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HEALTH & SAFETY LABORATORY

**Review of the Public Perception of Risk, and
Stakeholder Engagement**

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EXECUTIVE SUMMARY

OBJECTIVES

How risk is conceived, and at what level, is an area that is open to debate. A number of broad distinctions can be made regarding the level at which risk is investigated, and how it is conceived within social science. These distinctions are in part dependent upon the assumptions from within the theoretical perspectives from which risk is studied, but also historically on the divisions between the paradigms as to what constitutes a basis for studying human behaviour. There is a division between approaches to risk that reflects the debate within the social sciences between the realist and constructionist perspectives, about what is knowable in some 'final' sense.

The challenge within risk perception research is to combine the realist and constructivist positions (in relation to different hazards) for a more comprehensive understanding of risk perception that can inform regulatory decision-making. This in turn requires engaging with the 'public'.

The area of public stakeholder engagement over regulatory options is not well mapped and presents a number of obstacles to effective and meaningful engagement. This is particularly the case where stakeholders may be unfamiliar with the subject matter, and where decisions are needed on complex issues. The Health and Safety Laboratory (HSL) were commissioned to provide insight into these areas, and to:

1. Conduct a review of the literature on 'public' perception of risk, especially in relation to hazardous industries that are subject to permissioning and licensing regimes.

2. Provide a critical analysis for the methods of 'public' consultation.

This analysis will be used to inform HSE research to gauge public assurance of the control of hazardous industries that are subject to permissioning or licensing regimes.

MAIN FINDINGS

Risk Perception
- At the level of the individual risk perception is a result of many factors, as opposed to rational judgements based on the likelihood of harm. There are a number of explanations for why the perception of risk is not based on these rational judgements. These reasons include: systematic biasing of risk information, the use of mental shortcuts, and the way that risk information can be presented.

- Greater scope exists for these biases when the risk is complex or the effect of the harmful consequence is delayed. These biases do not occur in isolation, but are influenced by the situation in which the individual perceives the hazard. The relationship between the situation and the bias is unclear, but is not thought to be insignificant.

- Long standing evidence from the psychometric approach to risk perception indicates that acceptance of a hazard is related to the qualitative characteristics of that hazard. The accepted range of characteristics include:

  - The nature of the hazard – familiarity and experience of the risk; understanding of the cause-effect mechanism; uncertainty; voluntary exposure to the risk; artificiality of the hazard; violation of equity of benefits arising from hazard.
  - The risk's consequences – ubiquity of the consequences of the risk (geographically and across time); fear of the risk consequences (catastrophic potential); delay effect (e.g. the salience of the risk is a function of delay in deleterious consequences); reversibility (potential to restore original state); negative impact on individual, social and cultural values.
  - Management of the risk – personal control over the risk; trust and distrust in perceived institutional control of the risk.

  There is indication that hazards should be judged on a case-by-case basis to account for the separate contexts of each hazard. There is little indication of the relative weights that should be afforded each characteristic, and the extent this varies with contextual factors.

- There is wide support for the idea that risk perception is influenced by social relations and trust in risk management institutions, and increasing concern over the limitation of approaches that do not account for social explanations. Though there is little understanding of how these social factors interact with the range of risk characteristics identified by the psychometric tradition.

- It is acknowledged that risk has a 'dual nature' that relates to the extent it is understood as existing 'objectively', or is a product of mental processes. Integrating these two understandings is problematic, and is one of the central difficulties in incorporating public perceptions of risk into risk policy decision-making.

- Research into risk perception is increasingly rejecting single theoretical perspectives, especially where perceptions of risk are not through direct experience, but are mediated, e.g. via the mass-media. There is indication that the public responds to media coverage of hazards in a more rational and active way than might be presumed. Neither is the relationship between media coverage and risk perception as unidirectional or directly proportional as might be thought. There can be differentiation at a national and local level, between risk amplification and attenuation over the same risk issue.

- It is important to consider the extent that a person has knowledge of, or is familiar with a hazard when investigating factors that influence perception of risk. For example, there is evidence that the media play a more important role in people's interpretation of hazards when they have less experience or knowledge of those hazards. Similarly, evidence suggests that when the public is less familiar or directly involved with a hazard, trust in risk management institutions can act as a shortcut for mediating judgements of risk acceptability.

- A number of criticisms are raised regarding the methodologies used to investigate risk perception that are relevant to high hazard industries, principally:

  - It is problematic to measure perception of risk without acknowledging the context in which it is experienced.

- It is also problematic to measure what someone has not experienced or considered previously.
- It is important that data collection methods do not impose conceptualisations on the participants, nor researchers frame the problem according to their own values.
- When the public is asked to compare risks, care should be taken on how the information is presented. There are also problems in comparing risks, as 'real world' risks are multi-faceted and not identical.
- Care should be taken when aggregating individual judgements of risk as indicative of group responses, as the process of individual decision-making, and group decision-making are not synonymous.

Stakeholder Engagement
- Descriptions of the stakeholder process are based on pluralist assumptions of social organisation, and are at a very generalised level. This limits the possibility of defining acceptable engagement processes in relation to the context or nature of the issue to be discussed. Though one major distinction that is made is the amount of interaction with participants that is required.

- There are a number of high level factors that are identified as influencing the 'success' of engagements practices, some of these include: early involvement of participants, the perception of independence and transparency, consensus of the task definition, accessibility to information, and mutual trust among participants.

- There is a potential for selection to introduce systematic bias into the consultation process. There is very little indication given of whom to consult for deliberative processes within the literature, and the extent that participants are identified in relation to the nature and purpose of the engagement. There is an assumption that stakeholders are already known or visible in relation to specific issues, and that members of the 'ordinary public' can be chosen by representative sampling methods. The size of the sample also needs to be considered, as assuming the findings from a small sample can be generalised to a larger population is problematic.

- There are some criticisms of the purpose of consultation as simply being a process of enfranchising the public, but of relating to secondary agendas for regulating authorities, such as legitimising regulatory activities and helping to manage reputation through the diffusion of potential culpability.

- The outcome of engagement processes can be influenced by systematic patterns in group behaviour that are unacknowledged. These can include: conformity effects, polarisation effects, and groupthink. If mediators of the consultation process are insensitive to this contradiction, it can influence the type of knowledge that is generated by the consultation process.

- The process of educating participants regarding the consultation issue is also problematic for the knowledge claims that can be made from the consultation. This is not just because it confounds data collection and generation, but also because it raises the question of whether the participants responses can be considered to be representative of uniformed 'ordinary citizens', once they have been informed.

- The outcomes of engagement processes can be contextually based and contingent. There is the related difficulty for empirical based policy decision making to use such data as sufficient evidence to support judgements. Little prescription exists on how to do so. This

also raises questions regarding the extent that findings from consultations can be applied to other situations or contexts.

RECOMMENDATIONS

- Future research into public perception of risk will need to be focused on the relationship between the qualities of the hazard that influence individual perceptions of risk, and the explanation of risk perception as a result of social processes, i.e. it will be beneficial for research to examine the interaction between individual and social explanations of risk perception.

- There is some debate as to whether the public perception of risks, e.g. their relative ranking, is associated with their priorities for allocating resources to mitigate the risk. There is potential for the outcome from consultative processes that seek to rank hazardous industries according to risk, and those that seek to allocate resources to mitigate risk for public assurance to be different, or at least not to be considered logically equivalent questions by participants. Any knowledge claims resulting from engagement processes for hazardous industries will have had to acknowledge this distinction.

- The debate over incorporating public evaluation of risk into the decision-making process centres around the problem of integrating opposing points of view. The process and outcome of any public consultation regarding high hazard industries should acknowledge this 'dual nature' of risk, and so not be based on one theoretical viewpoint or methodology.

- Similarly, the people managing the engagement process (especially in relation to high hazard industries) need to be aware of the complexity of risk understandings, in order to elicit participant's judgements of acceptability of risk from systematic bias and misinformation. People managing the engagement process should also be aware of the role they play in potentially influencing participants' judgements, and they should reflect on their role in the process of knowledge creation, and the extent they are not separate from it.

- The participants' familiarity with the issue needs to be considered. If the participants are unfamiliar with the issue (as is potentially the case with permissioning regimes) then the issue of informing the participant needs to be incorporated as part of the consultation process, and becomes a central factor for this process. There is indication that the public can comprehend more complex information than might be presumed, if it is managed appropriately for them. This requires the organiser of the consultation process to consider the role of moderating the process of informing the participants. This can be resource intensive, and should present information in such a way as it does not reflect the values of the moderator, and enable participants to perceive they have sufficient information for the task at hand. This aspect would have to be very well considered for consultation on hazardous industries, and would have to include detail on the nature of the hazard, and the regulatory framework, but also the legislative structure.

- Participant accounts and judgements of risk acceptance should not be taken at face value, especially for those living near high hazard sites. These expressed preferences may be influenced by experiential verification and issues of economic dependency, but could be more complex. Judgements that express less concern over risk could actually mask high levels of concern, but expressing lack of concern could be a strategy to suppress conflicting attitudes (cognitive dissonance). There are also assumptions made that participants are operating from single perspectives. This might not be the case, e.g. participants could be engaged with an issue out of individual concern, but also as a result of a professional role.

In the event that the HSE commission further engagement activities, the motivations of participants to engage in the consultation process need to be acknowledged, and understood by those managing the consultation.

- HSE communication strategies need to be informed by stakeholder and public understandings of risk, hazardous industries, and the purposes and processes of regulation, and the way these differ from the HSE's own understandings. There is a cleavage between stakeholders and public who are informed and involved in these issues, and those who are not. Communication strategies need to be based on this differentiation between familiarity and unfamiliarity, as a universal approach for both groups is not appropriate.

1 INTRODUCTION

The HSE (Health and Safety Executive) currently regulates the Hazardous Installations / Major Hazard industries sectors through a range of permissioning and licensing regimes. In view of the limited resources available to the regulator and the complexities of industries within the Major Hazards sector, the HSE is anxious to make optimal use of its available capacity. A series of stakeholder engagement exercises have been commissioned to inform HSE's decision making on this issue. This work has been commissioned by HSE to engage with representatives of the public and local liaison groups over regulatory options for the following sectors: onshore gas; nuclear power; chemical processing; offshore oil/gas.

The area of public stakeholder engagement over regulatory options is not well mapped and presents a number of obstacles to effective and meaningful engagement. This is particularly the case where stakeholders may be unfamiliar with the subject matter, and where decisions are needed on complex issues. To this end, the Health and Safety Laboratory (HSL) were commissioned to provide insight into these areas, and to:

1. Conduct a review of the literature on 'public' perception of risk, especially in relation to hazardous industries that are subject to permissioning and licensing regimes.

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This analysis will be used to inform HSE research to gauge public assurance of the control of hazardous industries that are subject to permissioning or licensing regimes.

Section two provides an overview of the differing ways risk can be understood. Sections three and four compare the theoretical approaches to studying risk from the level of the individual, and the level of the social. Section five outlines the factors that influence risk perception, while the next section outlines the criteria that are thought to determine public concern. Section seven presents conclusions from the previous sections. The next sections outline the purposes, processes and concerns for stakeholder engagement. Section ten presents the logistical and logical limitations of stakeholder engagement in relation to current findings from the risk perception literature.

1.1   METHODOLOGY

The first stage of the project involved a review of literature relating to risk perception and public consultation. The search was conducted using database, citation and HSE on-line facilities and 'grey' literature (e.g. HSE reports). Databases searched included:

- Osh-rom - This includes four leading databases covering occupational safety and health since 1960.
- Healsafe - Records of recent work relating to public health, safety and industrial hygiene since 1981.
- Pascal -   Scientific and technical information since 1973.
- Social Scisearch – A world wide multidisciplinary index to social behaviour and related sciences literature since 1972.
- PsycLIT – compiled by the American Psychological Association, citing abstracts to over 1,300 journals in psychology and behavioural sciences.

Key words used in the search included: risk perception; public perception of risk; public concern; risk amplification; risk attenuation; societal risk; risk ranking; stakeholder engagement; public consultation; public involvement; public participation; and deliberation.

2 BACKGROUND

2.1   COMPETING APPROACHES TO RISK

How risk is conceived, and at what level, is an area that is open to debate. AF Wåhlberg (2001) points out that risk perception can be defined as cognition, a personality trait, or a behaviour. Power (2004, p. 14) describes the concept of risk as 'elusive, contested and inherently controversial.' Slovik (1999) suggests 'multiple conceptions of risk', and that 'public' understandings of risk are related to a broad range of categories, whilst 'expert' conceptions of risk are based on likelihood of harm.

The division in the broader debate concerning how risk is understood is in part dependent upon the assumptions from within the theoretical perspectives from which risk is studied, but also historically on the divisions between the paradigms as to what constitutes a basis for studying human behaviour. There is a division between approaches to risk that reflects the debate within the social sciences between the realist and constructionist continuum, about what is knowable in some 'final' sense (Renn 2001, in Kemp et al, 2002). This divide is also supported by Thomson and Dean (1996) (cited in Gaskell and Allum, 2001), who posit conceptions of risk on a continuum between probabilistic and contextualist models.

In its extreme position, the realist perspective asserts that there is an objective reality that is ultimately knowable through empirical investigation. 'Objective' risks are seen as properties of the environment that exist in their own right and can be identified and measured, and so an empirical approach is appropriate to investigate them. 'An underlying premise of this position is the view that scientific knowledge is essentially neutral, unproblematic stuff, concerned with truth about the physical world as defined by experts' (Weyman and Kelly, 1999).

The constructionist position suggests that reality is constructed and represented through discursive social processes. Judgements of risk are relative, arising from the culture in which they are situated, and reflecting the values and social organisation of that culture. This can occur at the wider societal level but also within smaller groups or sub-cultures. Accordingly, any investigation into risk perception should be at the level of these representations and social processes. Risk becomes a concept invented by humans to help them cope with uncertainty and danger (Slovik, 1999). A criticism of this constructionist position relates to what Pidgeon (1998) terms 'the inherent contradiction of its own 'true' account of the world'. Are social science knowledge claims provisional, and dependent upon specific social contexts, or can they ever be considered 'true' in any absolute sense? Despite this difficulty there is strong recognition of the need for social explanations of risk perception. The Royal Society report (Pidgeon et al, 1992) concludes that cultural variables play an important part in how people understand risk, and that 'differences in public evaluations of risk might consider the social and cultural context in which those exposed to a risk are located.' Weyman and Kelly (1999) reach a similar conclusion in their review of risk perception that 'in order to understand people's reactions to risk, it is necessary to take some account of the social and cultural contexts in which hazards arise, and the manner in which these variables shape people's attitudes, beliefs and behaviour.'

Some researchers conceptualise these two approaches to risk as broadly divided between government, science and industry, and the 'public', partly reflecting the traditional partition between 'objective' and 'subjective' approaches to risk perception. Though the divide is also cited as evidence of how the critique of the authority of experts, and rationalistic models of risk analysis is being incorporated into regulatory decision-making processes (Power, 2004).

Combining these two positions is problematic for academia and policy regulators. Gaskell and Allum (2001) argue that differences in the conceptualisation of risk are a 'fundamental fault line in society' that has broad implications when assessing risks within the public domain. Part of the difficulty is that if risks are conceived as 'objective', and assessed within an empirical framework, evidence that relates to other conceptions of risk are rejected as 'unscientific'. However, if all perspectives and criteria for judging risk were seen as equal, then all knowledge claims would have equal weight, and so regulatory decision-making would be mired in relativism. This also refers to what Pidgeon (1998) terms the 'inherent contradiction' within social science approaches that emphasise contingent knowledge claims. Though as Fischer (2003) indicates, relativism can provide some defence against ideology and dogmatism.

The challenge within risk perception research is to combine the realist and constructivist positions (in relation to different hazards) for a more comprehensive understanding of risk perception that can inform regulatory decision-making (Ball and Boehmer-Christiansen, 2002). Indeed, Pidgeon (1998) states that 'balancing and integrating the best available scientific judgements and evidence on the one hand with aspects of public risk evaluations on the other, is one of the most difficult questions to be faced by democratic governments and their regulators today.' Pidgeon (1998) also suggests that by incorporating public evaluations of risk into decision making, risk management and evaluation becomes a process that has the flexibility to avoid being reliant upon single, 'universal criterion for risk tolerance'.

The process of incorporation is a contentious one, for which there exists little prescription, or consensus in how to combine empirical judgements with public perceptions to ascertain the acceptability of risks, though there is great need to integrate these two perspectives (Fischer, 2003). Renn (2001, in Kemp et al, 2002) states that the problem for regulating bodies in determining the acceptability of risks 'relies on subjective judgement and social values but there is no clear procedure to resolve value conflicts.' Fischer (2003) observes that the process of interpretation is common to both perspectives, and suggests the possibility of interpretive processes bridging this divide. Though little insight is given in to how this should be done.

2.2   PERSPECTIVES ON RISK

A number of broad distinctions can be made regarding the level at which risk is investigated, and how it is conceived within social science. These distinctions can be defined along the continuum of the individual and the group, and constructivist and realist. A great deal of the research into risk perception seeks either explanation at the level of the individual, or at the wider social level. Less research is aimed at integrating these two levels, or understanding the interaction that takes place. Few of the approaches to risk perception consider what elements are determined by the objective properties of the hazard, and what parts are learned or inherited (AF Wåhlberg, 2001). Figure 1 presents the different approaches to risk in relation to these dimensions.

Constructivism

Psychometric
approach and
Mental models

Safety culture

Cultural
approaches

Social amplification
of risk

Individual

Group

Rational actor
models

Realism
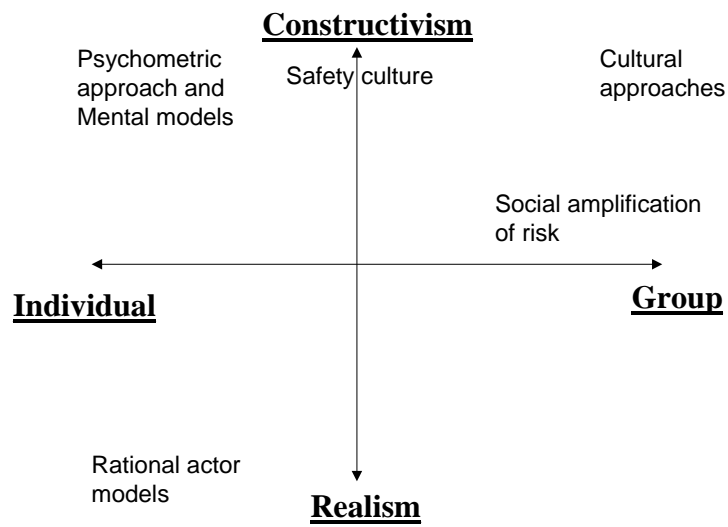
Figure 1.   Perspectives on Risk   (after Renn, 1998)

The next two sections present a summary of the approaches to studying risk perception at the
level of the individual and the wider level of the social group, which reflects Pidgeon's (1998)
grouping of social science research into two broad schools, the psychometric approach and
cultural theories of risk. General methodological criticisms regarding each approach are
provided within the summaries.

3 THEORETICAL APPROACHES FOCUSING ON THE INDIVIDUAL

3.1 RATIONAL ACTOR MODELS

A number of approaches to studying risk perception are based on the assumption of human behaviour as the outcome of rational choice. These approaches can be categorised as behavioural decision theory and value expectancy models.

3.1.1 Behavioural decision theory

Early work in this area draws upon economic models of rationality relating to the concept of utility, and the largest gains to be associated with an activity. The work of Starr (1969) introduced the concept of 'revealed preferences' where the equilibrium between a risk and the benefit to society reflects the acceptability of that risk, e.g. that risks are evaluated in terms of costs and benefits. Research revealed that decision-making often fails to conform to models of rationality, and leads to explanations of 'bias' and error in individuals' processing of risk information that modify perceptions of risk in recognisable ways. This 'non-rational' decision-making was explained in terms of the 'short-cuts' or heuristics that people use to reduce and manage the complexity of the world around them. One such example is 'availability bias'. This relates to the ease with which incidents can be recalled, and is posited to account for discrepancies between actual fatalities and lay estimation of fatalities, e.g. overestimation of low probability fatalities, and underestimation of frequent causes of death (Weyman and Kelly, 1999).

Criticism has been levelled at the notion of errors and biases in that they may be moderated by other individual and contextual variables, and that the experimental conditions were not ecologically valid, e.g. did not reflect 'real world' situations (Weyman and Kelly, 1999).

3.1.2 Value expectancy models

This approach attempts to explain the reasons why people are motivated to protect themselves in relation to their understanding of risk and perception of vulnerability. It draws on assumptions from behavioural decision theory, principally that risk behaviour is based on a rational decision making process, where alternative behavioural outcomes are evaluated as a type of cost benefit analysis. The decision making process involves choosing between the expected outcomes of an event, while acknowledging the values that are associated with that event.

Weinstein (1993) (cited in Weyman and Kelly, 1999) summarises the common characteristics of value expectancy models as:

a. The desire to minimise the negative consequences of an anticipated event motivates individuals to protect themselves.
b. The perceived seriousness of these consequences is judged to influence the outcome of the self-protective behaviour.
c. The perceived likelihood of an event occurring influences the motivation to adopt self-protective behaviour.
d. The benefits of self-protective behaviour are weighed against the costs of such behaviour.

The value expectancy approach is criticised for the lack of attention paid to the role of contextual factors in perception of risk (especially social and group effects in relation to individual decision making). There is also criticism that a number of studies make causal knowledge claims, based on correlational findings (Weinstein et al, 1995, cited in Weyman et al, 1999). Also the reliance on attitudes to perceived risk as determinants of precautionary behaviour is increasingly questioned, due to evidence that suggests the weakness of the relationship between attitude and behaviour (Green, 1998, cited in Weyman et al, 1999). Weyman and Kelly (1999) observe that the perception of vulnerability is a concept that is common to most of the models of behaviour for health protection. They suggest that although perceptions of vulnerability are required to engender changes in behaviour, 'other factors, such as the costs of preventative behaviour, social pressure, and perceived self-efficacy (ability to effect change) play a more important role in determining behaviour.' There is also evidence that indicates personal vulnerability and risk to society are judged differently. Personal risk assesses individual vulnerability, 'whereas societal risk examines a person's estimate of the generalised risk to the rest of the population' (Weyman and Kelly, 1999, p. 44).

3.2   THE PSYCHOMETRIC APPROACH

The psychometric approach initially involved the use of multivariate statistical techniques with attitudinal data to examine peoples' expressed risk evaluations and acceptance of a range of hazards. The approach developed to investigate the variables which determine people's judgement of risk, to the extent that there is now consensus that acceptance of a hazard is related systematically to qualitative characteristics of the hazard (Pidgeon, 1998). Weyman and Kelly (1999) highlight the different conceptualisation of risk within this approach and that '…risk is inherently subjective. Risk does not exist '*out there*' waiting to be measured, but is an abstract concept…' (p. 10).

There are a range of characteristics identified by research, but principally the findings highlight the importance of two characteristics perceived as intrinsic to the hazard, which influence people's perception of risk. These qualities are located across the two dimensions described as seriousness of consequences (perceived dread), and degree of familiarity/uncertainty (unknown risk). These qualitative dimensions can have varying importance for different hazards, indicating that the profile of a hazard should be taken on a case-by-case basis, and that its context should also be accounted for (Pidgeon 1998). Cross-cultural differences in tolerability of risk are also highlighted, indicating the influence of social context on perception of risk (Weyman and Kelly, 1999).

Weyman and Kelly (1999) report that criticism of the psychometric approach relates to the influence on the results of the hazard sets used, the small sample size, and the lack of representativeness of the samples. Concern is also raised regarding the lack of distinction made between types of variables (e.g. whether they are cognitive and located at the level of the individual, or intrinsic properties of the hazard) providing explanation of variance (AF Wåhlberg, 2001). There is also the issue of 'group averages hiding substantial differences in [individual] understanding and interpretation' (Walker et al, 1998, AF Wåhlberg, 2001). The main criticism is said to be '…the absence of a social perspective within the paradigm' (Weyman and Kelly, 1999, p. 9). The separation of risks from the social context in which they are experienced is an assumption that has also gained criticism (Nelkin, 1989, Turner & Wynne, 1992, cited in Weyman and Kelly, 1999, p. 9). However, Walker et al (1998) point to recent work by psychometric researchers as focusing on this cultural element in shaping risk perception, citing such factors as fairness, equity, responsibility and blame.

Weyman and Kelly (1999) also raise concern that many psychometric studies require individuals to make judgements about situations that they may not have encountered or even

thought about before. They consider comparison with workplace contexts to be qualitatively different, hypothesising that in this context individuals are more likely to be familiar with the hazards, or have thought about them before.

Criticism is raised regarding theories of individual differences, in the assumption that 'aspects of personality and cognitive style remain consistent traits of the individual, irrespective of context' (Weyman and Kelly, 1999, P. 53). Further criticism suggests that 'much contemporary risk taking research assumes that individuals' risk criterion is pervasive and affects all perceptions and behaviour' (Plax and Rosenfield, 1976, cited in Weyman and Kelly, 1999, p. 54). Another criticism is that the scales (or set of choices) used, are predetermined by the researcher and not generated by the public, and so reflect the public's responses to the choices offered to them, rather than their own concerns (Poortinga and Pidgeon, 2003).

3.3 THE MENTAL MODELS APPROACH

Weyman and Kelly (1999) note that although this perspective shares some commonality with more cultural approaches it is 'fundamentally cognitive and rooted within the psychology of the individual.' This approach compares expert and lay models of risk in order to identify gaps in understanding of hazards, so that risk communication can be effectively targeted at these gaps. A central assumption is that people understand the world by creating internal representations of the world. It is these representations that people use to reason with and so understand their environment and impose order and predictability on it (Weyman and Kelly, 1999). Typically the approach focuses on eliciting lay understandings of hazards, without imposing expert conceptualisations, an essentially 'bottom up', data driven process, as opposed to a 'top down' conceptually driven one, which is reflected in many of the other approaches.

A related approach is Laddering Methodology (Frewer, 2001), which is a form of semi structured interviewing that elicits participant's concerns, and how these concerns are interrelated. The method allows a map of the concerns and understanding to be drawn in the same way as the mental models approach. Though laddering incorporates people's value systems to illustrate the attribute – consequence – value association chain, which is posited as driving decision-making (see rational actor models).

Weyman and Kelly (1999) report that research in this area has focused on specific hazardous substances. They report a number of findings, including:

- The difficulties people face in understanding the differences between single exposure and repeated exposures. Patterns of repeated behaviour are understood as discrete incidents ('accumulation bias')
- The decreased risk that people judge their own behaviour when comparing themselves to others who behave in the same way ('optimistic bias')
- The search for causal explanation can bias people to make associations between two factors because they are close together ('cerebral contiguity')

Criticisms of the approach relate to definitions of risk that are narrow and do not include contextual influences on risk perception, and exaggerate the consensus in expert judgements of risk (Weyman and Kelly, 1999). Part of the difficulty of this qualitative approach is to '…elicit people's beliefs that neither puts new concepts in their minds nor leaves existing ones unstated' (Bostrom et al, 1992, cited in Weyman and Kelly, 1999, p. 11).

4 THEORETICAL POSITIONS FOCUSING ON THE SOCIAL LEVEL

4.1 SOCIAL, CULTURAL AND ORGANISATIONAL PROCESSES

The Royal Society (1992) report identified one of the principal trends in the risk perception literature as the acknowledgement of 'the significance of social, cultural, and political processes in shaping individual attitudes towards and the social acceptability of risks.' The study of risk perception moves from the level of the individual, to consider the result of the interactions of individuals within formal and informal networks. From this perspective the perception of risk is socially situated, and not just determined by the characteristics of the risk event itself, or individual understanding. Information about hazards is not interpreted in a vacuum, but within a social context. 'Risk perception…cannot be reified and assessed independently of the social system in which they are embedded' (Frewer, 2001, p. 244). Similarly, Breakwell et al (2001) stress the importance of considering the context in which a hazard occurs. The attributes on which a risk is evaluated, are in part determined by, and arise out of the social context. There is potential for perception of risk to extend beyond the actual hazard itself, and to assume a 'cultural profile' related to broader social issues (Weyman et al, 1999).

One of the first attempts to investigate risk from a sociological perspective was Cultural Theory proposed by Douglas and Wildavsky (1982) (cited in Gaskell and Allum, 2001). Cultural Theory describes the cultural groupings that people belong to as in part accounting for group members' perception of risk through their shared 'worldview'. Within Cultural Theory the domains of 'cultural bias' and 'social relations' are taken to explain differences in risk perception. Cultural bias is conceived as the shared values within a group. Social relations are defined as five patterns or types observed within interpersonal relations: hierarchical, egalitarian, individualist, fatalist, and hermit. The variations of combinations that can occur within these two domains are seen to relate to differences in perception of risk across groups, or 'worldviews'. Risks are selected for attention that reinforce the group's position or way of life, relative to other groups. It is the context of the group that determines which hazards attention is focused on; the acceptability of risk; and the reactions to risk that are legitimised. As Weyman and Kelly (1999) suggest, the focus on risk does not just serve the self-protection of the individual; it can express 'wider socio-political interests and agendas.'

An extension of Cultural Theory is that all human activities are culturally situated, which implies that expert judgements of risk are also subject to cultural considerations (Weyman and Kelly, 1999). Walker et al (1998) also suggest that 'experts themselves may be just as subject to differences of perception and judgement…depending on their institutional and disciplinary locations.' So it becomes problematic for policy decisions to be based on such an approach that emphasises the contingency of knowledge, as the legitimacy of any evidence on which decisions are based is undermined by relativism (e.g. criticisms that the evidence is context specific, and cannot necessarily be generalised).

Criticism is raised of this approach regarding the lack of interaction between these groupings, and the extent that they are discrete. Gaskell and Allum (2001) are critical of this typology for accounting for the 'public's' attitude to biotechnology as it implies single perspectives (as opposed to plural rationalities) when 'people are ambivalent; they view biotechnology through both the entrepreneurial and egalitarian perspectives'. Walker et al (1998) accept that Cultural Theory highlights important aspects of risk such as 'accountability' and 'blame', but that it reduces socio-cultural context to a small number of general groups. This criticism of over

simplification is echoed by Ball and Boehmer-Christiansen (2002). Further criticism of the cultural approach relates to it being a static model that does not account for change over time.

The Royal Society report (Pidgeon et al, 1992) also suggests that the empirical basis of the cultural and social perspectives is limited. Weyman and Kelly (1999) also describe attempts to empirically evaluate cultural theory while combining psychological insights as 'largely unresolved.' This criticism is reflected by Hornig Priest et al (2003, p. 753), that 'The relationship between culture (in the sense of worldview), social structure and risk perception (or risk interpretation) is not very well understood'.

Pidgeon (1998, p. 6) suggests that for policy purposes, it would be useful to gain insight into the 'social and cultural contexts in which particular hazards become important for particular groups.' This raises further questions for risk policy decision-making regarding the appropriate weighting given to the context. Research considering risk perception at the social level is moving away from generalised descriptions of the cultural context to more specific ones. Walker et al (1998) are concerned with specific definitions of context. They consider that a more straightforward definition of context 'might begin with the history, past experience and current social and institutional relationships of those exposed to a hazard. It would also need to take account of the variety of social networks within which individuals are situated.' Pidgeon (1998) criticises some social science research as failing to acknowledge the importance of context over biological variables. He illustrates this with findings from gender differences in risk perception that are not universal differences as implied, but disappear in deprived communities. Similarly, Slovik (1999) suggests that gender differences in risk perception that indicated that 'white males' were more risk tolerant than other groups, were not indicative of biological explanations, but socio-political ones. However, Pidgeon (1998) also reports on a review undertaken by Sjöberg (1995) of a range of studies to determine the importance of socio-demographic variables for perception of risk. He concluded that the correlations were very weak, accounting for a small percentage of the variance, and that it would be very difficult to group individuals according to categories (using questionnaire techniques) that would allow their risk preferences to be predicted with certainty.

Walker et al (1998) also highlight the geographical location of the hazard and where risks are perceived as an important aspect of context that has received little attention. Location is deemed to influence perception of risk to the extent it provides the physical setting. It is where the wider social and economic relationships are experienced, and provides a sense of place and identity through a history of shared experience. 'Responses to environmental risks are inextricably bound up with social ties and with shared experience of and commitment to the neighbourhood' (Klintman, 1995, cited in Walker et al, 1998, p. 14). 'Economic, social and political factors appear to have a significant influence on the relative importance given to specific concerns in different locations (Vari et al, 1991, cited in Walker et al, 1998, p. 14). Walker et al (1998) also indicate how opposition to a perceived threat can create 'community identities' which are not associated with 'conventional socio-demographic divisions.' It seems reasonable to claim that the specific context where risks are perceived is a contributing factor to the judgements of acceptability that are made, and 'sense of place' may thus play an important role in the framing of risk attitudes' (Walker et al, 1998).

4.2   WORKPLACE CONTEXTS

Another example of the more specific conceptualisation of cultural context is the focus on the workplace. Weyman and Kelly (1999, p. 21) highlight how within the framework of safety culture there is a 'growing body of empirical evidence which suggests that individuals frequently possess substantially accurate perception of risk in industrial contexts…These

findings, in the main, however, relate to understandings of physical risks in high hazard environments.'

Weyman and Kelly (1999) raise a concern over this approach regarding the 'inherent contradiction in the use of individual attitudinal scales to measure social phenomena.' The assumption being that the aggregation of individual scores is equal to the sum response of the group. This assumption presumes that individuals' perceptions are uninfluenced by being within a group, and ignores group effects that can influence individual judgement. Weyman and Kelly (1999) also suggest that this approach shows the need to move away from research into responses to hazards at the level of the individual, to include environmental and cultural considerations.

4.3   THE SOCIAL AMPLIFICATION OF RISK

Sociological risk research is increasingly rejecting approaches based on any single theoretical perspective. The framework for the social amplification of risk is becoming a focus for integrating multi-disciplinary approaches to risk, especially how characteristics of a hazard interact with social, cultural and psychological processes that strengthen or weaken perception of risk. Within this framework (partly in order to avoid the problems of relativism) 'risk' is conceptualised as both a social construct and an objective property of the hazard. The focus is not only on the direct experience of risk but how interpretations of risk are acquired (Kasperson et al, 2003). Research in this area is especially concerned with the social processes (the mass-media and sources of risk information) that increase public concern and socio-political activity over some hazards and events that experts judge as low risk, and the secondary effects that these interpretations have (e.g. the resulting decisions or actions). The level of enquiry is at the collective, rather than individual level.

Kasperson et al (2003) give an overview of empirical research within the framework of social amplification of risk. Key findings that they cite in relation to perception of risk include:

- Public responses to hazards are more rational than might be thought.
- Public concern regarding a hazard does not necessarily mirror media coverage, i.e. sustained media coverage does not in itself ensure amplification. The relationship between mass-media coverage and the formation of risk opinion is not unidirectional, but complex.
- Several factors may need to be present for the amplification of risk, such as, media coverage; signal potential; and perception of incompetence for risk management.
- Risk signals that are attributable to incompetent risk management are important for public concern.
- Similarly, trust and perception in institutional risk management handling of risk are important.
- Important differences between individuals who amplify risk, and individuals who attenuate risk relate to the perception of individual risk (for amplifiers), and satisfaction with institutional responses to risk (for attenuators).
- There can be a discrepancy between risk amplification on a national/regional scale, and attenuation at the local level. This can relate to such issues as economic benefits associated with the risk at a local level (see Walker et al 1998, Social, Cultural and Institutional processes).
- Some hazards may be hidden and not subject to amplification effects. Characteristics of these 'hidden' hazards include: diffuse effects of the hazard; time lag between the hazardous event and the onset of deleterious consequences; assumptions made about the hazard obfuscate the potential for harm; the hazard affects people at the margins of

society; and the fast pace of change that introduces the hazard is too quick for society to respond.

- The stigmatisation of a hazard is in part due to it being perceived to have such qualitative characteristics as: dread consequences; involuntary exposure; inequitable impact; unbounded impact; and the violation of a natural standard (see Psychometric approaches).

Breakwell et al (2001) identify the factors of 'self-interest', 'moral outrage', and 'fear' as contributing to the increase in public concern reaching a critical point. This corresponds to the ways that events perceived as having a high 'signal potential' correlate well with events that scored highly on the dread and unknown dimensions (Slovic et al 1984, cited in Gaskell and Allum, 2001). Similarly, Petts et al (2001) define the key factors for 'risk signatures' that determine whether certain hazards are given more attention than others. These factors include: the specificity of adverse effects; concern for potential effects; concern over perceived secrecy; distrust in institutions due to vested interests; and whether the issue presents moral questions or not.

Breakwell et al (2001) also identify factors within the production of news that can contribute to the process of amplification of a risk object. These factors include: commercial pressure to promote stories that secure increased audiences; the lack of reporting of 'real science'; the use of templates to pre-frame a story; and the private agendas of individual journalists and editors. The sequence with which notifications of hazards are made is also seen as contributing to amplification effects. The lack of 'real science' is a conclusion that is also drawn by Petts et al (2001), along with the observation that some sections of the media give importance to lay perceptions and testimonies, to the exclusion of science.

Petts et al (2001) suggest that the link between the mass media and the perception of risk is not as direct as some might suggest. They emphasise that the public interprets media in an active way, from a number of sources, stressing that public views on risk are contingent and continually negotiated. Petts et al (2001) make a distinction between members of the public who are engaged with, or knowledgeable about an issue, and those who are not. The media is felt to play a more important role for people's interpretation of an event when they have less direct experience or knowledge of it, a finding which is supported by the wider literature on social communication.

A number of criticisms have been made of the social amplification of risk framework, principally that it presupposes a baseline of public risk concern that is then transformed through the process of social amplification, and that it is of too high a level of generalisability to generate knowledge claims that can be subject to falsification (Kasperson et al, 2003, AF Wåhlberg, 2001). Furthermore, the unidirectional model of communication on which it is based can be regarded as a simplification, as can the mechanistic model of social communication on which it is based. The link between the perception of risk, and the effect on behaviour is also somewhat unclear.

4.4 RISK COMMUNICATION AND TRUST

Although risk communication and trust do not represent a methodological approach to risk perception, they have received considerable academic interest as they provide an important link between risk perception and the engagement of the public in decisions on risk management (The Royal Society, 1992). To some extent the perception of risk is mediated through communication with and from the regulatory bodies that play a part in the social construction of risk. Weyman and Kelly (1999, p. 24) indicate that 'there is a growing consensus among researchers that effective risk communication frequently has as much to do with the perceived characteristics of

the source of this information as features of the hazard itself.' Public risk perception is not about an individual's unmediated judgement of a hazard, but that this judgement is in part formed by their 'perceptions of trust and credibility in science, government and state institutions' (Weyman and Kelly, 1999). The issue of trust extends beyond the actual management of the hazard itself, understanding how distrust arises becomes central to risk management (Walker et al, 1998). Thus the issue of trust has become increasingly important within research into risk perception. According to the Royal Society report (1992) the issue of trust represents an area where the theoretical approaches at the level of the individual, and approaches at the level of the social can be combined.

The issue of trust is also central to the area of risk communication. There are criticisms of the 'deficit' model of risk communication, namely that simply focusing on issues of improving communication (i.e. the transfer of information) is not sufficient to overcome issues of distrust (Frewer, 2001). Weyman and Kelly (1999) cite the perceived impartiality and independence of the information source as another factor associated with trust in a number of studies. Hunt et al (1999) suggest that public trust in sources of information about radiation risks is not fully accounted for by either the perception of competence (degree of knowledge) or objectivity (vested interest to misinform the public). They found that a fictitious source of risk information was rated as having a high degree of knowledge, suggesting that perceptions of trust are also partly based on perceptions of the wider social organisation (e.g. the legislature), as well as specific institutions and organisations, none of which will remain static.

'The proposition that people's perceptions of, or opposition to, a technological risk are shaped more by social relations and concerns about the perceived trustworthiness of those who manage it than by 'objective' assessments of the risk has now received widespread support' (Walker et al, 1998). Walker et al (1998) state that the situation is further complicated for 'socially marginalised' groups, when their distrust of risk management institutions might be part of a wider experience of marginalisation.

5   VARIABLES WHICH INFLUENCE THE PERCEPTION OF RISK

What can be said about the ways that the 'public' judge risk? The 'public' judge risk according to a complex range of dimensions as opposed to merely estimating the probability of occurrence (Gaskell and Allum, 2001). A number of factors and themes that contribute to the evaluation of risk are presented in this section.

5.1   PERCEIVED CONTROL

There are a number of terms within the literature that refer to the notion of control at the level of the individual, namely, agency, locus of control, and self-efficacy. The psychometric tradition demonstrates the links between perceived control and the concept of personal vulnerability. There are also links to the voluntariness of exposure to risk, or the extent that it is perceived as within the control or volition of the individual. Weyman and Kelly (1999) suggest these are 'important qualitative variables used in lay evaluations of risk, contributing to the widely identified 'dread' dimension.' They also highlight control as a 'source of cognitive or attributional bias' that can lead to 'unrealistic optimism', notions of invulnerability, and social comparison effects, and thus engender lower levels of precautionary behaviour. Weyman and Kelly (1999) also point to studies within the health field of individuals' perception of increased levels of control moderating their levels of anxiety.

The notion of control can also be more socially situated, relating to perceptions of competency in the institutions that manage risk. The notion of competency is important to some conceptions of 'public trust' (see section below on Trust and Distrust). Weyman and Kelly (1999) highlight other findings that trust in government and industry to manage risk, is associated with the extent those hazards are 'perceived to be amenable to control.' Therefore socially situated notions of control can be understood as an interaction between the nature of the hazard, and the perceived competency of an organisation to manage the resultant risk.

5.2   PSYCHOLOGICAL TIME AND RISK

Weyman and Kelly (1999) present evidence from a number of studies that indicate a cognitive bias regarding the time scale between an incident and the onset of deleterious effects. 'One consequence of this being that 'risk willingness' (i.e. the willingness to accept higher levels of risk) increases as a function of time, being greatest when the consequences are furthest distant' (Weyman and Kelly, 1999, p. 39).

Other examples relating to the influence of time given by Weyman and Kelly (1999) is a tendency to understand risk acts that are repeated as discrete events, rather than a pattern of behaviour for which probabilistic risk accumulates (i.e. that people's judgements of how risk changes over time do not follow the 'laws of formal probability').

5.3   FAMILIARITY

Familiarity is an influence on lay evaluations of risk, and is part of the wider construct of 'unknown risk'. At this level familiarity is associated with personal experience of risk, risk knowledge, perceptions of controllability, and can be mediated by media coverage of hazards (Weyman and Kelly, 1999), though less than might be presumed (Kasperson et al , 2003).

On drawing conclusions from the cognitive perspective on risk perception, Weyman and Kelly (1999) suggest there is evidence that people over estimate risks they are unfamiliar with and

under estimate risks with which they are not familiar. Such biases are accounted for by availability and simulation heuristics. These forms of cognitive bias relate to the ease with which such events can be recalled, or the way that direct experience of a risk encourages an individual to believe that the likelihood of repeat occurrences of the risk are higher than they really are. The sensational aspect of a risk can also contribute to the ease of recall, and thus reportedly lead to an overestimation of risk, especially where there are associations with 'dread' (Weyman and Kelly, 1999). Conversely, Weyman and Kelly (1999) report of instances where experience of risk is not associated with deleterious consequences resulting in 'unrealistic optimism'. They quote Kasperson et al (1992) who observe that the nature of the feedback from direct experience of risk can either reassure or induce anxiety.

The research by Walker et al (1998) provides evidence from a socio-cultural perspective that individuals who reside close to hazardous installations exhibit reduced levels of anxiety about the hazard. Though as Weyman and Kelly (1999) point out, 'locality may be insufficient in itself to explain reduced levels of anxiety'. Walker et al (1998) suggest that economic involvement and direct experience with the site are also required for the reduction of anxiety in individuals. Weyman and Kelly (1999) conclude that it is a combination of 'familiarity due to geographic locality', 'economic cost benefit trade-offs', and 'vested interests of stakeholders' that contribute to the perception of the risk of major hazard sites.

Weyman and Kelly (1999) also illustrate how local familiarity with risk (or lack of) can influence the authority of sources of risk information. 'People react against not having their expert/lay knowledge of conditions at the coalface taken into account. Furthermore if the advice given by the authorities and scientists is clearly flawed to the extent that it demonstrates their ignorance of real world conditions this will further serve to undermine their credibility' (Wynne, 1992, cited in Weyman and Kelly, 1999, p. 42).

Familiarity with a risk can also relate to mediated knowledge of a risk, and not just direct experience. Hornig Priest et al (2003) question the assumption that higher levels of science literacy result in lower levels of perceived risk, and so greater acceptance. Their research into predicting support for biotechnology across Europe and the USA found weak correlations between these variables. This provides support for criticisms of the 'deficit model' that judgements of risk acceptability involve wider belief and value systems, and are not just dependent upon improving the quality of the risk information to the public.

5.4   TRUST AND DISTRUST

People's perceptions of risk are not often based on direct experience, but through information that is mediated from different sources. Therefore the issue of trust in bodies that manage risk, and in risk information, has become increasingly central to understanding the public's perception of risk (Hunt et al, 1999, Poortinga and Pidgeon 2003, Siegrist et al, 2000, Weyman and Kelly, 1999).

Trust is an ambiguous concept, which is not defined by a single objective factor. A number of studies have attempted to define the type of judgements people make that determine their level of trust in institutions. Walker et al (1998) cite the work of Kasperson et al (1992) as indicative of these conventional trust attributes, describing social trust as defined by four expectations:

1.   Expectations about the commitment of an organization to meeting its obligations

2.   Expectations about the organization's competence over time to meet those obligations

3. Expectations about the extent that the organization cares about those to whom there is a relationship of trust

4. Expectations about the extent to which the obligations are expected to be met

Renn and Levine (1991) (cited in Weyman and Kelly, 1999, p. 29) define trust according to five attributes. Again the notions of responsibility and capability are central:

1. Competence – technical expertise

2. Objectivity – lack of bias

3. Fairness – all points of view are considered

4. Consistency – of risk messages over time

5. Faith – perception of good will of the message source

Criticism can be raised to the extent that these attributes are considered discrete. There would appear to be the potential for some overlap between the attributes of objectivity and fairness. There is also the need to distinguish between different levels of trust, e.g. interpersonal and institutional/social (Poortinga and Pidgeon, 2003). Questions also exist as to whether these attributes do underpin individual's evaluations of trust, but rather mask less socially desirable judgements based on similarity of values.

Trust is also conceptualised as a strategy or heuristic that is used by the public to reduce the complexity of a hazard, or when they possess insufficient knowledge of the hazard (Siegrist et al, 2000). Explanations move away from rational models of decision-making, to incorporate explanations rooted at the societal level of shared values. Under these situations it is suggested that agreement and similarity of values determine trust, as opposed to rationalistic evaluations of the other party's competency. This is indicative of the distinction between 'value rationality' and 'instrumental rationality' (Bruce and Tait, 2003). An example of this approach is the 'salient values similarity' (SVS) theory of social trust (Earle and Cvetkovich, 1995, Siegrist et al 2000).

Attempts have been made to incorporate the more traditional multi-dimensional models of trust with the value similarity approach. Siegrist et al (2003) propose a 'dual mode model of social trust and confidence', incorporating the 'competence' attribute from the more conventional definitions of trust. In this model social trust is conceptualised as the perception of value similarity, and confidence in the perception of the other's performance. Siegrist et al (2003) suggest that in the context of electro-magnetic field (EMF) risks, social trust and confidence impact upon an individual's willingness to accept risk. However, Poortinga and Pidgeon (2003) are sceptical of the universal influence that SVS may have in explaining the perception of risk regulation. They suggest that value similarity might be of relevance for hazards with which there is a low familiarity, though they are not convinced whether value similarity is a discrete component of trust.

Poortinga and Pidgeon (2003) question whether the complexity of traditional multi-dimensional models of trust is necessary. They sought to find out which of two models of trust (as a two dimensional concept) provided the best account of public trust in government risk regulation. They concluded that the two factors that provided the greatest account of the variance of trust in government risk regulation were a general trust dimension, and a scepticism dimension. Though

they also highlight the difficulty in untangling judgements of trust in specific government policies, as opposed to the wider issues of governance.
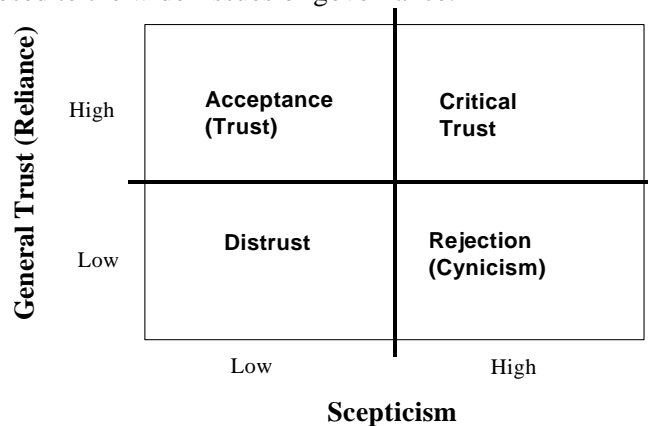

Figure 1. The Typology of Trust   (Source Poortinga and Pidgeon 2003)

Poortinga and Pidgeon (2003) propose a typology of trust based on the dimensions of general trust and scepticism (figure 1). They imply that this typology has an implication for public participation procedures, i.e. that it is beneficial to consult with people who are categorised as exhibiting critical trust, as they will engage in a way that is balanced and reasoned, and neither blindly accepts or rejects the issue under consideration.

Slovik (1999) emphasises that one of the main characteristics of trust is that it is 'fragile', and that there is an asymmetry between creating and destroying trust, i.e. that trust can be destroyed quickly but takes a longer time to be developed. Events that destroy trust are more visible than events that build trust, and so contribute more to influencing attitude. He cites that trust destroying events carry more weight than events that build trust, and that 'sources of trust destroying news are more readily believed than sources of good news' (Slovic, 1999, p. 698), a tendency that is reinforced by the practices of the news media (see Breakwell et al, 2001). This observation that messages indicating risk are trusted more than messages about the lack of risk is confirmed in a study by White et al (2003). This explanation emphasises the content of the risk information as the determining factor for acceptance. But to what extent do factors at the level of the receiver determine the interpretation and acceptance of risk information? Weyman and Kelly (1999) note that 'what people want to know is not summary estimates, but substantive information of what a hazard is and how it works' (Bostrom et al, 1992, cited in Weyman and Kelly, 1999, p. 47).

Trust in information sources would also seem to be dependent in part upon the nature of the risk. Weyman and Kelly (1999) cite findings from Jungerman et al (1996) showing that for some risks, information from certain groups is perceived as most honest, e.g. information on environmental risks from environmental pressure groups. Hornig Priest et al (2003) move to a conception of trust as an act of active choice by an individual between the competing knowledge claims of various social institutions, based on the trust given to opposing social institutions ('weighing the truths'). The gap in the levels of trust between pairs of opposing social institutions being predictive of support for some applications for biotechnology at a national level. Though this approach can be criticised for an oversimplification in the way it places risk information oppositionally. Weyman and Kelly (1999) suggest that the issue of credibility in sources of risk information extends to incorporate the historical profile of the institution providing the risk information. Poortinga and Pidgeon (2003) suggest there is a need to investigate how the individual's familiarity with the institution informs judgements of trust. The significance of risk information from official sources is downplayed by Liebow et al (1993)

(cited in Walker et al, 1998, p. 9), suggesting that people do not actively seek risk information from official sources, rather they base their risk judgements on information gained in their everyday activities. Walker et al (1998) consider there is a reinforcing effect between risk awareness and concern, such that increased levels of concern might sensitise individuals to notice and seek out risk information. This suggests that there is perhaps not such a direct linear relationship between trust and perception of risk, as the literature might suggest, and that risk information is integrated in relation to existing concerns and knowledge.

Cognitive psychology and decision-making research have not traditionally posited explanatory value on how motivational variables may influence the acceptance of risk (Kasperson et al, 2003). White et al (2003) suggest that prior attitudes to the hazard mediate the way the positive or negative aspect of the message is trusted, i.e. that 'people with negative attitudes distrust positive messages. They conclude that people have more trust in messages that are congruent with their prior attitudes, and that 'greater trust in negative messages about hazards may be a product of a 'confirmatory' rather than a 'negativity' bias' (White et al, 2003). Frewer (2001) considers that prior attitudes create a feedback cycle, which explains how attitudes to certain hazards can be resistant to change. The work of Frewer et al (2003) (into the mediating role of trust in communicating about the risks and benefits of genetically modified food) is also suggestive of the alternative view that trust is not a precursor of risk attitudes, but a consequence of pre-existing attitudes towards the source of the risk. Attitudes to the hazard guide peoples' perceptions of the motivation of the organisation providing the information on risk. This leads to considerations that perhaps the concepts of trust and distrust are not opposing ends of the same continuum, but separate concepts, relating to positive or negative attitudes about a hazard. This raises the question of how people trust information about new or emerging hazards, i.e. ones about which they have no prior attitudes. This can be seen as further evidence in support of claims that perception of risk is informed by 'world views' or wider values.

5.5   THE FRAMING OF RISK

There is a growing body of evidence that 'public' perceptions of risk do not reflect models of rational choice, or the axioms of probability (Gaskell and Allum, 2001). The work by Paul Slovik and his colleagues indicated that lay perceptions of risk differed in a systematic way from more empirical assessments (e.g. that lay perceptions of numbers of fatalities for low probability hazards were over-estimated, whereas high probability hazards were under-estimated). Walker et al (1998) suggest that it is perhaps misleading to compare lay and expert perceptions of risk in terms of cognitive bias (the implication being to explain the inaccuracy of lay judgements in terms of recognisable patterns of distortion). 'Instead it may be a problem of people operating with quite different (and perhaps incommensurable) frames of reference' (Walker et al, 1998, p. 9).

The way an individual's understanding of risk can be influenced by semantic differences in the way that the risk information is referred to as cognitive 'framing effects' (Weyman and Kelly, 1999). Weyman and Kelly (1999) indicate that one of the most widely researched effects is the 'domain effect'. They summarise the results as 'where risk information is framed in the domain of 'gains' people are generally risk averse, conversely, where decision options are framed in the domain of 'losses' people tend towards risk-seeking, in order to minimise loss.' Kahneman and Tversky's 'Prospect Theory' (cited in Gaskell and Allum, 2001) addresses the discrepancy of why people's decision making in assessing risk does not follow models of rational choice based on maximising utility. The utility (or value) arising from a risk in terms of gains or losses is not judged as equal. A loss will carry a greater weight than the equivalent gain.

If the 'public' estimation of the frequency of a hazardous event does not conform to theories of probability, what other ways are used for estimating probability. One of the ideas put forward is

the use of simplified learning and problem solving shortcuts called heuristics. One idea is that the ease with which an event can be recalled relates to a higher perceived probability. Thus more dramatic events are proposed to be more easily recalled than commonplace less dramatic ones, and so estimated as occurring more frequently. There is an implication that the perception of these more dramatic events is amplified by the tendency of the media to report them as they are more newsworthy.

However, Weyman and Kelly (1999) conclude that framing effects have modest influences, and interact with a range of variables that can moderate or amplify these effects. Criticism of claims made regarding the influence of framing effects relates to the ecological validity of the empirical research that underpins it. This work is based on textual descriptions of risk as opposed to real life situations that are 'naturally framed', where the likelihood of alternative options is not known.

Weyman and Kelly (1999) note that 'predispositional variables' such as personal beliefs, values and past experience can frame perceptions of risk. In the variables that influence the social framing of risk, they cite Walker et al (1999) and list proximity effect, the effects of the geographical locality, social reference groups, and the interdependence of those at risk with the source of risk.

5.6 RISK COMMUNICATION AND NUMERICAL REPRESENTATIONS OF RISK

Weyman and Kelly (1999) note that traditionally the notion of risk has been expressed as probabilistic representations, and defined in terms of likelihood of consequences and an estimation of severity. 'Juxtaposing professional estimates of risks and public perceptions of risk has been a popular activity…Most of these studies confirm a clear discrepancy between the priority list of experts and the mean values of concerns among the general public' (Renn, in Kemp et al, 2002, p.129). The way that information on the number of fatalities is used for judging the importance of risk is seen as the main area of contention between technical risk analysis and lay perception of risk (Renn 2001, in Kemp et al, 2002). Walker et al (1999) state this position more emphatically that 'perceived consequences of an event appear to figure significantly in evaluations of technological hazards…[and] been found to be more important than the level of perceived risk of an event taking place in explaining demands for risk mitigation.' The discrepancy between expert and lay judgements cannot solely be due to the public's lack of expertise. The problem of representing probabilistic risk information can result in framing effects becoming a source of cognitive bias (Weyman and Kelly, 1999). They report on research that indicates that people respond differently to equivalent risk information being presented in different forms. The explanation put forward is that people focus on numerical cues (e.g. numerator values as opposed to denominator values) or 'anchors' that influence the judgements made.

Criticisms are raised of communicating risk in this way, as 'numbers alone may not suffice, especially when they refer to very small quantities or are expressed in unfamiliar units, the numbers may simply not 'speak' to people' (Morgan 1992, cited in Weyman and Kelly, 1999, p. 47). Weyman and Kelly (1999) report that subjective scaling techniques (presenting probabilistic risk information in the form of risk comparisons) have been used by some researchers to overcome the problems associated with people being able to understand statistical probabilities. These techniques are based on respondents classifying risk according to expressions of amount in terms of probability and consequence, and is often used to present risks that people are unfamiliar with, and anchor them to risks they have more understanding of. Weyman and Kelly (1999) highlight criticism of this technique as it depends upon 'a narrow, unidimensional view of risk, specifically one which relates to the likelihood of undesired

consequences.' This assumption contrasts the acceptance within the social sciences that lay conceptions of risk are based on a much broader range of variables than those implied by estimates of likelihood and consequence. There are also difficulties in interpreting such approaches, as 'real world risks' are 'multi-faceted', so expressions of amount are likely to vary between 'individual and groups of individuals.' Weyman and Kelly (1999) draw criticism to the assumption that the probability of two 'real world risks' can be directly compared, as 'in reality no two risk situations can be considered identical.' There are also questions regarding the appropriacy of this approach for risks with a very low likelihood. Frewer (2001) also raises similar criticisms of this 'Richter Scale' approach to judging relative environmental risks.

Weyman and Kelly (1999) also report on 'cumulative probability bias', or the difficulties people have in 'conceptualising the effects of cumulative risk' at both a behavioural level, and in understanding 'textual representations of probabilistic risk.' They also point to findings from risk communication research that indicate the need to present how risk accumulates with repeated exposure over time, instead of presenting a risk estimate based on a single instance.

5.7 PERCEPTIONS OF HAZARDOUS SUBSTANCES

'Intuitively, the scope for misconception and misunderstanding of risk appears to be greater for substances than for physical hazards' (Weyman and Kelly, 1999, p. 52). On the basis of the evidence presented from a number of studies within the psychometric perspective, Weyman and Kelly (1999) suggest chemicals will 'tend to score highly on the 'dread' dimension, and moderate to high on the 'unknown' dimension. Certain substances are seen as evoking 'highly emotional or affective reactions.' Weyman and Kelly (1999) also point to the differences in lay and expert understanding of what constitutes a chemical, and how the 'social profile' of a chemical may lead to perceptions of its risk amongst the lay population. 'In general it seems that the potential for inaccuracies with regard to lay understanding of toxic risk remains substantial' (Weyman and Kelly, 1999, p. 52).

5.8 THE CONTEXT OR THE INDIVIDUAL?

Weyman and Kelly (1999) report contention in attempts to combine cultural approaches offering broader explanations, and psychological approaches offering explanations at the level of the individual. Debate particularly centres on Dake's (1992) concept of worldviews operating as 'cognitive filters' in personal perception of risk. To some extent the disagreement is over the extent that explanations at the personal level are discrete from explanations at the social level, reflecting issues from the 'nature' versus 'nurture' debate. The operationalisation of worldviews by Dake (1992) being linked to the psychology of the individual, instead of being associated with the social context. Walker et al (1998) conclude that further evaluation is necessary, though Slovik (1999) reports strong correlations between worldviews and risk perceptions for a wide range of hazards.

There are other explanations of risk perception that attempt to link the level of the individual with that of the social. Walker et al (1998) draw attention to how the study of attitudes can be seen not just at the cognitive level of the individual, but based in a 'social discursive context'. Discursive psychology situates attitudes as social arguments, as opposed to mental processes. These arguments are formed within social interactions and dialogues (argument and counter-argument), which are situated within the wider social, political and cultural context. Differences in perception of risk across society can be explained as the defence of sectional interests, or the result of social processes (Weyman and Kelly, 1999). Disagreements over acceptability of risk, may not just reflect differing information or theoretical perspectives, but 'more fundamental value commitments with which particular groups identify (Pidgeon, 1998, p. 6). There are affective aspects to people's perception of risk that may be based on their 'strength of belief in

particular good or bad outcomes' (Eiser, 1994, cited in Walker et al, 1998, p.8). These beliefs can contain affective elements such as emotions and values that are 'shaped by a variety of social relationships and cultural commitments' (Walker et al, 1998).

The influence of affect (e.g. feelings or emotions) has received some attention as a factor for understanding public perceptions of risk, especially as some of the dimensions of trust can have affective properties (Poortinga and Pidgeon, 2003). Slovik (1999) also compares the notion of worldviews and emotion as being functionally similar, in that they both serve to orient individuals in their decisions. Affect can be defined as the 'positive (like) or negative (dislike) evaluative feeling towards an external stimulus' (Slovik, 1999, p. 694). Slovik (1999) suggests that the affective evaluation of a hazard is 'primary', and partly determines the risk and benefit judgements that are made for the hazard. He reports that risks and benefits of hazards are inversely correlated, such that '…higher perceived benefit is associated with lower perceived risk…' and vice versa. So when the affective judgement of a hazard is positive, the hazard is regarded as being of high benefit and low risk (see Prospect Theory p. 17). Though Slovik offers no explanation of the cause of the affective response, or the extent that it might not be an overarching concept, but be determined by the perceived characteristics of the hazard such as the 'dread' dimension.

Weyman and Kelly (1999) regard the debate over whether behaviour is determined by the individual or the situation as simplistic. They cite the position of Endler (1973) as being the most insightful, namely that the focus of investigation should be how 'individual differences and situations interact in evoking risk taking behaviour' (Weyman and Kelly, 1999, p. 53). Though Weyman and Kelly (1999) remark that this approach has not carried over into 'the majority of studies of perception of risk.' There would appear to be little change from this observation in relation to the current literature.

Weyman and Kelly (1999) note that there is a general consensus from the cognitive and socio-cultural paradigms that 'perceived risk likely owes more to the situation than the individual'. Though they add the caveat that a lot of this research has been 'funded, and directed, by public policy considerations' (Weyman and Kelly, 1999, p. 55), and so is likely to focus on situational differences as opposed to individual ones.

6   THE CRITERIA THAT DETERMINE PUBLIC CONCERN

For the purposes of regulatory decision-making, a number of attempts have been made to combine the insights from research into risk perception to define the criteria that influence the acceptability of risk to the public. Renn (2001, in Kemp et al, 2002) observes that the management of risk involves prioritising, and this process of prioritisation is based on risk reduction measures that are proportional to severity (where severity is a combination of the magnitude of harm and likelihood). He suggests this approach does not reflect the way that lay risk decisions can be based on a range of factors (such as equity, fairness, flexibility, or resilience) and not just the single aim of risk minimisation. He also suggests that this operationalisation of severity gives equal weighting to low-consequence, high-frequency events, and high-consequence, low-frequency events. This assumption of parity between the two types of occurrence does not reflect lay preferences, as 'most people prefer a risk that will kill a few people at a time rather than a risk that kills many people at once.'

If a pluralist conception of risk is accepted, e.g. that risk is based on a range of multi-dimensional attributes, the question arises of whether these attributes are equal, or whether they systematically vary according to the context or nature of the hazard. When deciding which risk criteria to choose to accurately reflect and predict public concern over a hazard, Fischhoff (2004) cautions that criteria 'express political-ethical values, whose importance should, arguably, be a matter of informed public debate.' This is especially relevant when deciding on the weighting of the criteria.

In selecting criteria to represent the dimensions of risk for the purposes of regulatory decision-making, Fischhoff (2004) raises a number of concerns regarding the attributes of the criteria. He states that the chosen criteria should:

    a. Span the risk space
    b. Express the specific concerns that are usually raised by citizens and policy makers
    c. Be able to be communicated fully
    d. Be able to be assessed by technical staff
    e. Be in a form that can be used within deliberative processes

He also states that many of the criteria are 'intangible' in that their potential effects are difficult to measure. A number of criteria are strongly correlated. Fischhoff (2004) cites involuntariness with equity, and uncertainty with catastrophic potential as 'dimensions' of risk that are quite constant across different risks, people rating risks and methods for rating risk.

The Treasury report on the principles of managing risks to the public (HM Treasury 2004), lists six indicators from the psychometric paradigm that can be correlated with public concern (based on Fischhoff's work). These six factors form the basis of a tool for allowing the assessment of 'non-expert views of risk.' The six factors are:

The nature of the hazard:
- Familiarity and experience of the risk – generally people are less tolerant of risks which are new to them, or about which they have little knowledge or experience.
- Understanding of the cause-effect mechanism – this refers to people's uncertainty of the cause-effect mechanism, which can relate to disagreement among the 'experts', or uncertainty in interpreting the risk information provided.

The risk's consequences:
- Equity of the consequences of the risk – are the effects of the risk and the associated benefits spread equally across society?
- Fear of the risk consequences – people are less tolerant of hazards if the associated harm is horrific, or if the harm is unknown and could be severe.

Risk management:
- Control of the risk – people are less tolerant of the risk if they perceive themselves as having no control over it
- Trust in risk management – people are also less tolerant of risk if they do not trust those responsible for managing the risk.

The acceptability of a hazard is in part determined by its perceived properties, or qualitative characteristics. Renn (2001, in Kemp et al, 2002) provides a list of variables that have been found to 'affect the perceived seriousness of risks,' which mirror those provided by Fischhoff (2004). These are: the expected number of fatalities or losses; the catastrophic potential; situational characteristics, and the beliefs associated with the cause of risk. The catastrophic potential describes peoples' perception of low-probability, high-consequence risks as more threatening than risks that are more likely to happen but with lower consequences. Other examples are equity and trust. If an exposed population is not seen as sharing any of the benefits of a risk (i.e. it is unfair), the risk can be perceived as more unacceptable. Risks are also perceived to be more manageable if the risk regulator or originator is trusted (Renn, 2001, in Kemp et al, 2002). Further qualitative factors are provided in Table 1.

Table 1 Qualitative Characteristics of Risk

QUALITATIVE CHARACTERISTICS	DIRECTION OF INFLUENCE
Personal Control	Increases risk tolerance
Institutional control	Depends on confidence in institutional performance
Voluntariness	Increases risk tolerance
Familiarity	Increases risk tolerance
Dread	Decreases risk tolerance
Inequitable distribution of risks and benefits	Depends on individual utility, strong social incentive for rejecting risks
Artificiality of risk source	Amplifies attention to risk, often decreases risk tolerance
Blame	Increases quest for social and political responses

(Renn, 2001, in Kemp et al, 2002)

The beliefs associated with the cause of risk describe how the perception of risk can be a product of a wider set of beliefs or attitudes relating to the hazard or the cause of the risk. Most people perceive risks as more serious if their wider beliefs about the risk have some negative aspect. It is in this way that people avoid cognitive dissonance, i.e. having to deal with conflicting beliefs (Renn, 2001, in Kemp et al, 2002).

Renn (2001, in Kemp et al, 2002) details the difficulties in selecting the factors that influence the perception of risk, if public concerns are to be included in regulatory decision making for risk. He describes the attempt to do this by the German Advisory Council on Global Environmental Change. The criteria selected were based on a meta-analysis of the findings from the literature on risk perception. The chosen criteria included:

- Extent of damage – the numbers of deaths, injuries or losses.
- Probability of occurrence – an estimation of the likelihood of the extent of damage occurring.
- Incertitude – to account for the different factors of uncertainty.
- Ubiquity – how the damage is spread geographically (intragenerational justice).
- Persistency – how the damage is spread over time (intergenerational justice).
- Reversibility – the possibility that the damage can be undone, and the original state restored.
- Delay effect – the delay between the event happening and the experience of the deleterious effects.
- Violation of equity – the discrepancy between those who benefit from the risk and those who do not.
- Potential of mobilization – the negative impact on individual, social and cultural values. Renn (2001, in Kemp et al, 2002) notes that this is the only social criterion that was included in the final list.

7   CONCLUSIONS FROM RISK PERCEPTION RESEARCH

The following paragraphs present a summary of the factors identified within the risk perception literature that might be expected to influence public concern over hazards. They are sub-divided into the level of the individual, and the wider social aspect.

7.1   INDIVIDUAL CONSIDERATIONS

Weyman and Kelly (1999) suggest that 'the scope for cognitive bias and fragmentation of risk knowledge is greater where risks are manifested in complex ways (e.g. where there is uncertainty or low understanding of the cause-effect mechanism of the risk), or where their effects are less tangible, or diffused, for example, by delays between exposure and the onset of symptoms of ill health,' (e.g. a delay effect).

At the level of the individual risk perception is a result of many factors, as opposed to judgements based on the likelihood of harm. A range of biases, framing effects, and heuristics is apparent in the way that individuals process risk perceptions that can lead to attenuation or amplification effects. Such examples include: availability bias, domain effects, and unrealistic optimism. However, these factors are moderated by contextual or situational variables, though the relationship is unclear their influence is not thought to be insignificant.

Long standing evidence from the psychometric approach to risk perception indicates that acceptance of a hazard is related to the qualitative characteristics of that hazard. The accepted range of characteristics include:

- The nature of the hazard – familiarity and experience of the risk; understanding of the cause-effect mechanism; uncertainty; voluntary exposure to the risk; artificiality of the hazard; violation of equity of benefits arising from hazard.
- The risk's consequences – ubiquity of the consequences of the risk (geographically and across time); fear of the risk consequences (catastrophic potential); delay effect (e.g. the salience of the risk is a function of delay in deleterious consequences); reversibility (potential to restore original state); negative impact on individual; social and cultural values.
- Management of the risk – personal control over the risk; trust and distrust in perceived institutional control of the risk.

There is indication that hazards should be judged on a case-by-case basis to account for the separate contexts of each hazard. There is little indication of the relative weights that should be afforded each characteristic, and the extent this varies with contextual factors.

7.2   SOCIAL CONSIDERATIONS

The 'dual nature' of risk relates to realist and constructionist approaches to risk, and the philosophical underpinnings of how risk can understood in any ultimately 'final' sense. The problem of integrating these two approaches is widely acknowledged, and is the central difficulty in incorporating public perceptions of risk into risk policy decision-making, due to the incommensurate epistemologies.

The findings from risk perception research that explore differences between genders and demographic groups are increasingly being interpreted from a cultural perspective (instead of individual differences) in terms of such concepts as marginalisation and exclusion. For example the findings that women are more risk averse than men is explained as differences in perception

of involvement in, and access to, risk decision-making processes (Frewer, 2001; Pidgeon 1998). This raises the issue of how perceptions of exclusion in risk management decisions are addressed in public consultation processes.

Walker et al (1998, p.10) state that the 'the argument that perceptions of risk are shaped significantly by contextual processes – rather than simply by risk probabilities or even risk characteristics – now commands widespread support.' The Royal Society report (Pidgeon et al, 1992) criticises approaches that reduce perceptions of risk to a single correlation within a model of risk, as this 'imposes unduly restrictive assumptions about what is an essentially human and social phenomenon (cited in Weyman and Kelly, 1999, p. 31). The precise mechanisms by which contextual processes operate are unclear, though some attempts are being made to provide more detailed descriptions and categorisations of context, e.g. the concept of specific locations framing attitudes to risk. Though local framing effects of risk can be moderated by economic trade-offs/dependency or vested interests.

Renn (2001, in Kemp et al, 2002) suggests that one of the major debates in risk management is a philosophical one between constructivism and realism, and concerns the nature of reality and what is knowable. On one hand the realist camp asserts that estimates of risk are 'objective', and correspond directly with the reality of observable hazards. At the other extreme, criticism has been raised that such estimates are not universal, but reflect the assumptions and conventions that have been learned by 'experts'. Cultural relativism is asserted over claims of universality. In holding that risk is at least in part a social construct, questions are raised as to the extent this position is a tenable one for the purposes of risk policy and management decision-making. Claims that can be made about risk are then relative, as the perceptions of any individual are equally valid, as there is no basis for any absolute knowledge claim about the risk to be made. Renn asserts that 'risk evaluation and management needs to reflect this debate.' Similarly, Renn (2001, in Kemp et al, 2002) asks whether risk assessments are 'constructions of human minds' or whether 'they represent physical entities that are independent of subjective judgements?', before concluding that both positions need to be acknowledged as there is a 'dual nature' to risk. How to integrate these opposing rationalities into risk policy decision-making is 'far from clear' (Walker et al, 1998). A less extreme position for integrating these approaches is to see risk as an interaction between the social and cultural processes and variables that construct risk, and the factors that can be regarded as innate to individuals, and separate from the social learning process. Weyman and Kelly (1999) conclude that there has been little research into how cultural influences on perception might interact with more cognitive variables, and summarise that there is an acceptance of the limitations of approaches that do not account for social and cultural influences. The Royal Society Report (1992) also concluded that one of the major considerations for research into perception of risk is to combine psychological and sociological approaches, something that does not appear to have been taken forward within the current literature.

Research into risk perception is increasingly rejecting single theoretical perspectives, especially where perceptions of risk are not through direct experience, but are mediated, e.g. via the mass-media. There is indication that the public responds to media coverage of hazards in a more rational and active way than might be presumed. Neither is the relationship between media coverage and risk perception as unidirectional or directly proportional as might be thought. There can be differentiation at a national and local level, between risk amplification and attenuation. People's direct experience of a hazard can influence amplification effects, especially as media accounts play a more important role in people's interpretation of hazards when they have less experience or knowledge of those hazards.

Trust in institutions that manage risk is important for mediating amplification effects. Evidence suggests that when the public is less familiar or directly involved with a hazard, trust in risk

management institutions can act as a heuristic for mediating judgements of risk acceptability. There is some suggestion that distrust is a separate factor to trust, and that there is an asymmetry between the two. Existing attitudes to hazards are also important in framing trust in risk information, giving more support to the idea that risk perceptions are influenced by social values, or that they are socially framed.

7.3 IMPLICATIONS FOR HIGH HAZARD INDUSTRIES

There is considerable support for assessing perceptions of risk in relation to the context in which they arise, and not as separate entities (Frewer, 2001). However, the contingent nature of explanations that emphasise context, limits the possibility of generalising knowledge claims across a wider range of contexts (Fischer, 2003). It also raises the problem for generating evidence on which empirical approaches to policy decision-making (such as permissioning regimes) can be based.

There have been relatively few studies into the perception of risk by the public for high hazard industries. Within this body of work a significant amount of research has focused on risks of long-term toxic exposure (Walker et al, 1998). Though Walker et al (1998) express concern at transferring conclusions from one type of site to another. They also raise concern whether research findings from other countries can be applied to the UK because of the social, cultural and political differences.

Walker et al (1998) report that a number of studies show that residents living near to high hazard sites express less concern about the site than those living further away. They cite the work of Wiegmann et al (1991) who attribute the effect in part to economic dependency, but also on residents learning that they are not in danger from the site through a process of 'experiential verification'. Walker et al (1998) relate this to the issue of 'correcting cognitive bias'. However, they offer alternative explanations that are suggestive of greater complexity and show that it is problematic to accept such results at face value. Walker et al's (1998) alternative explanation is that the expressed lower levels of concern are a facet of a conflict between high concern, and low levels of perceived control. So residents are actually concerned, but they express a low level of concern to cope or defend against the discomfort of their perception of lack of agency. In effect they deny, or lie to themselves regarding the extent of their concern. This also relates to the self-reinforcing relationship between risk awareness and risk perception, and issues of cognitive dissonance.

7.4 METHODOLOGICAL CONCERNS

A number of criticisms are raised regarding the methodologies used to investigate risk perception that are relevant to high hazard industries, principally:

- It is problematic (e.g. lacks ecological validity) to measure perception of risk separately from the context in which it is experienced, or at least without acknowledging the context in which it is experienced. This applies to hazards at both a local and national level.
- It is also problematic to measure what someone has not experienced or considered previously. This introduces the need to educate the participant about the matter in question. Not only does this educational process need to be conducted consistently and systematically, and in such a way as to minimise framing effects, it confounds data generation and collection. It is likely that the public is not familiar with the concept of permissioning regimes.

- It is important that data collection methods do not impose conceptualisations on the participants, nor researchers frame the problem according to their own values. Thus limiting the range of responses that participants are able to give.
- When the public is asked to compare risks, care should be taken on how the information is presented, e.g. risks presented as probabilities can be difficult for people to understand as they focus on issues of consequence. There are also problems in comparing risks, as in the 'real world' risks are multi-faceted and not identical.

Levels of social trust and perception of risk could well be a function of the familiarity with the regulatory institution or hazard. Studies that focus on more specific or less generalised aspects of a hazard, engender more complex views from participants, especially in relation to economic dependence, place, identity and stigma (Poortinga and Pidgeon, 2003). So the level at which the perception of risk is investigated (e.g. local or national) needs to acknowledge the participants' familiarity with the hazard, as this can influence the level of complexity of their judgements of the acceptability of risk.

The following sections examine the purposes, processes and concerns of stakeholder engagement.

8 PURPOSES OF ENGAGEMENT

Why, and to what extent should 'public'[1] concerns be integrated into the regulatory decision process? There is a wide range of opinions arguing for greater 'public' participation in risk decision-making based on enfranchisement and the view that 'public' risk perceptions represent legitimate concerns, and not just noise or bias. This can be seen as part of a wider trend within the organisation of policy decision-making, from 'government' to 'governance', e.g. a changing emphasis from a top down to a bottom up process. Equally there are criticisms of the 'technocratic' approach to decision making, especially that the emphasis on empiricism fails to acknowledge the complexity of the situation under consideration, and leads to a pre-framing of the problem in a way that excludes wider concerns (Fischer, 2003, European Commission 2004).

How risk is understood also has implications for decision-making within the regulatory process. If risk is in part accepted as a social construct, then the corollary is that the 'public' judgements must be included to account for the social element, and that such participation can help to foster trust in the risk management institutions (though the process can be employed uncritically) (Kasperson et al, 2003). As it is the public that will be affected by hazards, then their involvement is required for defining tolerable risk levels (Renn, in Kemp et al, 2002, p. 128).

The public inquiry into building the Sizewell B reactor has influenced current policy on public consultation[2] (Pidgeon, 1998). The inquiry recognised that risk assessment was a combination of science and the values expressed by the public, so that public opinion underpinned the evaluation of risk. The legitimacy of regulatory bodies' decisions is in part dependent upon public trust in these institutions. 'What we know about the conditions that foster distrust suggests that moves to go beyond traditional approaches to risk communication and increase public participation in the process are likely to increase the legitimacy of risk management procedures and at least create the possibility of a reduction in public distrust' (Walker et al, 1998, p. 13). Slovic (1999) argues a similar position that public participation increases the legitimacy and acceptance of such decision-making. To this end the diversity of 'public' viewpoints should be considered, as well as ways of informing such groups and challenging their biased perceptions. The acknowledgement of the limitations of the 'deficit model' also results in less emphasis on expert judgement. The consultation document on managing risks to the public (HM Treasury 2004) states that the 'public can reasonably expect to be consulted' as reliance on experts can be criticised for assuming a consensus of expert opinion, and not reflecting public concern.

Pidgeon (1998) summarises the main arguments on ethical and epistemological grounds in favour of incorporating risk perception into regulatory decision-making:

1. People should be able to influence regulatory decision making on risks that affect them.
2. Public perceptions reflect basic 'values' and preferences regarding risk, and not just the absence of information.
3. Perceptions are not abstract, but lead to actions and consequences.
4. Experts can be biased as risk assessment involves some value judgements.

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[1] The term 'public' is used as a matter of convenience. The limitations of the term are acknowledged, especially the implication of an undifferentiated, homogeneous group.
[2] The terms 'public consultation' and 'stakeholder engagement' are to some extent used synonymously throughout the literature. A broad differentiation is made in this report that 'stakeholders' are more familiar with the hazard under discussion, than the 'public'.

5.   Lay risk perspectives can inform expert judgements (e.g. idealised conceptions).

There are some criticisms of the conception of consultation as simply being a process of enfranchising the public. These criticisms highlight the secondary agendas for regulating authorities that are potentially served by the consultation process. Power (2004) points out that the incorporation of the public into regulatory decision making processes also serves to legitimise regulatory activities and helps those bodies to manage their reputation through the diffusion of potential culpability.

Renn (in Kemp et al, 2002, p.129) states that the public perception of risks is 'diametrically opposed' to the calculated numbers of fatalities and 'risk numbers of the risk professionals'. This discrepancy has lead many 'experts' to argue against incorporating public perceptions of risk in the decision making process as such estimates will be inaccurate (due to cognitive bias or social amplification effects, etc) and so result in attention being given to minor risks as opposed to greater risks that do not have such a high public profile. Pidgeon (1998) summarises five arguments against using public perception of risk regarding the allocation of resources for regulating High Hazard industries. These arguments in part reflect the tension between positivist and constructivist approaches to risk:

1.   The public does not have the knowledge to accurately evaluate risks. Their judgements are subject to noise and bias, and not consistent over time.
2.   Risk perceptions might reflect broader social prejudices towards particular groups, in particular the group's potential for invoking blame and thus being valued less.
3.   Managing risk means managing public perceptions as the public does not understand the nature of the risk.
4.   The public is not homogeneous in its perception of risk. Reducing the plurality of perceptions of risk to a single representation is problematic.
5.   Knowledge claims from social science are relative and bounded by social context, so it is difficult to justify basing regulatory policy on these findings.

The purpose of engagement as providing a means of reconciling these incommensurate approaches to risk is one that is being increasingly advocated. Though at times little distinction is made between gauging 'public' opinion and incorporating this judgement into the decision making process.

Renn (2001, in Kemp et al, 2002) describes risk as having a dual nature. By this he means that there are 'physical as well as socio-cultural aspects of risk.' He suggests that the two approaches could be integrated, such that socio-cultural aspects of risk determine the prioritisation of the issues of concern, and the extent of the consequence is quantified by technical risk assessment methodologies. Renn suggests that defining risk as a combination of hazard and outrage is a way of combining 'expert' and public perceptions of risk. 'Although the formula of 'risk equals to hazard and outrage' does not provide any clue of how to combine scientific assessments with public perceptions' (Renn, in Kemp et al, 2002, p. 129).

Pidgeon (1998) also states that the onus is on social science researchers and risk analysts to create more optimal conditions that lead to better judgements. Gaskell and Allum (2001) conceive of 'two cultures of risk' that form a division that reflects differences in 'expert' and 'lay' approaches to risk. They suggest that the purpose of consultation is to bridge this divide, and that 'in an ideal world, perhaps the bureaucrats (regulators and politicians) would hold the ring between these positions institutionalising the ways in which the competing parties are

represented, the public interest served and safety ensured' (Gaskell and Allum, 2001, p. 7). Renn (2003) puts forward the position that the process of participation presents a learning experience for citizens, that allows them to reflect on their judgements and acknowledge the 'bias' in their perceptions, and so arrive at more measured policy recommendations. Though concern is raised regarding the calls for greater public participation that do not specify any method by which this should be undertaken (Slovic, 1999).

If '…acceptable risk decisions require judgements both about the scientific issues involved and the ethical or value principles to adopt in allocating resources and distributing unavoidable harm across a society. The question then becomes one of deciding how far expressed risk perceptions do tap value and ethical issues that should count in any appropriate decision process, and then how to incorporate these with the best available scientific information there is' (Pidgeon, 1998). However, this decision making process is further obfuscated as there is evidence that public perception of risk is not a good indicator of public priorities for allocating resources to mitigate risk (Frewer, 2001). Frewer (2001) suggests the involvement (and expressed desire to be involved) in risk management decisions by the public is more closely associated with priorities for reducing risk than their perceptions of risk. This highlights concerns over the differentiation of judgements of risk acceptability between members of the public who are involved or uninvolved with the issue at hand. As public perception of risk is contingent and subject to change, the problem is further compounded by deciding which public understandings of risk should, or should not, be acknowledged at any specific point in time (Power, 2004).

The challenge for consultation processes is to provide '…a concept for evaluation and management that on the one hand ensures integration of social diversity and multidisciplinary approaches, and on the other hand allows for institutional routines and standardised practices' (Renn, in Kemp et al, 2002, p. 127).

The following section looks at the relative merits of public consultation processes, and the incorporation of public understanding of risk into the decision making process.

9   PUBLIC ENGAGEMENT PROCESSES AND CONCERNS

This section outlines the process of incorporating public judgements of acceptance into risk decision-making, and also concerns arising from these actual consultation methods.

9.1   THE PROCESS OF CONSULTING

Information and guidance on the process of consulting is at a high level of generality, which in part is a reflection of the contingent nature of the process. Frewer (2001) categorises the different methodologies of eliciting public perception of risk along the continuum of high and low deliberative input. Deliberation is the process of discussion between parties to arrive at consensus that results in decisions. Survey methodologies are seen as low in deliberative input, whereas citizens' juries are high. The six modes of consultation proposed by Seargeant and Steele (1998) also fall within this continuum. Though they suggest that there is a trade-off between richness of data and generalisability within this continuum, e.g. the data from a large survey can be seen as more generalisable than a focus group, though the focus group may yield data that is richer, i.e. the issue has been considered in more depth.

Renn (2001, in Kemp et al, 2002) highlights three levels of discourse at which the deliberative process can take place for the management of risk, and whether public involvement is appropriate at the level or not:

- Cognitive discourse – involves the 'most adequate description or explanation of a phenomenon' by experts.
- Reflective discourse – involves deciding the balance between the competing trade-offs of too much, and too little caution, e.g. the importance of concerns or the weighting. This process can involve stakeholders and public interest groups.
- Participatory discourse – is 'mainly appropriate as a means to search for solutions that are compatible with the interests and values of the people affected and to resolve conflicts among them' (Renn,2001, in Kemp et al, 2002).

This distinction between assigning priorities and resolving differences is apparent in the technique Fischhoff (2004) describes (developed by Carnegie Mellon University) for integrating and triangulating individual and group perceptions of risk. The first operation involves holistic rankings, and providing attribute weights. These are used to determine priorities. The second operation involves self-study and group discussion in which differences can be reconciled.

Frewer (2001) posits two basic evaluation criteria for public participation exercises: acceptance criteria (public acceptance of a procedure), and process criteria (the effective design and implementation of the participation procedure). Frewer (2001) suggests that the operationalisation of these evaluative criteria enables participation exercises to be compared more effectively at different points in time.

Acceptance criteria include:
- Representation – are the people involved in the participation, a representative sample of the population that the issue affects?
- Independence – the participation is managed in an unbiased way.
- Early involvement – public involvement should occur early enough to influence decisions.
- Influence – outputs should have a genuine impact on policy, and be seen to reflect differences in desired outcomes among the different 'publics'.

Process criteria include:

- Transparency – decision-making processes should be clear to observers.
- Resource accessibility – participants should not be prevented from engaging in participation due to insufficient resources. Resources can include such aspects as provision of information.
- Task definition – the task should be defined from the outset to limit misunderstanding as far as possible.
- Structured decision making – to enable the underlying reasons behind decisions to be examined.
- Cost effectiveness – the allocation of resources must be proportional to the importance of the policy issue to be discussed.
- The use of multiple methods – to avoid relying on one single method, which may produce a certain type of result.

Seargeant and Steele (1998) suggest that the drivers for the consultation process are also an important consideration for determining the process. They categorise drivers in three types (though the extent that they are separate or discrete is unclear):

- Specific – including uncovering the needs of a particular group.
- Contextual – including the belief in the value of consultation, and the desire to reach a consensus or secure public support.
- Instrumental – including resolving disputes, and compliance with the requirements of others.

Seargeant and Steele (1998) also identify four logical and logistical factors that influence the process of consultation, these include:

- The cost.
- The amount of interaction required from all parties.
- The type of information that is required to be given to the participants (e.g. level of complexity); and the type of information that is required as an outcome of the consultation process (e.g. how reliable).
- The reliability and replicability of the results.

Seargeant and Steele (1998) advocate that planning the consultation process requires consideration of the combination of the drivers and logical/logistical factors. The optimal process they suggest is:

- Matching the specific drivers with the methods.
- Checking that the requirements of the contextual drivers are served by the method (e.g. if involvement is a key issue, then more deliberative approaches such as discussions are appropriate).
- Checking the needs of the consultees (i.e. level of involvement, strength of opinion /motivation) against the proposed method, e.g. if the participants have no prior knowledge of the issue then a more deliberative method with an educational element is required.

The work by the European Commission into inclusive forms of governance (European Commission, 2004) identifies a number of factors that are required for effective deliberative procedures. These include:

- Participants of the deliberative process need to be able to define the scope of the debate and the issues to be considered from the outset. Participants should be given equal access to participate. Barriers to participation could be elements such as: lack of information that is understandable, or lack of access to expertise.

- There should be mutual trust among participants and a commitment to a joint conceptualisation of the issue under discussion. As well as a joint recognition that the deliberative process is transparent, legitimate and fair. To this extent, the differentiation of decision framing, and decision taking is recommended.

- The outcomes of the deliberative process should be flexible and open to revision (though the factors that determine this contingency, and its extent, are unclear).

Renn (2003) describes the process for the inclusion of the public in the decision making process for the siting of incineration plants in Germany. The stages of the process were notable in that they were not radically different from standard decision-making practices. The stages included:

- A group agreement of values, and their relative structure.
- Deciding the criteria for collecting information from each site.
- Deciding the weighting for each criterion.
- Deciding a ranking of the sites relative to the agreed criteria.

The success of the process was in part attributed to it being perceived as fair and transparent by the participants, which points to the idea that it is not just the prescription of the process that is important, but the participants' acceptance of the process as being capable of achieving the desired ends. Fischer also (2003) highlights the difficulty of defining prescriptive methodologies or formulas for public consultation. He describes a participative process similar to Renn's, but focuses on refining the information that is required to make a decision. Participants are given reading material on the issue, from which they develop questions. They then get additional information from experts to help focus their questions. There is then a conference where experts present their evidence and are cross-examined by participants, who then prepare a consensus report as a final outcome (Fischer, 2003). This process appears to be more explicitly modelled when issues are polarised into opposing view points.

Renn (2003) stressed that the citizens were able to understand the complex and sometimes ambiguous scientific information, but that the role of the moderators (who were responsible for organising the participation exercise) became crucial in managing this aspect, especially in providing the necessary information that was requested by the citizens. It was felt to be important that the groups perceived that they had the necessary information with which to make a balanced judgement. Renn (2003) also cited survey evidence that the citizens had more faith in the outcome of public participation after their involvement. Fischer (2003) also suggests that the public's capability to deal with scientific information is greater than estimated, especially when the deliberation process is suitably structured and organised. He emphasises the role of the person managing the deliberation process, defining them as a facilitator whose role is to encourage participants to be self-critical in their interpretive judgements. The importance of 'mediation capabilities' is also emphasised in the approach to risk governance advocated by the European commission (European Commission, 2004). Similarly Seargeant and Steele (1998) talk of the importance of managing the process of consultation. They identify three factors:

- To clarify and explain the mediator's role and responsibilities.
- To explain the consultees' roles and responsibilities.
- For the mediator to understand the consultees' motivations and expectations.

The link between participatory processes and the decision for the final outcome was found to be unclear and weak (European Commission, 2004). Seargeant and Steele (1998) also identify the outcomes of the consultation process (especially decisions and the resulting implementations) as the weak point of the participation case studies they examined. The absence of final decisions was also regarded as likely, though the setting of targets was considered one way to prevent this. This suggests that it is not in effect a unidirectional, mechanistic process leading to the final outcome (as some of the models might suggest), but that there remain confounding factors, that are less apparent, but influence the deliberative process. Seargeant and Steele (1998) emphasise how the separation of the outcome of the consultation process, and the final decision making process to implement the outcome, has more potential to result in an outcome that is less relevant to the participants of the consultation. They cite examples where the results of the consultation process were not what was expected or desired by the commissioning organisation, and so the decision on the final outcome is then determined by the organisational requirements. Seargeant and Steele (1998) suggest that final decision-making process needs to be specified as part of the consultation process, to help avoid such problems, and that such specification requires:

- The identification of end points.
- That decision-making involves the right people at the right levels.
- That decisions must relate to the purpose of the exercise.
- That decisions must produce outcomes which are understandable, relevant and usable for the participants of the consultation.

In terms of judging the outcomes of a deliberative process, Fischer (2003) suggests that there are four factors or levels that must be satisfied for knowledge to be judged as acceptable. These factors are:

- The technical-analytical discourse – e.g. the scientific concerns.
- The contextual discourse – e.g. the concerns of the specific situation.
- The systemic discourse – e.g. concerns of society.
- The ideological discourse – e.g. the overarching ideological concerns.

9.2 CONSIDERATIONS WHEN CONSULTING THE PUBLIC

A number of concerns have been raised regarding deliberative processes. Renn (2001, in Kemp et al, 2002) cites Coglianese's (no year given) summary of the criticism as 'pathologies' relating to:

- Tractability having priority over public importance.
- Regulatory imprecision.
- The lowest common denominator problem.
- Increased time and expense.
- Unrealistic expectations.
- New sources of conflict.

The work by the European Commission into inclusive forms of governance (European Commission, 2004) identifies a number of obstacles to effective deliberative procedures. These include:

- Failure to distinguish between the issues of the risk posed, and whether the benefits offered by the risk justify its adoption.

- The risk is defined in a certain way, or preframed, from the outset, in such a way that does not acknowledge the conceptualisations of other stakeholders.
- Decisions have been imposed from a national or global perspective or justification, but fail to acknowledge the local context of the implementation.
- The failure to integrate scientific and social judgements of risk, and the differentiation of scientific risk assessment as separate from risk management.
- The emphasis on scientific consensus and certainty, while understating the polarity of opinion, in order to obscure the judgemental nature of the decision making process.
- The failure to acknowledge when a decision practically needs to be made in the face of uncertainty, and not just discuss the issue theoretically, or 'plug the expertise gap'.
- Decisions are subsequently found to be restrictive, but are difficult to reverse, e.g. due to the pressure of public opinion.
- Lack of trust in the decision maker by the stakeholders.
- Stakeholders are involved, but perceive that they have no influence on the deliberative outcome.

Participative approaches are time consuming and resource intensive, they do not guarantee consensus, and the selection of participants can introduce systematic bias into the participatory process (Fischer, 2003, Pidgeon, 1998). '…The extent to which the process is democratic remains problematic' (Power, 2004, p. 19). The importance of identifying and choosing stakeholders is also raised by Ball and Boehmer-Christiansen (2002), and suggestion is made that motivations as well as stated positions of stakeholders need to be acknowledged. Poortinga and Pidgeon (2003) suggest that a typology of trust can help determine relations between risk regulators and citizens, for incorporating public perceptions of risk into decision-making processes. Whereby citizens with a critical level of trust are regarded as most suitable as they are willing to engage with the risk regulator, but not unconditionally or uncritically.

Deliberative methods can be criticised for the extent that the participants involved are a representative sample of the wider population (Seargeant and Steele, 1998), e.g. that the opinions of a small group can be generalised, and presumed to reflect those of a wider group. This is especially so when the participants' motivation and involvement in the issue may not be reflected in the wider populace, e.g. if the participant is a member of a Special Interest Group (SIG). Fischer (2003) emphasises a definition of relativism that focuses on individual perspectives, as opposed to criteria. Groups of citizens and experts can then become redefined as 'interpretive communities'. Representative selection then involves including participants from these different perspectives, as opposed to any socio-demographic distinction. Fischer (2003) observes that the process of interpretation is common to both expert and normative knowledge claims, and suggests the possibility of interpretive processes bridging the divide between these groups. Though little insight is given as to how this should be done

An important distinction is made between participants who already have prior knowledge and engagement with an issue and those who do not (Seargeant and Steele, 1998). If public understanding of risk issues does not exist *a priori*, then the deliberative process may well require that participants receive some education about the matter at hand, especially if it is a complex area, or one with which they have not had to engage previously. Stallen and Thomas (1988, cited in Walker et al, 1998, p. 12) suggest that 'genuine communication with the public' entails education of the public, and would involve explaining the theories and techniques used by 'experts' to assess risks. Renn (2001, in Kemp et al, 2002) suggests that the public needs to be educated before any participation or deliberative process can be valid. Pidgeon (1998) states that some of the problems associated with eliciting the relative values that people give to hazards involve distinguishing their lack of information, and the effects of misinformation from how the preferences are expressed. Value elicitation techniques are regarded as inherently

problematic, as they are especially sensitive to the wording of questions (see framing effects, p. 17). Fischer (2003) also raises the issue of the competence of the facilitator to help manage the consultation process without imposing their own values on it, and the requirement for them to have a more sophisticated understanding of the concerns of social science in relation to deliberative practices.

This education process can confound data generation and data collection (see Weyman and Kelly's criticism of the mental models approach p. 7). It also changes the nature of the consulted public, making it difficult to generalise the knowledge claims to groups of the public who have not been educated about the risk issues. Pidgeon (1998, p. 9) suggests that this issue needs further research, especially 'to develop methods that will allow public knowledge to be explored for its strength and weaknesses, and to allow judgements to be supported by information on (and reflection about) the basic science of the matter.' Pidgeon (1998) also highlights the dangers of such participatory approaches (namely consensus-seeking and group polarisation processes).

The issue of reaching a consensus is a central concern for deliberative processes. Renn (2001, in Kemp et al, 2002) talks about the problems of the process of seeking consensus among differing groups in the risk management process. He suggests that operationalising consequence as physical harm, avoids the difficulties of establishing a consensus on other aspects of consequence (such as 'value violation' or inequity), which rely on individual values and subjectivities. Whereas, 'physical harm may be the only consequence that (almost) all social groups and cultures agree is undesirable' (Renn 2001, in Kemp et al, 2002). Renn (2003) suggests the potential of the deliberation process to provide an environment that engenders consensus-seeking behaviour, and 'dissolves fundamentalist positions' through an emphasis on rational, evidence-based decision-making. However, this applies for people who accept the group norms from the outset. Renn (2003) does admit the possibility that the participants only agreed to the deliberation process, because they did not have fundamentalist views. There is no suggestion of any means for incorporating the views of individuals who do not agree to abide by such norms. The participation process was seen as providing a learning environment for the participants to reflect on how their perceptions of risk were biased. However, little differentiation was made between the variation in the strength of individual's beliefs and the resultant shift in attitude. Though, Renn's (2003) suggestion that strongly held beliefs are more resistant to such consensus building approaches is in line with general findings from the psychological literature on social persuasion.

Similarly, Frewer (2001) points out the difficulty of achieving a consensus between different groups, when such groups may understand, and represent the issue under discussion in very different ways. Frewer (2001) also suggests that risk management institutions need to further understand the characteristics of these inter-group differences in order to 'develop new forms of mediation'. This is important as Fischer (2003) emphasises the role of interpretive judgements in the production of knowledge arising from deliberative processes. Deliberative processes can be influenced by systematic patterns in group behaviour, such as:

- Conformity effects – people seek to agree with other members of the group, especially if similar arguments are perceived as originating from different sources (Frewer, 2001).
- Minority opinions – it is suggested that people perceived to be in the minority within the group, have more influence in shifting group opinion.
- Polarisation effects – group attitudes tend to be more extreme than individual attitudes of the participants. This can result in group shifts to risk or conservatism.

- Groupthink – the behaviour of small groups, characterised by, overestimation of the group's morality, closed mindset to new information, and pressure to conform to the majority view.
- Individual group members may not be operating from a single perspective, but from individual concerns, and the requirements of their professional roles and responsibilities (European Commission, 2004).

It is appealing to apply results from such deliberative exercises to other scenarios, but care must be taken as the nature of the outcome is contingent to that particular participation exercise. The nature of the knowledge gained is not as readily generalisable as knowledge claims with less constructionist underpinnings. Ball and Boehmer-Christiansen (2002) raise this difficulty in relation to categorising values, leaning towards the view that certain values have more utility for certain situations, e.g. a context driven process. Pidgeon (1998) suggests that incorporating the plurality of group perceptions of risk into a single 'public' representation is less problematic if these expressed preferences are not viewed as stable properties of individuals, but rather as discourses that are 'evoked by particular risk contexts or controversies' and not limited to specific groups of the 'public'.

The following section discusses the limitations of stakeholder engagement in relation to the findings from the risk perception literature.

10   THE LIMITS OF STAKEHOLDER ENAGAGEMENT

10.1   LOGISTICAL LIMITATIONS

There is a potential for selection to introduce systematic bias into the consultation process. There is very little indication given within the literature of whom to consult for deliberative processes, and the extent that participants are identified in relation to the nature and purpose of the engagement. There is an assumption that stakeholders are already known or visible in relation to specific issues, and that members of the 'ordinary public' can be chosen by representative sampling methods. The size of the sample also needs to be considered, as assuming the findings from a small sample can be generalised to a larger population is problematic. There are also assumptions made that participants are operating from single perspectives. This might not be the case, e.g. participants could be engaged with an issue out of individual concern, but also as a result of a professional role. The motivations of participants to engage in the consultation process need to be acknowledged.

There are also more discursive approaches advocated for selecting participants, where the possible range of opinions for an issue is considered, and participants are chosen for the deliberative process to represent this range of opinion, and not according to demographic distinctions. However, mapping the range of possible opinions is not an unproblematic activity. It is likely that hazardous industries will have both a local and national profile (e.g. that of the specific site and the wider industry), and choice of participants will need to reflect this in relation to the purpose of the consultation (e.g. for deciding the relative importance of concerns, or finding a solution to a specific problem).

The participants' familiarity with the issue also needs to be considered. If the participants are unfamiliar with the issue (as is potentially the case with permissioning regimes) then the matter of informing the participants needs to be incorporated as part of the consultation process. There is indication that the public can comprehend more complex information than might be presumed, if it is managed appropriately for them. This requires the organiser of the consultation process to consider the role of moderating the process of informing the participants. This can be resource intensive, and should present information in such a way as it does not reflect the values of the moderator, and enables participants to feel they have sufficient information for the task at hand. This aspect would have to be very well considered for consultation on hazardous industries, and would have to include detail on the nature of the hazard, and the regulatory framework, but also the legislative structure.

Other logistical considerations include the cost of the deliberation process, the time it will entail, the amount and type of interaction that is required, and the amount and type of information that needs to be given to participants, as well as the form of information that is required as an output.

There is a contradiction inherent to consultation processes relating to positive and negative aspects of group effects, and the extent that they are acknowledged or unacknowledged. On the one hand the emphasis and consensus on establishing group norms for rational decision making can be central to combining a plurality of opinions as a single representation for the outcome of the consultation process. On the other hand the outcome of deliberative processes can be influenced by systematic patterns in group behaviour that are unacknowledged. These can include: conformity effects, polarisation effects, and groupthink. If mediators of the consultation process are insensitive to this contradiction, it can influence the type of knowledge that is generated by the consultation process.

A related point to the importance of establishing group norms for the consultation process, is that no indication is given of how to consult with participants who do not wish to conform to these norms, e.g. they operate from an ideologically entrenched position.

10.2 LIMITATIONS OF KNOWLEDGE CLAIMS

There is some question as to whether the public perception of risks, e.g. their relative ranking, is associated with their priorities for allocating resources for mitigating the risk. Any knowledge claims resulting from deliberative processes for hazardous industries will have had to acknowledge this distinction. There is potential for the outcome from consultative processes that seek to rank hazardous industries according to risk, and those that seek to allocate resources to mitigate risk for public assurance to be different.

One possibility is that the process of consultation will not result in an outcome. This can be because participants genuinely fail to reach a decision, or if a decision is reached it is not one that the body organising the consultation agrees with, so any outcome is subject to the political decisions of the organising body. To this end recommendations are made to set participants targets for reaching outcomes, and to specify the final decision making process as part of the consultation.

The argument over incorporating public evaluation of risk into the decision-making process centres around the problem of integrating realist and constructionist rationalities. The process and outcome of any public consultation regarding high hazard industries should acknowledge this 'dual nature' of risk, and so not be based on one theoretical viewpoint or methodology. There is also the related difficulty for empirical based policy decision making to use such contextually based and contingent data as sufficient evidence to support judgements, little prescription exists on how to do so. This also raises questions regarding the extent that findings from consultations can be applied to other situations or contexts.

Consultative process can be placed along a continuum of low and high deliberative input. There is a trade off across these levels, between data that has less depth but is more generalisable, and data of more depth but also more contingent. Methods for the consultation process should be chosen in relation to the purpose of the consultation and the type of data required for the purpose of risk management decision-making. The different levels of deliberative input require different awareness and sensitivities from the researcher or mediator. In consultative processes that require interaction between the researcher and participant (e.g. face to face interviews or focused group discussions), the researcher needs to be aware that they play a role in generating interpretation, as they are not completely separate from the participant (e.g. the issue of researcher reactivity/influence, or bias). The outcome (e.g. the knowledge claims or report) needs to acknowledge the relationship of the researcher in producing the knowledge (e.g. through critical reflection). In this way third parties can have more contextual information to judge how the researcher might have influenced the information produced. Though this still presents difficulties for policy makers that base their decisions on more traditional types of empirical evidence.

Participant accounts and judgements of risk acceptance should not be taken at face value, especially from those living near high hazard sites. These expressed preferences may be influenced by experiential verification and issues of economic dependency, but could be even more complex. Judgements that express less concern over risk could actually mask high levels of concern, as expressing a lack of concern could be a strategy to suppress cognitive dissonance or opposing attitudes.

An important distinction to make with participants of a consultation process is the extent that they are knowledgeable and familiar with the issue under consultation. There is suggestion that when people are less familiar with a hazard they are more reliant upon framing effects and heuristics. So the type of information that can be collected from groups who are informed and those who are not will be different, and subject to slightly different processes. In the instances when the group is unfamiliar with the consultation issue, the researcher will have to be careful to distinguish lack of information from misinformation (e.g. biases, framing effects, and heuristics) on how preferences are expressed. Participants are more likely to have less knowledge of a risk when it is complex, and there is uncertainty relating to the cause-effect mechanism, and the deleterious effects are less tangible or diffused (e.g. a delay effect). There is also the possibility that participants are unfamiliar with the consultation issue as they are (or perceive themselves to be) marginalised from mainstream societal processes and institutions. In these cases the perception of marginalisation may well moderate all the participant's accounts.

The process of educating participants regarding the consultation issue is also problematic for the knowledge claims that can be made from the consultation. This is not just because it confounds data collection and generation, but also because it raises the question of whether the participants responses can be considered to be representative of uniformed 'ordinary citizens', once they have been informed.

There is a range of qualitative characteristics of hazards that influence amplification effects. These relate to: the nature of the hazard, the risk's consequences, and the management of the risk. These factors should be considered in relation to the context of the hazard (and not separately), as evidence suggests that risk perception is shaped significantly by contextual processes.

There is little prescription within the literature of what is considered an acceptable consultation process. There is some indication that effective consultation processes require the acceptance by the participants of the process itself, and the specific design and structure of the process to achieve the necessary outcome. Factors identified that determine 'successful' consultation processes, include: the consultation issue is defined and framed by the participants; participants are committed to this conceptualisation of the issue; there is mutual trust among the participants; and the reliance on rational decision making is regarded as legitimate. A distinction is also made between the process of decision framing and decision taking (e.g. defining the problem and agreeing a solution). Though these factors presume that participants have sufficient information, and are sufficiently engaged to make such decisions.

11   CONCLUSIONS AND RECOMMENDATIONS

11.1   MAIN FINDINGS

Risk Perception
- At the level of the individual risk perception is a result of many factors, as opposed to rational judgements based on the likelihood of harm. There are a number of explanations for why the perception of risk is not based on these rational judgements. These reasons include: systematic biasing of risk information, the use of mental shortcuts, and the way that risk information can be presented.

- Greater scope exists for these biases when the risk is complex or the effect of the harmful consequence is delayed. These biases do not occur in isolation, but are influenced by the situation in which the individual perceives the hazard. The relationship between the situation and the bias is unclear, but is not thought to be insignificant.

- Long standing evidence from the psychometric approach to risk perception indicates that acceptance of a hazard is related to the qualitative characteristics of that hazard. The accepted range of characteristics include:

  - The nature of the hazard – familiarity and experience of the risk; understanding of the cause-effect mechanism; uncertainty; voluntary exposure to the risk; artificiality of the hazard; violation of equity of benefits arising from hazard.
  - The risk's consequences – ubiquity of the consequences of the risk (geographically and across time); fear of the risk consequences (catastrophic potential); delay effect (e.g. the salience of the risk is a function of delay in deleterious consequences); reversibility (potential to restore original state); negative impact on individual, social and cultural values.
  - Management of the risk – personal control over the risk; trust and distrust in perceived institutional control of the risk.

  There is indication that hazards should be judged on a case-by-case basis to account for the separate contexts of each hazard. There is little indication of the relative weights that should be afforded each characteristic, and the extent this varies with contextual factors.

- There is wide support for the idea that risk perception is influenced by social relations and trust in risk management institutions, and increasing concern over the limitation of approaches that do not account for social explanations. Though there is little understanding of how these social factors interact with the range of risk characteristics identified by the psychometric tradition.

- It is acknowledged that risk has a 'dual nature' that relates to the extent it is understood as existing 'objectively', or is a product of mental processes. Integrating these two understandings is problematic, and is one of the central difficulties in incorporating public perceptions of risk into risk policy decision-making.

- Research into risk perception is increasingly rejecting single theoretical perspectives, especially where perceptions of risk are not through direct experience, but are mediated, e.g. via the mass-media. There is indication that the public responds to media coverage of hazards in a more rational and active way than might be presumed. Neither is the relationship between media coverage and risk perception as unidirectional or directly

proportional as might be thought. There can be differentiation at a national and local level, between risk amplification and attenuation over the same risk issue.

- It is important to consider the extent that a person has knowledge of, or is familiar with a hazard when investigating factors that influence perception of risk. For example, there is evidence that the media play a more important role in people's interpretation of hazards when they have less experience or knowledge of those hazards. Similarly, evidence suggests that when the public is less familiar or directly involved with a hazard, trust in risk management institutions can act as a shortcut for mediating judgements of risk acceptability.

- A number of criticisms are raised regarding the methodologies used to investigate risk perception that are relevant to high hazard industries, principally:

  - It is problematic (e.g. lacks ecological validity) to measure perception of risk separately from the context in which it is experienced, or at least without acknowledging the context in which it is experienced. This applies to hazards at both a local and national level.
  - It is also problematic to measure what someone has not experienced or considered previously. This introduces the need to educate the participant about the matter in question. Not only does this educational process need to be conducted consistently and systematically, and in such a way as to minimise framing effects, it confounds data generation and collection.
  - It is important that data collection methods do not impose conceptualisations on the participants, nor researchers frame the problem according to their own values. Thus limiting the range of responses that participants are able to give.
  - When the public is asked to compare risks, care should be taken on how the information is presented, e.g. risks presented as probabilities can be difficult for people to understand as they focus on issues of consequence. There are also problems in comparing risks, as in the 'real world' risks are multi-faceted and not identical.
  - Care should be taken when aggregating individual judgements of risk as indicative of group responses, as the process of individual decision-making, and group decision-making are not synonymous.

Stakeholder Engagement
- Descriptions of the stakeholder process are based on pluralist assumptions of social organisation, and are at a very generalised level. This limits the possibility of defining acceptable engagement processes in relation to the context or nature of the issue to be discussed. Though one major distinction that is made is the amount of interaction with participants that is required.

- There are a number of high level factors that are identified as influencing the 'success' of engagements practices, some of these include: early involvement of participants, the perception of independence and transparency, consensus of the task definition, accessibility to information, and mutual trust among participants.

- There is a potential for selection to introduce systematic bias into the consultation process. There is very little indication given of whom to consult for deliberative processes within the literature, and the extent that participants are identified in relation to the nature and purpose of the engagement. There is an assumption that stakeholders are already known or visible in relation to specific issues, and that members of the 'ordinary public' can be chosen by representative sampling methods. The size of the sample also needs to be considered, as

assuming the findings from a small sample can be generalised to a larger population is problematic.

- There are some criticisms of the purpose of consultation as simply being a process of enfranchising the public, but of relating to secondary agendas for regulating authorities, such as legitimising regulatory activities and helping to manage reputation through the diffusion of potential culpability.

- The outcome of engagement processes can be influenced by systematic patterns in group behaviour that are unacknowledged. These can include: conformity effects, polarisation effects, and groupthink. If mediators of the consultation process are insensitive to this contradiction, it can influence the type of knowledge that is generated by the consultation process.

- The process of educating participants regarding the consultation issue is also problematic for the knowledge claims that can be made from the consultation. This is not just because it confounds data collection and generation, but also because it raises the question of whether the participants responses can be considered to be representative of uniformed 'ordinary citizens', once they have been informed.

- The outcomes of engagement processes can be contextually based and contingent. There is the related difficulty for empirical based policy decision making to use such data as sufficient evidence to support judgements. Little prescription exists on how to do so. This also raises questions regarding the extent that findings from consultations can be applied to other situations or contexts.

11.2 RECOMMENDATIONS

- Future research into public perception of risk will need to be focused on the relationship between the qualities of the hazard that influence individual perceptions of risk, and the explanation of risk perception as a result of social processes, i.e. it will be beneficial for research to examine the interaction between individual and social explanations of risk perception.

- There is some debate as to whether the public perception of risks, e.g. their relative ranking, is associated with their priorities for allocating resources to mitigate the risk. There is potential for the outcome from consultative processes that seek to rank hazardous industries according to risk, and those that seek to allocate resources to mitigate risk for public assurance to be different, or at least not to be considered logically equivalent questions by participants. Any knowledge claims resulting from engagement processes for hazardous industries will have had to acknowledge this distinction.

- The debate over incorporating public evaluation of risk into the decision-making process centres around the problem of integrating opposing points of view. The process and outcome of any public consultation regarding high hazard industries should acknowledge this 'dual nature' of risk, and so not be based on one theoretical viewpoint or methodology.

- Similarly, the people managing the engagement process (especially in relation to high hazard industries) need to be aware of the complexity of risk understandings, in order to elicit participant's judgements of acceptability of risk from systematic bias and misinformation. People managing the engagement process should also be aware of the role

they play in potentially influencing participants' judgements, and they should reflect on their role in the process of knowledge creation, and the extent they are not separate from it.

- The participants' familiarity with the issue needs to be considered. If the participants are unfamiliar with the issue (as is potentially the case with permissioning regimes) then the issue of informing the participant needs to be incorporated as part of the consultation process, and becomes a central factor for this process. There is indication that the public can comprehend more complex information than might be presumed, if it is managed appropriately for them. This requires the organiser of the consultation process to consider the role of moderating the process of informing the participants. This can be resource intensive, and should present information in such a way as it does not reflect the values of the moderator, and enable participants to perceive they have sufficient information for the task at hand. This aspect would have to be very well considered for consultation on hazardous industries, and would have to include detail on the nature of the hazard, and the regulatory framework, but also the legislative structure.

- Participant accounts and judgements of risk acceptance should not be taken at face value, especially for those living near high hazard sites. These expressed preferences may be influenced by experiential verification and issues of economic dependency, but could be more complex. Judgements that express less concern over risk could actually mask high levels of concern, but expressing lack of concern could be a strategy to suppress conflicting attitudes (cognitive dissonance). There are also assumptions made that participants are operating from single perspectives. This might not be the case, e.g. participants could be engaged with an issue out of individual concern, but also as a result of a professional role. In the event that the HSE commission further engagement activities, the motivations of participants to engage in the consultation process need to be acknowledged, and understood by those managing the consultation.

- HSE communication strategies need to be informed by stakeholder and public understandings of risk, hazardous industries, and the purposes and processes of regulation, and the way these differ from the HSE's own understandings. There is a cleavage between stakeholders and public who are informed and involved in these issues, and those who are not. Communication strategies need to be based on this differentiation between familiarity and unfamiliarity, as a universal approach for both groups is not appropriate.

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