risk management under conditions of uncertainty that has led expert groups to assume that lay people cannot conceptualise uncertainty in risk assessment or risk management (Frewer and Salter, 2002). However, there is evidence that elite groups in the scientific and policy community have underestimated the ability of non-experts to understand uncertainty. One result is that risk communication has failed to discuss uncertainty where this exists, increasing public distrust in

the motives of regulators and scientific advisors. Failure to take account of societal issues may increase public distrust in scientific and regulatory institutions still further.

Groenewegen (2002), in his analysis of Dutch toxicology, has observed that scientists who are also advisors are frequently involved in the definition of the social problem as well as the research agenda put into place to counter it. He concludes that, in early toxicology activity (for example, that arising in the early 19th century as a response to the public health problems associated with industrialisation) research, advice and policy developments were closely linked. More latterly, advice, policy and research activities were much more clearly demarcated, which has resulted in differentiation of agendas within the risk management process. Rothstein *et al* (1999) note that in the area of agrochemical regulation there is tension between international and national harmonisation of regulatory practices and how these are enacted. In other words, disagreement occurs between regulatory activity focused at a national level and similar regulatory activity focused at a national level how these are The authors use these observations to question the claimed universalisation of scientific culture in the agrochemicals area, although there is evidence for local divergences away from such universalisation. For example, Lofstedt and Vogel (2001) have observed that trends in consumer and environmental regulation have resulted in stricter European regulations, but that in the US the opposite effect has been observed. Societal and cultural factors clearly influence how risks are assessed.

Historically, many scientists thought that providing the public with information about uncertainty would increase distrust in science and scientific institutions, as well as cause panic and confusion regarding the extent and impact of a particular hazard on human health, the economy and the environment. However, there is evidence that members of the public (drawn from different social backgrounds) are very familiar with the concept of uncertainty (Frewer *et al*, 2002 a). The failure of institutional actors to communicate about uncertainty was actually increasing public distrust in institutional activities designed to manage risk. Furthermore, participants in the research indicated that they would also like to be provided with information about what the scientific and regulatory communities are doing in order to reduce that uncertainty. Effective communication about uncertainty is likely to become particularly important as

increased transparency in risk management processes mean that scientific uncertainties associated with risk analysis become more likely to be the subject of public scrutiny and debate (see also section 4, public trust in information sources and regulatory institutions).

7 Implications for risk management

Woolgar (1996) comments that scientific methods are not “neutral” (as might be expected by the literal application of scientific rationality to empirical investigation). They are rather defined by a series of non-neutral decisions by those individuals who have developed scientific methods in the past. Decisions are thus made at the expense of alternative methods deemed less accurate, less appropriate to contemporary views of what constitutes science strategy, or which require a greater investment of resource than decision makers are prepared to allocate. The current crisis of public confidence in risk management practices, in part, originates in the exclusion of societal concerns and values from the risk management framework. These concerns might usefully be included in risk assessment (What is assessed, how is uncertainty dealt with, “how safe is safe enough?”) and risk management, (how can socially inclusive risk management practices be developed?) as well as risk communication (what information is needed and by whom?). There is a need to more efficiently integrate societal concerns and values into risk assessment and risk management procedures, as well as incorporate risk perceptions into risk communication. At present, failure to so do is one of the causative factors associated with the decline in public confidence in risk assessment and risk management.

8 Links to research

Research questions which merit further investigation.

- *How best should different forms of uncertainty associated with risk assessment be communicated to the public*
- *How can effective and inclusive public participation in risk management be developed?*
- *Should new methods of consultation (for example, e-democracy) be developed to provide a more societally inclusive basis for risk management?*
- *How can policy impact of public participation be assessed, and the results of this analysis be communicated back to both participants in the public participation exercise and the wider community?*
- *How can more integrated risk analysis frameworks, which take account of the influence of values in risk assessment, risk management and risk communication, be developed.*
- *What changes to institutional structures need to be made in order to accommodate these new trust creating processes. (For example, should new information channels be developed to create internal links between public consultation, risk assessment and risk managers in institutionalised fora?)*

With respect to risk communication, it is important to investigate dynamic changes in both the extent and nature of public perceptions associated with specific hazards, in order that these can be used to develop effective risk communication practices. Greater understanding of individual differences in perceptions will facilitate information delivery. However, communication is a two-way process, and institutions need to learn how to internalise public views and societal values into risk analysis. As risk analysis becomes more transparent, both the uncertainties inherent in the process, and the points at which societal and political values start to influence decision making, (in risk assessment, risk management and risk communication) become open to public scrutiny. Thus it is important to address these issues in the process of risk communication and developing societal dialogue, but it is not always clear how best to proceed with these issues. One issue is becoming clear – it is essential to integrate social and natural science research in developing best practice in risk analysis, rather than running the two research agendas in parallel as has been conducted in the past.

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