Science, Society and Public Confidence in Food Risk Management

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3.1 Introduction

Many members of the public have become increasingly concerned about risk management practices, particularly in the context of food and food production. This trend has manifested itself through expressions of concern and anxiety about changes in agricultural practices and food production technologies. Perceptions of risk associated with genetically modified foods, Bovine Spongiform Encephalopathy (BSE) and Creutzfeldt-Jakob Disease (vCJD), emerging pathogens such as E-Coli 0157, and increasingly complex information about appropriate nutrition have all been, and continue to be, foci of public fear and cynicism about how food risks are managed.

In the past, risk assessment and risk management have tended to create firewalls between natural and social science input into risk analysis. However, increased understanding of the social and cultural factors that influence people's responses to different food hazards will provide the most rigorous basis from which to align risk management with the needs of the wider public. It is also important to facilitate the process of integrating natural science with society in a way that promotes quality of life and environmental sustainability, and this can only occur if social as well as technical issues are included in debate about risk issues. In the area of risk management, this process of integration will only occur if understanding of the cultural systems that define people's responses and representations of risk provide input into the debate about how to manage risk and risk mitigation priorities. Failure to develop such interdisciplinary integration is likely to increase public distrust in science and its associated technological applications, and reduce public acceptance of risk management decisions. It is important to ask why members of the natural science community have historically argued that research within the natural science area is immune from influence from social processes, particularly in the area of risk management and selection of priorities for research strategies (Woolgar 1996). If questions such as these are not asked, it is likely that public cynicism regarding the motives of scientists, risk regulators and risk managers will continue.

3.2
An Historic Perspective on Risk Perception

In the 1970s, regulatory agencies and other institutional actors with responsibility for the management of risks believed that the general public were acting "irrationally" with respect to their responses to different technological and lifestyle hazards. For example, people's rejection of nuclear technology was assumed by technical risk experts in this area to be "irrational" as probabilities of personal harm were relatively low compared to other hazards linked to lifestyle choices to which people exposed themselves on a voluntary basis. For example, it was argued that an individual was more likely to experience the negative consequences of the risks associated with a car accident than from an incident involving a nuclear installation. Despite this difference in probabilities, people expressed much greater concern about the risks of the latter relative to the former. Technical risk assessors argued that if only people could understand the science that informed technical risk assessments in the same way as did experts, then "irrational" responses and reactions would disappear. For example, the general public would not be concerned about the development and application of an emerging technology, or be unduly concerned about risks with relatively low occurrence. The application of arguments of this sort has permitted elite groups to dismiss such public reactions as inappropriate and irrelevant at best, and symptomatic of public "ignorance" and Luddite responses to technology policy at worst. The membership of decision-making bodies was consequently restricted to elite groups of "right-thinking" individuals who had the skills and intellectual capability to respond in an "appropriate" manner to technical risk information provided by probabilistic risk assessment. This attitude has had, and to some extent continues to have the effect of promoting scientific agendas in a way that is independent of the concerns or priorities of the rest of society; however it is these public concerns that have influence on, and consequences for, human health, food availability and sustainability, economic growth and international regulation. Understanding of public concerns and priorities, and associated dynamic shifts with time change should form the basis for the development of an effective risk management strategy. Moreover, effective risk communication in itself is unlikely to be enough to allay public concerns about risk and risk management. Greater emphasis should be placed on actively involving the public in the process of decision-making regarding risk management practices, ensuring that these processes are an explicit, rather than implicit, part of the culture of institutions involved in regulation.

3.3 Risk Perception and Communication

Initial research into risk perception was conducted in the late 1970s and 1980s. The seminal work by Paul Slovic and colleagues (e.g. Slovic 1993) resulted in the development of a theory of risk perception known as the "Psychometric Paradigm". This research posited that people judge "risk" in terms of psychological dimensions other than probability and harm: in particular, perceived control, the extent to which a risk was perceived to be taken on a voluntary basis, dread, and catastrophic potential were found to be important psychological determinants of people's responses to risk. These psychological factors were used to explain public responses to low probability technological risks. For example, it was argued that people objected to nuclear power because they had no personal choice over whether or not to expose themselves to the risks, and believed that if a nuclear accident occurred the risks were potentially catastrophic. The existence of alternative energy sources also resulted in people questioning whether nuclear energy was, in fact, necessary. In comparison, driving a car was a voluntary and controlled activity that provided a direct benefit to the person engaging in the potentially risky activity.

Research within the "psychometric paradigm" provided the foundation for empirical investigation into qualitative differences between "lay" and "expert" conceptualisations of risk. It has been argued that many problems associated with effective risk management relate to differences in the way experts and lay people conceptualise risk (e.g. Barke and Jenkins-Smith 1993; Flynn, Slovic, and Mertz 1993; Lazo, Kinnell, and Fisher 2000; Mertz, Slovic, and Purchase 1998). Specifically, differences in concern between experts and the general public have been explained by the hypothesis that expert risk perception is not affected by the psychological factors that appear to drive the concerns of non-experts. That is, experts are less likely to consider that factors such as voluntary exposure, dread, or potentially catastrophic consequences have legitimate input into risk management policies. However, some authors have proposed that these reported differences between lay and expert groups are the result of methodological weaknesses that produce systematic bias in the results of comparisons of perceptions of risk derived from expert and non-expert groups. For example, Rowe and Wright (2001) have published a critique of empirical evidence supporting the psychometric paradigm on the basis of methodological artefact, arguing that observed differences are really the result of demographic differences between expert and non-expert groups. As a case in point, a relatively larger percentage of women may be allocated to the "non-expert" group, and women are known to rate risks as being more serious than do men (Kraus et al. 1992). Thus it is easy to dismiss the views of women as "non-normative" and maintain the views of the dominant expert elite as the foundation for risk management practices.

An alternative view is that, despite the demographic homogeneity of expert groups relative to the general population, this homogeneity realistically reflects an important social reality. If risk management and risk communication are driven by expert groups, and the composition of these groups favours a dominant demographic segment of the population, then there will be real consequences for society in terms of how communication processes are operationalized, and the infra-structure associated with how risk management is organised. The gap between science and society will continue to widen, and the public continue to become more distrustful of elite groups which promote an understanding of risk very different from the majority of the population.

Alternative arguments have focused on differences in the extent to which experts and the general public estimate the magnitude of a risk associated with a particular hazard. For example, Sjöberg et al. (2000) report that experts have a similar attitudinal structure to the public, but differ drastically in level of perceived risk. However, the authors note that differences may be hazard specific, (in this case, the hazard under investigation was nuclear energy). This finding cannot be generalised to all hazards, particularly those where the "technical expert" does not possess technical expertise specifically relevant to the hazard being assessed. Finally, it is arguable that risk-related concerns (whether held by lay people or experts in a specific area of risk assessment) may be unique to a particular hazard domain (Frewer et al. 1996). Differences in risk perception between expert and lay communities may differ qualitatively rather than quantitatively, (Larkin 1983; Hunt and Frewer 1998; Miles and Frewer 2001).

Use of qualitative analysis has supported this hypothesis in the case of organophosphate sheep dip (Carmody et al., submitted). The perceptions and beliefs held by three stakeholder groups, farmers, technical risk experts drawn from the biosciences, and the general public, were analysed using semi-structured interview techniques. The results indicated that, while all three interest groups shared the most often expressed concerns, the way and frequency with which these were associated varied between the three groups. In particular, values (for example, environmental concern, anti-technological perceptions) were most important for the general public relative to the other two groups. Thus the research provided evidence to support the idea that experts and lay people think differently about a given risk, but also provided evidence that those who experience direct benefits from a technology hold qualitatively different representations of beliefs and concerns compared to those who do not stand to benefit from its development and application. Of course, the results cannot be generalised to all hazard domains without further research. In par-

ticular, differences in public perceptions of different food hazards across nutritional and technological domains (Sparks and Shepherd 1994) means that generalization of results may be difficult and that domain specific analysis should be carried out as standard practice.
There is also evidence that, particularly but not only in the area of technology and its applications, people will tolerate risk if they perceive there is some direct benefit to themselves (Alkhami and Slovic 1994; Frewer et al. 1998). People are more concerned about the extent of the personal or environmental benefits resulting from a particular technology than the extent of the risks. Public acceptance will be driven by perceptions of personal benefit (Frewer et al. 1997; Frewer 2000; Deliza 1999; Da Costa et al. 2001). In terms of acceptance of food risks, potential benefits of consuming different products are likely to vary. For example, sensory properties, local traditions in cuisine, and cultural beliefs such as appropriateness of use of a particular food, may represent more important benefits to consumers in comparison to producer benefits or even improved nutrition.
The relationship between perceived risk and benefit is not necessarily straightforward. Consider the case of genetically modified foods. Siegrist (1999) reported that the extent to which people trust companies and scientists performing gene manipulations influences perceptions of risk and benefit associated with the use of the technology in food production. When trust is controlled statistically in the analysis of the data, the inverse relationship between perceived risk and benefit vanishes. Furthermore, perceived risk and benefit were reported to contribute independently to technology acceptance. The focus of this study was therefore geared towards understanding how well people thought the risks of genetic modification were managed ("societal trust") rather than focusing on how truthful institutions were about the extent and impact of the risks themselves.
Results such as these have lead to the formation of a hypothesis that trust in institutions is a causative factor linking technology acceptance and public confidence in science and regulatory practices (Czetovitch and Lofstedt 1999). It is, however, necessary to distinguish between trust in institutions (societal trust) and trust in information and information sources (source credibility). Societal trust may have a different relationship with perceptions of risk and benefit compared to people's beliefs in the honesty of the same institutions as sources of information. Empirical work in this area has explicitly attributed information to a particular source (often as an experimental manipulation), and gauged the effect on perceived risk and benefit. Trust is usually assumed to be multidimensional and specifically influential with respect to different sources and subjects of communication (Frewer et al. 1997; Johnson 1999). The impact of the information (or informational content) of a risk message on trust in an information source can also be measured post information inter-

vention. Hovland, Janis and Kelley (1953) have identified two important dimensions that contribute to the extent to which people trust information sources; expertise and trustworthiness. Expertise refers to the extent to which a speaker is perceived to be capable of making correct assertions, whilst trustworthiness refers to the degree to which an audience perceives the assertions made by a communicator to be ones that the speaker considers valid. An example is provided by the case of genetically modified foods (Frewer et al., submitted). Two kinds of information about genetically modified food were presented to participants in an intervention trial – "product specific" information (which was skewed to present genetically modified foods in a positive light) and "balanced" information, (which discussed the potential risks and benefits of genetic modification of foods in a very neutral, but probabilistic, way). The information was attributed either to a consumer organization (shown to be highly trusted in pilot research), or an industry association (shown to be highly distrusted), or the European Commission (moderately trusted) under the different experimental conditions used in the study. Attitudes towards genetically modified foods were assessed before and after the information intervention. Data about people's perceptions of information source characteristics were also collected. The results indicated that the extent to which people trusted information sources had little impact on attitudes towards genetically modified products or product acceptance. Prior attitudes towards genetically modified foods accounted for almost 95 and 90 per cent of the variance in perceived benefit and perceived risk respectively – trust, however, had negligible impact on these risk related attitudes. The extent to which participants trusted the information sources was predominantly determined by participants' already existing attitudes to genetically modified foods, and not influenced by perceptions of source characteristics. In other words, independent of the type of information provided, information provision in itself had little effect on people's attitudes towards genetically modified foods. Furthermore, perceptions of information source characteristics did not contribute to attitude change, nor did the type of information strategy adopted have an impact on post-intervention attitudes. Of greatest concern to industry and other institutions with an interest in information dissemination was the observation that the extent to which people trusted the information sources appeared to be driven by people's attitudes to genetically modified foods, rather than trust influencing the way that people reacted to the information. In other words, attitudes were used to define people's perceptions regarding the motivation of the source providing the information. This perhaps is understandable in the case of the product specific information, which was very positive about genetic modification, focusing only on benefits associated with novel products. People who favour the use of the genetic modification are more likely to trust a source promoting its benefits. People who do not support the use of genetic modification in food production are more likely to distrust this same source providing information which does not align with strongly held views.

This does not explain why the same effect was observed in the case of the "balanced" information strategy. The reason may be because of the way in which the information strategies were developed in the first place – from the opinions of "experts" in the area of biotechnology, who proposed a rationalistic approach to technology communication issues. Expert views regarding what is salient to risk communication may be very different from what is considered important by the public. In order to assess whether this was, in fact, the case, it is useful to reflect on how the different information strategies were initially developed through the process of "stakeholder analysis". This will now be described.

Scholderer et al. (1999) conducted "expert focus groups" in order to understand the opinions of stakeholder groups regarding information dissemination about genetically modified foods. Technology experts believed that negative public attitudes resulted from a lack of information about genetically modified foods – specifically the lack of "objective" information was thought to cause uncertainty about their associated risks and benefits and, subsequently, negative evaluation of the entire technology. Thus the information strategies adopted reflected the views of the majority of experts, who appeared to be proponents of the so-called "deficit" model of risk communication, which assumes that public perceptions are inaccurate because they do not align with those of experts (Hilgartner 1990). This is discussed in greater depth in the next section. It is not surprising that the information produced was not perceived to be salient in discussing issues of direct concern to the public.

3.4 Institutional Denial of Uncertainty

Public negativity and resistance to food technology in Europe has been well documented, (Frewer 1999) and is paralleled by increased public concern associated with changes in production that are dependent on technological innovation or change. Genetic modification of foods is a case in point. Industrial and government concern about low levels of public acceptance of emerging technologies such as genetic modification of foods, the cloning of animals, or other advances in the biosciences has resulted in a communications industry growing in parallel with the industrial expansion linked to the growth of genetic technology in the agro-food sector. To some extent, the historical focus of this communication work has utilised the so-called "deficit model" (Hilgartner 1990). The deficit model promotes the idea that if only the public understood science, (or a simplified version of science) they would respond to technical risks in the same way as technical experts. Another version of the deficit model might assume that the public are unable to handle uncertainty information, and that, if the "deficit" is not amenable to public understanding through increased communication efforts, then information should be repressed or hidden to stop the public reacting in an "irrational" and "inappropriate" way.

There is indeed some evidence that expert groups do not believe that the public can handle information about uncertainty. Various food risk experts, drawn from scientific institutions, industry and government, were interviewed about how they thought the general public might handle information about uncertainty associated with food risk assessment (Frewer et al., in press). Many people within the scientific community expressed the view that the general public were unable to conceptualise uncertainties associated with risk management processes, and that providing the public with information about uncertainty would increase distrust in science and scientific institutions. These same experts also believed that uncertainty information would cause panic and confusion regarding the extent and potential impact of a particular hazard. This contrasted with the opinions expressed by the public (Kuznesof, submitted). A series of focus groups sampling members of the public drawn from different social milieus demonstrated that the general public were very familiar with the concept of uncertainty (perhaps through exposure to conflicting scientific opinion in the media, or through decision making experienced as part of everyday life.

The observation that scientists have a tendency to deny that the public can understand and handle scientific uncertainty has real world ramifications. This has been demonstrated by institutional responses to BSE (Bovine Spongiform Encephalopathy) in the UK. It is now known that the occurrence of BSE in cattle represents a serious health risk to humans, as well as having important consequences for the UK economy. At the time of writing, at least 80 human fatalities have arisen from new variant Creutzfeldt-Jakob Disease (vCJD). All these cases appear to be directly linked to the consumption of infected beef. In addition, the negative effects on the UK economy have been documented, although these were most acute during the high level of media reporting regarding the risk issues (Burton and Young 1997).

Prior to the announcement of the link between BSE and vCJD, government officials dealing with risk assessment information appeared to take the view that the public were unable to conceptualise scientific uncertainty, due to lack of insight and understanding regarding scientific processes, risk assessment and risk management. Scientific uncertainty was associated with the lack of knowledge regarding the minimum infective dose in the form of ingested infected material by both cattle and humans, and ignorance regarding the path of infection. It was thought that disclosure of the uncertainties linking the occurrence of BSE in cattle and vCJD in humans would produce public panic and alarm, accompanied by a public boycott of beef and beef products. This would have a detrimental effect on the UK economy. The public were, therefore, believed by scientific experts associated with the case to be "deficient" in their understanding of scientific process, and could not be trusted to respond in a "rational" way to the risks, which were deemed to be negligible and scientifically unsubstantiated. An alternative to the "rationalist" argument might be that, under conditions where there is uncertainty about the extent and nature of a risk, and where alternative behaviours to the potentially hazardous activity can be easily taken by those exposed to these uncertain risks, then it is actually quite rational to change behaviour to avoid the uncertainty. From this, one might argue that officials from the Ministry of Agriculture, Fisheries and Food were prepared to compromise public welfare in order to protect UK producers. This observation probably chimed with beliefs already held of many members of the public when the truth emerged (Frewer and Salter, submitted). From this, it is justifiable to postulate that it was not public "irrationality" that was the concern to the regulators, but rather the impact that a "rational" response by consumers would have on the UK economy. Whatever the underlying reasoning behind events, the BSE crisis not only had serious consequences for human health and the UK economy, but also for how the frameworks used for providing scientific advice to government are structured and operated.

The report resulting from the BSE inquiry (HM government 2001), identifies that events after March 1987 "demonstrated a policy of restricting dissemination of information about BSE", (p. 35) primarily because of the possible effects on exports and the political implications of discovery of the disease. The report also argues that concerns that a new Transmissible Spongiform Encephalopathy in Cattle would have a negative impact on the beef industry and export market did not justify suppression of information which would be needed if disease surveillance was to be effective, and there was to be early implementation of remedial measures. On page 233 of the report, it is stated that,

those concerned with handling BSE believed it posed no risk to humans (but) did not trust the public to adopt as sanguine an attitude. Ministers, officials and scientific advisory committees … were all apprehensive that the public would react irrationally to BSE. … the fear was that it would cause disproportionate alarm, would be seized on by the media and by some scientists as demonstrating that BSE was a danger to humans, and scientific investigation of risk should be open and transparent. In addition, both the advice and reasoning of advisory committees should be made public.

One result of increasing transparency in regulatory decision-making is opening up the uncertainties inherent in risk management to public scrutiny, which has direct implications for the communication of this uncertainty. Failure to discuss uncertainty with the public is likely to increase public distrust in risk management practices.

3.5 Public Characterisation of Food Risk Uncertainty

The communication of risk uncertainty with the public has been the focus of empirical investigation. Research has indicated that the public are able to articulate their views on uncertainty, are comfortable with the notion that uncertainty exists in food risk information and that uncertainty might be attributable to a variety of causes. The public also utilise their experience in dealing with uncertainty in food safety in the decision-making processes associated with new or emerging hazards (Frewer et al. 2001).

The majority view held by the public concerning uncertainty was that it was due to deficiencies in the present state of knowledge, for example through conflicting evidence or incomplete information. The minority view was that uncertainty arose due to the suppression of risk information. A further view was that the public viewed uncertainty as a transitory concept – the source of uncertainty was expected to be resolved over time through research or related activities. Admission of uncertainty also had a truthful, credible resonance or "high face validity" for the public, which appears to increase their trust in regulatory institutions. The degree to which uncertainty was regarded as acceptable varied substantially in relation to the cause of the uncertainty. The presence of uncertainty was found to be most acceptable when it originated through incomplete or conflicting evidence (i.e. limitations in knowledge) rather than the suppression of knowledge.

In general, the public expressed a strong preference for the provision of full information in situations when uncertainty arose with regard to food safety. Indeed, some people believed that it is their "right" to be informed about risk uncertainty associated with food. Respondents wanted information on how risk assessments were made as well as about the wider processes of risk analysis. Above all, people expressed a preference to be provided with the informational tools in order to make their own informed choice about food selection decisions, and to have the personal freedom to act upon that information. Food safety information was criticised for lack of openness, transparency and source credibility. It was concluded that best practice in risk communication should also consider the broad objective of providing meaningful messages to individuals to empower them to make informed choices about their personal food selection decisions. Information about food risk uncertainty needed to be accompanied by contextual information or a description of why the uncer-

tainty exists, and address what information is needed to remedy the uncertainty. The contents of food risk messages should include the source of uncertainty, methods for remedying the situation, the foods affected, the most vulnerable groups at risk and the potential hazard posed.
In the UK, people exhibited similar preferences about the method of information delivery (explicitly preferring the television news, supermarket leaflets, and Government publications). Multiple delivery systems were the preferred way to deliver uncertainty information. In addition, people preferred the information to originate from Government and food industry sources, despite the fact that, in the UK, these sources are the most distrusted (Frewer et al. 1997). Taken together, the results mitigate against regulatory approaches which emphasise precaution over informed choice. All information about food risk uncertainties should be made available in the public domain, together with the means to enable consumers to make informed decisions (e.g. through an effective labelling policy).

3.6
What Drives Food Choices – Perceptions of Risk or Benefit?

Analytic approaches to decision-making may inappropriately treat perceptions of risk and of benefit as distinct concepts, although it is possible that the two concepts are not independent. Several studies have found an inverse relationship between perceived risk and benefit (Fischhoff et al. 1978; Alhakmi and Slovic 1994; Frewer et al. 1998). Indeed, Alkhami and Slovic (1994) have observed that, if this inverse relationship holds, it may be possible to change perceptions of risk by changing perceptions of benefit, and vice versa. Thus for a hazard which people perceive to be high in risk and low in benefit, reducing risk perceptions may be brought about by increasing perceptions of benefit rather than heightening perceptions of safety. Empirical support for this premise is weak (Frewer et al. 1998), although variation may be associated with the extent to which attitudes have crystallized and are amenable to influence by new information (Frewer et al. 1999). The relationship may also depend on the extent to which benefits specific to a potential hazard are perceived to be desirable, or the associated risks intolerable.
There is substantial evidence that, just as psychological constructs associated with risk may be very specific to the type of hazard under consideration, so may perceptions of benefit (Miles and Frewer 2001). It is important to understand what members of the public perceive to be benefits, as opposed to what is believed to be beneficial by technical risk experts. Misunderstanding public concerns can have very negative consequences for effective risk communication. Information must be relevant and important to consumers if they are to

read it and think about the contents in an in-depth-way. This is the basis on which consumers are able to make informed choices, and without which arguments that the public implicitly approve the technology cannot be made. If, for example, consumers are very concerned about ethical issues, and the information does not address these, relevance is reduced and the information is not read or thought about (Frewer et al. 1999). In particular, there has been considerable political pressure from the scientific community to focus communication efforts on the issue of substantial equivalence, which is assumed to imply that genetically modified foods are unlikely to effect human health, thus facilitating public acceptance (FAO/WHO report 2000). However, there is evidence that the public are concerned about environmental impact or other process-related risks. The communication is, unsurprisingly, at best likely to appear irrelevant, or at worst be perceived by the public as an attempt to hide the "real" risks of the technology from them in order to promote internal and opaque scientific or industrial agendas.

Foreman (1990) has noted that emerging technologies may result in public resistance if the resulting risks and benefits do not accrue equally between different groups within the population. For example, if the public believe that the benefits of the technology apply only to industry, or other stakeholders, but the risks will impact on the environment and affect the whole population, then one might predict a negative public response. This type of effect may extend to other hazard domains as well as those linked to emerging technologies. Perhaps of even greater concern is the perceived differential accrual of risk to specific demographic or geographic groups within the population, particularly if these groups perceive themselves to gain no benefit from hazard exposure and to be excluded from risk management decision processes (Frewer 1999). One solution may be to increase public consultation and public participation in risk management, so that the decision-making process is believed to be equitable and fair.

Many different types of public participation methodology have been identified in the literature (e.g. Fiorino 1990; Renn 1995). These range from those which elicit input in the form of opinions (e.g. public opinion surveys and focus groups) to those that elicit judgments and decisions from which actual policy might be derived, and which are essentially deliberative in nature (e.g. consensus conferences and citizens' juries). Space does not permit a substantive review of the different methodologies, and the interested reader is referred to Rowe and Frewer (2000) for a more detailed review of methodological approaches in this area. However, it is interesting to note that the practice of public participation has increased across all areas of policy development in recent years, although issues of "best practice" are disputed. Such procedures, which aim to consult and involve the public in decision making, include diverse methodologies, ranging from traditional opinion polls (low in deliberative input from participants) to public hearings, referenda, focus groups, consensus conferences and citizens juries (high in deliberative input). The success of these different methods has been measured in an ad hoc way, if measured at all. Rowe and Frewer (1999) have specified some theoretical criteria for benchmarking the effectiveness of public participation exercises, which are currently being tested in real world contexts. Broadly speaking, evaluative criteria fall into one of two categories: those related to public acceptance of a procedure (that is, "Acceptance Criteria"), and those related to the effective construction and implementation of a procedure, which refer to the procedural issues associated with the participation exercise itself ("Process Criteria"). These criteria, and the process of validation of these criteria, are described in greater detail elsewhere (Rowe and Frewer 2000; Frewer, in press). However, the potential effectiveness of public consultation may be compromised by failure to evaluate not only the process but also the substantive impact of the process on policy. Frewer and Salter (submitted) have argued that recommendations for best practice regarding public consultation and public involvement must include the explicit assessment of both scientific advice and public consultation on policy development if public confidence in science and risk management is not to be further eroded (Frewer 1999).

3.7 Conclusions

Initial research into risk perception was conducted in order to understand why the public did not react to potential hazards in a "rational" way that reflected risk mitigation priorities as defined by probabilistic analysis. The "psychometric paradigm" was developed as a basis for understanding people's risk perceptions, and identified that risk perceptions were driven by factors other than technical risk estimates. In contrast to earlier assumptions, the psychometric paradigm has demonstrated that people judge "risk" in terms of dimensions other than probability and harm: control, the extent to which exposure to a hazard is voluntary, dread, and catastrophic potential are all important determinants of people's anxieties concerning food choices and, indeed, hazards in general. The initial understanding of what was driving public risk perceptions developed theories focused on effective risk communication. Although some authors have argued that theoretical developments in risk communication were geared towards technology acceptance, this is not the case in the food area, where communication issues range from microbiological risk, (where communication efforts tend to focus on establishing good domestic hygiene practice) or crisis management (for example in the case of BSE or contamination of food by dioxins). Whilst 10 years ago the emphasis of communication about the use of technology in the food chain was geared towards technology acceptance, the emphasis is now on increased public involvement in deciding how to manage and regulate technology innovation. In particular, there has been increased stress in recent times on communicating information relevant to people's concerns, as well as conveying information about probabilistic risk assessment processes. The failure of the Richter scale approach to risk communication (where relative risk probabilities are explained in a simple, often diagrammatic, approach) is thus explained. Comparative risk communication is driven by comparison of technical risk estimates that do not take account of psychological factors that contribute to risk characterisation, although people need information beyond technical risk estimates (Adams 1997).

More recent research has implied that trust in science and risk regulators, and public confidence in scientific advice, has powerful explanatory power in the context of how people respond to and interpret information. Recent theoretical stances have developed the idea that distrust of institutions (partly through perceived exclusion from the decision making machinery linked to government and science) represents a key driver in creating and fuelling public negativity to scientific innovation and risk management practices.

Efforts to understand the psychological determinants of trust (in information sources and regulatory institutions) laid the groundwork for subsequent analysis of how complex risk information is processed and transmitted by individuals. However, the need for explicit public involvement in risk management policy has emerged as a key driver in initiatives to increase public confidence in risk management. It is arguable that a weak aspect of increased public consultation lies in the way in which outputs of consultations are explicitly used in policy development in the long term and evaluative procedures to assess the impact of these outputs on policy must be developed. It is increasingly clear that simply telling people about different risks will neither reduce their cynicism regarding risk management practices nor the quality of scientific advice, unless the information is relevant, perceived to be truthful, and is honest about the uncertainties inherent in risk analysis.

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