Improving health and safety
An analysis of HSE’s risk communication in the 21st century

Prepared by King’s College, London
for the Health and Safety Executive 2010
What constitutes state-of-the-art risk communication? Which practices may be considered anachronistic? Does HSE use the most effective means to communicate risks? Which theories and tools are most apposite for the appraisal of HSE’s risk communication? What policy recommendations would help the Executive to improve its performance in this area? To answer these crucial questions this report develops an in-depth analysis of HSE’s communication practices. The researchers explore HSE’s risk communication in two specific cases: that of the Buncefield oil storage incident of 2005 and that of the proposed development at the Oval cricket ground in London. The researchers conducted face-to-face interviews of the critical actors involved in each case. These interviews support a robust qualitative analysis of current risk communication practices. The analysis employs the latest theoretical and empirical knowledge from the academic discipline of risk communication. The authors conclude that the HSE has engaged third parties successfully to develop a proactive risk communication when faced with a major incident. For most decisions, however, HSE still relies on communication practices derived from the consensual, expert-led model with which the Executive operates. The authors formulate five critical recommendations to adapt HSE’s risk communication towards a more proactive model.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.
ACKNOWLEDGEMENTS

The authors would like to thank Mr Geoffrey Podger, Chief Executive, and Mr Patrick McDonald, Chief Scientist, for allowing the project to take place. The authors would also like to thank all those both within HSE and external to it who generously agreed to be interviewed, as well as those who offered advice and support. The authors are particularly grateful to Lord Newton of Braintree and Mr Taf Powell for their crucial support. The authors would also like to thank Professor Baruch Fischhoff and Professor M Granger Morgan at Carnegie Mellon University, Professor Ortwin Renn at the University of Stuttgart, and Professor Adam Finkel at the University of New Jersey and Princeton, all of whom offered scientific advice at various stages of the project. Finally, the authors would like to thank Dr Vicky Warbrick for her help and commitment.
CONTENTS

1. INTRODUCTION .................................................................................................................. 5

2. RISK COMMUNICATION: WHAT IS THE STATE OF THE ART AND WHAT IS NOT? ....7
   2.1 KEY EXAMPLES OF GOOD RISK COMMUNICATION ............................................. 8
   2.2 RECOMMENDATIONS AND CONCLUSIONS ......................................................... 12

3. HSE AND RISK COMMUNICATION .................................................................................. 14
   3.1 CASE STUDY APPROACH ..................................................................................... 15
   3.2 BUNCEFIELD EXPLOSION CASE ........................................................................ 19

COMMUNICATION OF EVIDENCE .................................................................................. 20
   3.3 OVAL PLANNING CASE ....................................................................................... 24

4. CONCLUSIONS AND RECOMMENDATIONS .................................................................. 38

APPENDIX 1 PUBLIC CONSULTATION QUESTIONNAIRE ...................................................... 46
APPENDIX 2 OVAL CASE QUESTIONNAIRE ...................................................................... 47
APPENDIX 3 RISK COMMUNICATION: A REVIEW OF THEORETICAL DEVELOPMENTS .................................................................................................................. 48
APPENDIX 4 COMMUNICATING RISKS: A CHALLENGE TO PRACTITIONERS .......... 80

TABLE 1 - WHY DO YOU (MALMO RESPONDENTS) FEEL THAT BARSEBACK IS SAFE? ............................................................................................................................................ 9
TABLE 2 - KEY CRITERIA FOR INVESTIGATION ................................................................ 17
TABLE 3 - PADHI DECISION MATRIX ................................................................................. 27
EXECUTIVE SUMMARY

The objective of this research project on risk communication has been to contribute to re-establishing HSE’s leading role in the risk policy and communication field by sharing up-to-date knowledge on the subject and improving HSE's application of risk communication. The project translates ongoing theoretical and policy developments from the risk communication field into direct advice to help HSE adapt its risk communication practices to the challenges of the 21st century.

This report opens with an introduction followed by key examples of effective risk communication. The report moves on to present the results of two case studies. The first study is a short review of the risk communication of 'onshore oil/gas leaks', focusing on the Buncefield oil storage depot incident of 2005. The second study is an in-depth assessment of the unusual but nonetheless critical case of the proposed development at the Oval cricket ground (London). The report analyses interactions between key stakeholders and the procedures that inform the risk communication process. It does not discuss the technical evidence submitted in relation to the planning enquiry.

The analysis and discussion of the specific cases is presented to support the framing of internal HSE discussions about possible solutions to a changing risk communication environment. The main conclusion of this study is that HSE tends to apply a standard approach to risk communication. This approach may be called ‘consensual’, because it focuses on forming an agreement among experts and institutions rather than engaging in a debate with lobby groups and the general public. In the Oval case, for instance, risk communication to the wider public was very limited. In this case, legislation also played a role. It is recognised that the s321 direction would have restricted this process.

The recommendations of this report aim to improve rather than replace the consensual expert-based model. They are: (1) Establish a risk communication task force that will develop a strategy to deal with local planning matters. Similar tasks forces may be established to improve the communication of other ‘post-trust’ environments. (2) Clarify the concepts of 'risk based' and 'hazard-based' approaches in a way that makes sense to non-experts and that does not suggest that HSE rejects evidence and balanced decisions in distinct areas. (3) Re-connect research on societal risk with risk perception, risk amplification and trust studies so that the notion of ‘societal risk’ becomes more intelligible to non-experts and is linked more explicitly to society’s perceptions. (4) Take a proactive role in explaining in lay terms the processes, the roles, and the responsibilities of the actors involved in planning processes or other complex governance processes. (5) Learn from risk communication techniques to develop proactive risk communication with the media, with a strong focus on ‘post trust’ environments where traditional practices are no longer effective.
1. Introduction

Is HSE still seen as a fair and economically-neutral actor (Pidgeon et al. 2003)? A number of public stands and news articles have exposed the Executive to criticism, from suggestions that it is failing in its duty to protect the public in some areas, to suggestions that it is being risk-averse, tedious and cumbersome in others. In 2006, the Guardian published an article entitled “Those who walk under trees are at risk from these terrorising inspectors” (Jenkins 2006). In July 2007 the argument took a highly visible political dimension when the former Mayor of London sent a letter to the Head of HSE to complain about “over cautious” changes to planning advice by HSE:

“you are wiping out good housing for 40,000 Londoners, many of them in the direst need. (...) I am left with the strong suspicion that your motivation in setting these new guidelines has simply been to protect yourselves, rather than make any serious analysis that balances this minuscule risk against the very real and appalling loss of housing and employment for Londoners. (...) I suspect that staff at the Health and Safety Executive have good jobs and are well housed. It’s a pity you did not spend a little time considering those people who are not as lucky as you are. It is decisions like this that actually discredit the very real need for genuine health and safety protection. You have my assurance I will do everything possible to overturn this latest decision by your barmy bureaucrats.” (London 2007a)

HSE has highlighted that the UK has one of the best records for occupational health and safety in the world, including the lowest rate of work-related fatal injuries in the UK and the third lowest rate among EU member states of non-fatal injuries resulting in three or more lost working days. The BBC, however, has argued that “the watchdog on workplace safety (...) is failing to investigate hundreds of serious accidents every year because of a lack of funds” (BBC 2007). The Government’s response to the 2007-2008 Work and Pensions Committee third session report on “The role of Health and Safety Executive in Regulating Workplace Health and Safety” (House of Commons 2008) offered insights into the debate on HSE’s performance. The report argued that it is advisors and consultants, rather than the HSE itself, who are to blame for trivial and pointless restrictions: “over-zealous health and safety advisers encourage employers to produce over-burdensome risk assessments” (p.5). It also reported, however, “a 28% increase in construction fatalities” resulting from “inadequate resources”, as well as “extremely concerning” numbers of incidents and fatalities involving tower cranes (p.9). In addition, the Government also expressed a general concern for the declining number of inspectors and a specific concern for the failures to manage risks in the offshore industry.

According to HSE’s Chief Executive, Geoffrey Podger, the Executive is “dedicated to addressing the real risks that people face in the workplace”. Risks under the remit of HSE stem from many different activities, from nuclear plants to construction sites or local land use. Specific circumstances and perceptions of risks vary considerably (Slovic 1987 and 1993, Slovic et al. 1979, 1980 and 1981), which influences debates about adequate level of protection and risk tolerability (Bouder et al. 2007). Acceptability of risk is not set in stone but depends on society’s assessment of “how safe is safe enough” (Fischhoff et al. 1978).

---

criticisms mentioned above suggest that there is less agreement on HSE’s role and achievements among different groups in society now than in the past. We know from risk communication theory that people tend to distrust organisations when they feel that they lack fairness, competence or efficiency (Renn and Levine 1991; Lofstedt 2005). Controversies and negative reporting may amplify risks (Kasperson et al. 1988; Kaspersk 1992; HSE 2001; Kaspersk and Kaspersk 2005; Pidgeon et al. 2003) or confuse people about an organisation’s performance. Is HSE too cozy with major industries, while SME and individuals would suffer from bans, warning and threats? Over time, the persistence of conflicting and politicised messages about inadequate protection – even when they are a “health and safety myth” (House of Commons 2008) – may indeed confuse the public and affect trust negatively. Recent debates suggest that HSE may be moving towards a position where it could be severely affected by any high profile incident or dispute. If this is the case, how could HSE adapt its communication approach to new conditions?
2. RISK COMMUNICATION: WHAT IS THE STATE OF THE ART AND WHAT IS NOT?

Risk communication has its roots in risk perception, a field developed by Gilbert White at the University of Chicago in the 1940s. White’s and that of his students’ work on natural hazards (Burton and Kates 1964; Burton et al 1978 and 1992; White 1945 and 1961) and that of Baruch Fischhoff, Paul Slovic and others on technological hazards in the 1970s (Fischhoff et al 1981; Slovic 1987) showed that the public perceive some risks differently than others for a series of reasons, such as degree of control, catastrophic potential, and familiarity. Starting in the 1980s, in part driven by communication consultants emerging from academia, there began a move to apply the lessons coming out of the risk perception research to the new field of risk communication (Fischhoff 1995; Leiss 1996; National Research Council 1989). Whilst risk communication cannot be defined as an independent discipline, it may be best described as:

“Risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management (NRC 1989, p.21).

Although risk communication should not be seen simply as a one-way form of persuasion (Fischhoff 1989, 1995; NRC 1989), in many cases risks are indeed communicated in a top-down fashion.

To date the outcomes of the various risk communication programmes that have been put in place, be it in the environmental, food, or pharmaceutical sectors in both Europe and the United States, have been mixed at best. Many publics continue to remain hostile to the siting of noxious facilities close to their homes be they chemical plants, incinerators or nuclear reactors, and they continue to worry about the food they eat and the pharmaceuticals they take. Many of their concerns are based on unnecessary amplification of risk (and thereby attenuation of benefit) by medias and certain stakeholders, but it is also in part driven by a lack of funding of the risk communication programmes themselves as well as a general failure to evaluate successful and unsuccessful communication efforts (Kasperson and Palmlund 1987).

What is then good risk communication compared to bad risk communication? To be clear when an institution, regulator, stakeholder, or other body engages in risk communication, it is the responsibility of that body to communicate correctly and responsibly. In other words, according to the NRC 1989 definition, bodies communicating risks should design strategies to assist the public in understanding the problem at hand. Fischhoff takes a similar view when he argues:

“By definition, better risk communication should help its recipients to make better choices. It need not make the communicators’ lives easier…What it should do is to avoid conflicts due to misunderstanding…leading to fewer but better conflicts (Fischhoff 2009, p31; also Fischhoff 1995).

In the remainder of this section we highlight three examples of good risk communication, all of which one of us have been involved in, and following on from this we provide a series of recommendations on how regulators, such as HSE, can become better communicators of risk.
2.1 KEY EXAMPLES OF GOOD RISK COMMUNICATION

Over the years there have been a number of journal articles and books in both Europe and North America highlighting good and bad case studies of risk communication, of which the Leiss volumes remain the best known (Leiss and Chociolko 1994; Leiss 2001; Powell and Leiss 1997). These multiple volumes and other similar works help shed light to why some risk communication programmes fail and other succeed. In this brief section, we would like to follow along in the same vein, focusing in particular on good examples of risk communication, from three different nations.

THE FILTER INCIDENT AT THE BARSEBACK NUCLEAR POWER STATION, SOUTHERN SWEDEN

The incident centred around the Swedish nuclear (boiling reactor) plant located 20 kilometres from both Malmo and Copenhagen, near the small harbour and golf town Barseback which first came on line in the 1970s. The plant is situated close to densely populated areas (Copenhagen has approximately 1.5 million inhabitants, while Malmo has 350,000 inhabitants) and has therefore been a source of public and political friction between Denmark and Sweden for over 25 years. On the 28th July, 1992, during the start up of reactor II at the Barseback plant and following routine maintenance, a safety valve became stuck, causing insulation material to fall into the reactor’s water-cooling system, blocking the reactor’s inlet filters (for a detailed discussion see Lofstedt 1996 and 2005). Within 20 minutes, however, this material was cleared through a back-flushing mechanism. Nevertheless, the incident prompted the Swedish Nuclear Inspectorate (SKI) on 17th September 1992 to force a shutdown of all similar filters, arguing that any blockage increased the risk of a complete core meltdown. It also ordered the owners of the five affected reactors to redesign their filter systems.

From a risk communication point of view the situation was rather delicate. The Danish public as well as the Danish government were opposed to nuclear power and wanted Barseback closed. In addition at the time of the filter incident there were ongoing negotiations with a number of political parties on when Sweden should begin the phase-out of the country’s nuclear power stations- a decision the key political parties had taken in the wake of the Three Mile Island accident in 1979. Hence, the owner of the Barseback reactors, Sydkraft (now part of Eon) realised that they had to get their communication strategy right. Following the incident, the utility company decided to collaborate with the regulator rather than to question its decision to force the closure of the plant. As the then Head of Communication at Sydkraft argued:

“Yes, we felt the measures that the SKI put forward were harsh. Yet we knew that in effect the incident was our fault and that had we complained about it, it would have led to further ramifications leading to loss of credibility in the eyes of the regulator as well as the public.” (Claesson, 29th February 2000, interview with Lofstedt)

This stance by Sydkraft is all the more interesting considering that no other nation implemented such tough measures regarding reactors that were of similar construction and filter design following the Barseback incident (Steen 1993).

In Sweden, the regulator, the industry and the state all acted in what can be termed ‘the best interests of Sweden’. The regulator knew that drastic action needed to be taken; the filter incident was not predicted by the quantitative probabilistic risk analysis (QPRA) put in place by the manufacturer (ABB). The reason why SKI’s enforcement measures were made
possible with little industry opposition was because of its excellent relationships with the various industrial and political bodies based on mutual respect. In particular, a dialogue process put in place between the nuclear utilities and the Inspectorate following the US 1979 Three Mile Island accident, helped considerably (Hogberg 1999). In sum the regulators and industry tried to work together in an amicable way, or as Claesson argues:

“We never considered questioning the decision of the regulators. Rather we decided to work with them to find an optimal solution. In addition we invested quite a bit of resources to build up public trust.” (Claesson 29th February 2000, interview with Lofstedt)

This dialogue strategy was rather successful from a risk communication perspective. In the summer of 1993 Lofstedt conducted a survey on whether Sydkraft had overall done a good job communicating the risks associated with the Barseback plant with both the Swedish public and the regulators. Overall the study indicated that a majority of the public interviewed in Malmo were happy with the communication strategy. One question asked whether the public in Malmo felt that Barseback was a safe nuclear plant (more or less ten months after the incident). Result showed that of the 60 people who said yes (n=100) they noted:

Table 1- Why do you (Malmo respondents) feel that Barseback is safe?

<table>
<thead>
<tr>
<th>Reason</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust Swedish industry</td>
<td>57</td>
</tr>
<tr>
<td>It is a good plant</td>
<td>5</td>
</tr>
<tr>
<td>Information on it is widely available to the public</td>
<td>4</td>
</tr>
<tr>
<td>Do not know</td>
<td>2</td>
</tr>
<tr>
<td><strong>N=60</strong></td>
<td></td>
</tr>
</tbody>
</table>

Similarly representatives at Greenpeace Denmark felt that both the Swedish regulators and Sydkraft had done a good job. As the nuclear spokesperson for this Non-Governmental Organisation (NGO) noted:

“I trust the SKI more than I trust the Danish Inspectorate. SKI is truly not in the hands of industry. In face of industry pressure, it took drastic action to close down reactors that it did not feel were safe. That would never have happened in Denmark.”

(Danish Greenpeace spokes person interview with Lofstedt September 1993)

In sum Sydkraft’s communication strategy worked. In the final section we will summarise some of the key lessons emerging from this example.

**RE-LICENSING HYDROPOWER DAMS ON THE ANDROSCOGGIN RIVER, MAINE US.**

In the United States rivers are owned by the Government, and as a result hydropower stations operating on them have to be re-licensed by the Federal government (Federal Energy Regulatory Commission, FERC) every 35-50 years. These re-licensing procedures can be controversial if the owner of the dam cannot agree to concessions or agreements with the Federal Government itself, with local community groups or specific environmental NGOs. In 1988, for example, the Bowater/Great Northern Paper company began re-licensing procedures for two of its hydroelectric dams (out of a total of 16 it owns) along the Penobscot River in Maine. After 10 years of effort and at a cost to the company of approximately 11 million dollars (mainly for lawyers’ fees but also for a significant number of environmental improvements), the company received a license renewal to continue operating the two dams.
The price in terms of public and NGO distrust toward the company was significant as it refused to develop any kind of dialogue with the NGOs, rather force through the licensing procedure via a traditional notice and comment approach leading two of the NGOs appealing the decision in 1997 (Lofstedt 2003).

At the time of the Bowater/Great Northern paper company dispute, International Paper (IP) was becoming worried on how to best get its four dams re-licensed on the Androscoggin river in south central Maine. While the company was grappling with the re-licensing issue, the Environment, Health and Safety manager at the local paper mill on the Androscoggin near Jay Maine, Steve Groves, was approached by Dan Sosland, a senior attorney at the Conservation Law Foundation (CLF), a New England based NGO, suggesting that IP should implement a more proactive communication approach with regard to its re-licensing procedure. Dan Sosland was highly influential both within and outside IP-he served on IP’s local mill Androscoggin) environmental advisory board, and served as CLF’s chief legal representative for the re-licensing of Bowater/Great Northern Paper’s two hydropower stations on the Penobscot river, a re-licensing procedure that he vehemently opposed. Steve Groves, who had been brought out of early retirement from the Maine’s Department of Environmental Protection by IP, was interested. He knew that IP’s historical environmental and employment record at the Androscoggin plant was not very good. The mill had both a history of water pollution problems and following a string of strikes in the early 1990s, IP had fired all the mill’s unionised employees. Hence it was likely that the mill would be targeted by local community protesters regarding the re-licensing procedure.

In 1994 he set up a collaborative team with local and national environmental NGOs, representatives of IP, the state of Maine and national regulatory authorities (EPA and FERC). The participants were not financially compensated, although they would have an influence on the outcome of the re-licensing process. This collaborative, proactive risk communication approach, was similar to regulatory negotiation outlined by Harter (1982;1983) which calls for:

- Frequent meetings, closed to outside observers to allow more open discussion;
- Confidentiality of proceedings;
- Mediator involved to guide decisions;
- The legitimising of the process by a form of collective judgement.

The team met on numerous times over a three year period and together they did everything from identifying background studies for draft environmental assessments, to outlining the concessions IP should make on environmental grounds, to participating in public meetings and site visits associated with the re-licensing procedure. Of particular interest, aside from Don Sosland, no lawyers participated in the discussions.

As a result of the process, IP received its four hydropower licenses in record time. The process took four years to complete, and cost around four to five million dollars. The company received licenses for up to 50 years, 15 years more than usual, and was allowed to increase the generation capacity at one of its dams, Livermoore, by more than 50 per cent. The license application once submitted was commented by the EPA and the town of Jay, which were neutral to it, as well as by CLF and the Appalachian Mountain Club, both which came out strongly in favour of the licenses being granted. FERC accepted the application without any requests for further information, and on the 21st September 1998, prior to the expiration of the old license, re-licensed IP’s four dams, a first for FERC.

Environmental NGOs, state officials and IP were pleased by the outcome of the process. This was reflected in the media (Bangor Daily News) following the granting of the licenses. The Governor noted:
“An excellent example of how the regulatory system should work...you’ve got a faster license, lower litigation costs, land for the people of Maine, and a real spectacular result. (Angus King, Governor of Maine)

Steve Groves was also happy:

“IP saved as much as $1 million in pursuing its license with a collaborative approach instead of the normal FERC process.” (Steve Groves, IP)

Following the successful completion of the project, IP’s Androscoggin Mill won both state and national environmental awards and became considered for a Partnership Excellence Award from the EPA for the success of the re-licensing effort.

**SITING AND BUILDING A WASTE TYRE INCINERATOR IN WOLVERHAMPTON, UK.**

In the UK, cars and lorries generate 450,000 tonnes of waste tyres per annum. Historically most of these tyres were sent to landfill, something that the Government opposed as tyres do not degrade easily or compact. The situation is made worse by the UK having limited landfill capacity, ensuring that worn out tyres are transported long distances to be dumped. At the same time, tyres have a higher calorific value than coal largely due to a petrochemical content equivalent to 32.6 MJ/kg, making them suitable for energy production (Doig 1994).

Siting waste incinerators in the UK has over the past 20 years been difficult, with a number of proposed sites failing to get planning permission due to massive public opposition (eg Petts 1995). When Elm Energy (a subsidiary of a large US based utility), following active encouragement from the Government in terms of subsidising the electricity generated from waste tyres, decided to site and build a waste tyre incinerator in Wolverhampton, it knew that a proactive risk communication strategy was required. Elm Energy wrote to approximately 600 people in the vicinity of the proposed plant, detailing the pollution control and safety measures to be installed. An information caravan was also set up, and monthly public meetings were arranged to discuss problems and concerns. Additionally, a permanent pollution monitoring scheme was set up at the local council by Elm Energy, which allowed local government officials and the general public access to information on pollution levels in the area. Elm Energy also employed a local resident to undertake public relations work and deal with complaints. As one Elm Energy spokes person noted:

“We have regular meetings in the community to get feedback on their concerns and we have tried to understand public concern as much as possible (Senior Consultant, Elm Energy, February 1995 interview with Lofstedt).

The Elm Energy proposal to build the tyre incinerator in Wolverhampton was also a wise move. Wolverhampton is a town with a great deal of heavy industry (including tyre manufacturing), ensuring that the residents living there are already familiar and accepting of these types of plants. In addition it is a town with higher levels of unemployment than the national average and where wages overall are below average nationally, making the proposed incinerator a vehicle to create jobs in the economically deprived area. As one local planning officer in Wolverhampton noted:

“Elm was seen as open, honest and upfront and we felt that the waste tyre incinerator would lead to more job opportunities in the local community…Additionally, we produce many tyres here so it only fair that we remove some from circulation as well. (Local planning officer in Wolverhampton, February 1995, interview with Lofstedt).
During the planning and building process there was little organised opposition to it. Historically, the most vocal opponents to waste incinerators have come from environmental NGOs such as Greenpeace and Friends of the Earth who favour reuse and recycling rather than land fill or incineration and have over the years mounted a number of highly successful campaigns against incineration, in many times making the link between incineration and the production of dioxin (Greenpeace Web site 2009). However, in Wolverhampton there was little activity among environmental NGOs during the crucial proposal stage. Friends of the Earth did not have a field office in Wolverhampton, and other NGO spokespeople, when interviewed by Lofstedt, had limited awareness of the proposed incinerator and said they would not comment on it.

Based on Elm’s Energy proactive communication strategy, the local council voted unanimously in favour to build it. In November 1993 the 48 million pound incinerator, the first purpose built tyre incinerator of its kind in Europe, came on line. A year later Elm Energy received AA’s Achievement Award for Environmental Concern and in the same year it also received the Foreign Investor of the Year Award by the Corporate Relocation Magazine all because of the waste incinerator in Wolverhampton.

2.2 RECOMMENDATIONS AND CONCLUSIONS

Based on these three case studies there are a number of key recommendations from a risk communication perspective.

- Developing frequent dialogues between regulators, industry, media and key politicians. One key to successful risk communication is building relationships based on trust. This trust building can best occur prior to a crisis occurring. Is there any wonder why Sydkraft was able to maintain trust with the public and the regulators at the time of the Barseback filter incident, considering the fact that they had been in dialogue with the regulators on a regular basis for more than 14 years prior to the incident?

- Confrontations between the key parties in any dispute will not only destroy public trust in the key actors involved, but will also in more cases than not be socially amplified by the media (Pidgeon et al 2003). In all three cases highlighted above the risk imposer sought dialogue rather than confrontation;

- Do not involve lawyers in risk communication disputes unless it is absolutely necessary. When it comes to disputes, lawyers in their very nature attempt to inject more distrust in the process rather than less. In none of the three highlighted case studies did the lawyers play a prominent role;

- Risk communication will always be easier if the parties involved in a dispute are both competent and base their decisions on the best available science. This was the case of Barseback in which both parties knew what had to be done. Both parties acted “rationally” and although the incident was viewed as serious, it was resolved in a technical fashion that both parties were happy with;

- Involving highly trusted individuals as early as possible can help in solving risk communication disputes amicably. Involving a senior environmental lawyer and former state regulatory official in the Androscoggin case ensured a success for IP;
- Environmental NGOs, in the era of post trust, can significantly shape policy outcomes (Lofstedt 2005; Lofstedt et al 2009). One of the primary reasons why Elm Energy built a waste tyre incinerator in Wolverhampton was because of lack of NGO involvement;

- The opinions of local policy makers are important particularly early on in a siting process. Where policy makers perceive a community benefit from an incinerator such as jobs in a depressed area, they may still push forward a siting process even if some of the public oppose it;

- The issue of responsibility can also be important. In Wolverhampton the council felt that the town should make a significant contribution to the waste tyre programme as they manufactured so many of them in the first place.
This chapter concentrates on a critical aspect of HSE’s risk communication: risk advice for land use planning. Around the time of the major incident at the Buncefield (Hertfordshire) Oil Storage Depot (December 2005) HSE, on behalf of the cross-departmental Task Group on Societal Risk, organised a public consultation to seek views on how best to deal with societal risk around non-nuclear major hazard sites (see Appendix 1). A key objective was to inform decisions on the use of land for development in areas around such sites. HSE Deputy Chief Executive Justin McCracken highlighted that “Ultimately it is for society as a whole to decide what is an acceptable level of risk around non-nuclear major hazard sites” (HSE 2007a). Justin McCracken added that industry and the regulators already work together. In consensual regulatory traditions, compliance is often achieved through co-operation. In the UK system, for instance, this co-operation is seen as necessary to ensure that risks are maintained at as low a level as reasonably practicable. The urge to work together might also increase when significant economic activities are at stake. A USA official interviewed for this study pointed out that: “We don’t feel comfortable shutting down plants for safety reasons; sometimes we are blamed for being pragmatic.”

In Europe, the consensual nature of risk regulation reinforces this tendency (Kelman 1981; Vogel 1986). Decisions have been achieved behind closed doors usually, whereas the US has a long tradition of deliberative processes in which risks are discussed publicly (Kelman 1981; Vogel 1986). In the wake of the high profile risk scandals of the 1990s - and the BSE case in particular - this consensual model has been in crisis, which has led to alternative regulation models and the rise of the precautionary principle (Lofstedt 2004). HSE, however, has not been significantly challenged by these developments.

When HSE published “The tolerability of risk from nuclear power stations” (HSE 1988) it made a lasting impact on the community of risk experts.\(^3\) The Tolerability of Risk (ToR) model introduced a new heuristic to help ‘duty holders’ determine what risks could be accepted, refused or tolerated. The model guides them in fulfilling their obligation of maintaining risks as low as reasonably practicable (ALARP). Tolerable risks are risks that are watched carefully and reduced as close to negligible levels as reasonably practicable. From a risk communication perspective, a key innovation of the HSE approach is that it recommends combining traditional probabilistic assessments with estimates of societal views. The formal inclusion of the views of society is a departure from more ‘primitive’ stages of risk communication, when experts assumed that all they had to do was to “get the numbers right” and convey these numbers to the public (Fischhoff 1994). Scholars have also indicated that it was an underlying consensus –shared by government, industry and trade unions – that made the model possible (Fairman 2007). Changes towards more deliberation have been introduced with a fair degree of caution. In the 1980s, when HSE staff visited the US to develop the ToR model a senior American scholar recollected that the HSE staff adopted, what he called an old school’ attitude.

HSE does not formally endorse a standardised approach to the inclusion of public views. It has used direct communication methods in specific circumstances, for example it has used face-to-face techniques to improve enforcement of Small and Medium-Sized enterprises (HSL 2006a). Yet the agency’s approach to the understanding and communication of major societal risks is primarily expert-driven, arguably as a result of a deliberate choice (HSL 2005). Societal acceptance criteria use technical calculation methods, for example the “FN-
curve” (Carter and Riley 1998; Jonkman et al. 2002). HSE has also used the scaled risk integral (SRI) that takes into account the individual risk level and other characteristics of the location. Recently, it has encouraged the development of a “Public Perception of Risk Gauging Tool” to assess societal concerns scientifically (HSL 2006b).

3.1 CASE STUDY APPROACH

This report has explored three main questions:

Question one: How is the HSE expert model evolving?

Question two: Is the HSE risk communication model outdated?

Question three: How should HSE deal with post-trust environments?

The explosion of the Buncefield complex (Hertfordshire) in December 2005 offers a good starting point to address these questions. This event was the worst accident at a chemical plant since the Flixborough disaster of 1974. The former Health and Safety Commission (HSC), now merged with HSE, established an independent board to investigate the incident. The Buncefield Investigation Board’s 8th report made some “Recommendations on land use planning and the control of societal risk around major hazard sites” (HSC 2008). The report called for an improved risk-based planning system around major hazard sites (HSC 2008: 9). It highlighted the complex nature of societal demands in this area:

“This balance has to meet rising expectations for provision of housing and employment on the one hand and on the other hand the rising expectation (especially after Buncefield) of being safe at home and at work” (HSC 2008:3)

Despite its highly cautious wording and without criticising HSE’s approach formally, the report invited the regulator and key stakeholders to rely on the traditional expert-led approach and made only a rather vague argument in favour of more direct methods to balance conflicting interests.5

4 “HSE’s publication R2P2 proposed a societal risk criterion (a 1 in 5000 chance per annum of an event causing 50 fatalities). HSE has since proposed a more complex formulation and gone on to develop a ranking technique based on it, though there is not yet general agreement over how it can be applied to all hazardous sites. Clearly further research work is needed but we believe a rudimentary method of estimating societal risk agreed now between parties is more important than academic perfection. Refinement can come later. We understand that HSE intends to take this work forward as part of an agreement between ministers following the CD212 consultation. We believe that in going forward with the revisions to the planning system around major hazard sites, the boundaries of acceptability of societal risk need to come to public debate and a public consensus needs to be developed”. (…) “Another difficulty is that there is no clear basis in law for taking into account society’s aversion to multiple fatality events (known as scale aversion) when conducting a numerical risk assessment or enforcing risk reduction measures, but HSE’s policy is to reflect societal risk when making judgements about whether measures are grossly disproportionate in relation to what is reasonably practicable. While such aversion is not measurable in a literal sense, the debate about whether, and to what extent, scale aversion should be introduced has run for some time. Guidelines are needed on what weighting to give to more severe incidents to allow practical application of societal risk. HSE advises that this issue is being pursued as part of its ongoing work on societal risk, and we encourage HSE to conclude this work as soon as practicable.” (HSC 2008: 34).

5 “Ultimately, risk assessment involves judgement but we also advocate the much wider use of a method known as quantified risk assessment if planning is to be more responsive to the risks at major hazard sites.” (HSC 2008: 6-7) (…) “With land use planning […] we have been conscious that it is
Where are we today? Is HSE’s expert model evolving? Or is the model stable and, if so, is HSE’s risk communication model outdated? How should HSE deal with “post-trust environments”, which are characterised by more aggressive media coverage and a more demanding public (Lofstedt 2005)? This study explores how the prevalent consensual model of regulation affects the communication of risk in areas where major incidents have already taken place (e.g. Buncefield) or may take place. It concentrates on the more problematic areas where the regulated community does not have a strong heuristic, such as ToR, at its disposal

**CASE SELECTION**

The limitations of expert-led models and the need to go beyond technical estimates of societal risk have become particularly tangible in areas where the governance structure is complex and conflictual, for instance, railway safety in the UK in the aftermath of the Ladbroke Grove accident (Renn, 2007). Controversies around the relationship between land use planning decisions and the siting of hazardous activities create a similar challenge, because of the dreaded nature of some risks (e.g. nuclear and chemical plants), the complexity of the interactions and the difficulty of reconciling multiple views and interests. Relatively frequent incidents in oil depots and refineries have also attracted HSE’s attention, as illustrated in the Conocophillips report.

This pilot review of Health and Safety research and policy debates combined with the analysis of risk theories and current practices has suggested three critical research hypotheses:

- HSE has primarily focussed on refining expert-based and top-down mechanisms. Comparatively, other options have been neglected, particularly participation.
- Risk theories, and risk amplification theories in particular (Kasperson et al. 1988), suggest that the accumulation of poor messages may lower trust; yet HSE has encouraged the technical estimation of people’s perceptions of dreaded activities rather than enhancing its capacity to engage in a two-way communication of risks.
- Empirical observation suggests that there are distinct areas where more direct stakeholder involvement would improve the effectiveness of risk communication, especially when governance is complex (e.g. land use planning); HSE, however, has made limited progress on adapting its communication technique to complex situations.

This study develops a qualitative analysis (Patton 1990) of two cases:

- **The Buncefield oil storage depot explosion**
- **The Oval cricket ground planning case**

about balancing several disparate interests – strategic, economic, social, safety and environmental. […] At the end of the day land use planning and societal risk necessarily entail political judgements. What we are proposing is a tool for flexible, transparent decision making which we believe will assist in achieving more consistent outcomes for the system for land use planning about major hazard sites in the future” (HSC 2008: v).

---


Both cases relate to HSE’s crucial but controversial role in land use planning. The Buncefield case has triggered a review of land use planning policy, while the Oval case presents a good test case of the complexities of land use decisions. Both cases are particularly relevant in terms of the economic, political and societal debates and the challenges that such high profile cases present for the regulator.

In the Buncefield case major worries only appeared after the risk had materialised. Most discussions about the risk have therefore taken place in retrospect, raising fundamental questions about the role of the regulator in prevention, preparedness, response and recovery. The magnitude of the explosion has sounded a “wake-up call”, with the effect of challenging HSE’s capacity to communicate when public pressure escalates. In the aftermath of the explosion, a collapse of public trust in HSE was likely; consequently the Executive was urged to define and develop the right communication quickly. The scale of this event means that it has played a seminal role, stimulating more systematic thinking on how Societal Risks should be approached.

The controversy about planning new developments at the Oval cricket ground presents a case, where the risk has not yet materialised and may never materialise, which conditions a ‘speculative’ or at least ‘prospective’ discussion. It may be described as a theoretical debate on risk in the post-Buncefield era. The building of a major development near a gasholder is a rare occurrence. The magnitude of the risk event implies that decision-makers may consider the possibility of a ‘dread’ effect (low probability/high fatality). The case is also unusual from a governance perspective, because it takes place in an area where HSE acts as “watchdog” (BBC 2007) rather than performing traditional regulatory functions. Finally, it takes place in a contentious environment where many interests contend, which, according to risk communication theory, suggests that direct stakeholders’ participation may be considered.

**METHODS**

The research has applied key risk communication criteria to test HSE practices in the selected cases (see Table 2). The criteria are relatively simple and grounded in risk communication theories and selected practices (two reports on theories and practices are attached as Appendices 3 and 4)

<table>
<thead>
<tr>
<th>Key criteria</th>
<th>Fiduciary avoidance</th>
<th>Consensual containment</th>
<th>Consensual assessment</th>
<th>Pluralistic assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative risk</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>estimates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBA</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Societal criterion</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Deliberations</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Our initial attempt collected data on the basis of semi-open interviews of all the critical actors involved in the selected cases, both inside and outside HSE. The selection of a target population proved to be our biggest challenge because of specific confidentiality restrictions.
Many cases of incidents are followed by a criminal investigation that may restrict access to information or people. Even after the HSE has provided its advice and has met with Planning Authorities to explain its advice, the HSE may still write to the Secretary of State to request call-in. If the Home Office and the Security Services advise that a s.321 direction is required, the HSE will act on the advice and will write to the Secretary of State, who will then decide whether the direction should be granted. If a s.321 direction is in place, this inevitably prevents the release of information which could be communicated to the public. Studies of critical and vulnerable sites may also be impaired because of the need to protect national security. The easy solution would have been to flee from the difficult cases of Buncefield and Oval and look for consensual alternatives. This approach, however, would have impaired the relevance and impact of the study. Cases without controversy often present little interest. Historically, risk communication has been most helpful when it has improved the quality of the risk debate in highly sensitive areas (nuclear waste, etc.). The building of standard procedures to deal with routine issues is merely a by-product of this process.

In the Buncefield case we were allowed to select and interview key actors and stakeholders (Residents, HSE staff, Major Incident Investigation Board, Business Community, Local Council etc). Many people contacted for an interview were very positive, with the exception of some business leaders who have shown little interest.

Confidentiality rules linked to the Oval enquiry made the selection process more restrictive. HSE lawyers were concerned about parties on the other side being interviewed because at the time, the then Secretary of State had not delivered her decision on the Oval inquiry. Selecting respondents on the basis of political convenience would not have been acceptable, since it would have biased the data collection process. We chose, therefore, to restrict interviews to the homogeneous population of HSE employees, which constitutes a distinctive and relevant “milieu” (Bauer and Gaskell 2000). As a consequence only those inside HSE were questioned about the Oval. Respondents have conveyed an HSE perspective on risk communication. The result, of course, is a high degree of subjectivity. We have considered that this subjective element is acceptable for at two main reasons.

The first reason is that the Buncefield and Oval cases take place at different levels, while remaining at the same time complementary and mutually informative. Buncefield is a seminal case, while Oval is illustrative. The Buncefield explosion has introduced a debate about Land Use Planning and our approach has enabled an analysis of the perspectives of the key stakeholders on how risks have been communicated and how they may be communicated in the post-Buncefield environment. The Oval case, on the other hand, concentrates on current practices and to some extent provides an illustration of current practices. This analysis contributes to the identification of what works well and less well from a risk communication perspective. This justifies its focus on the actor that matters to this study, i.e. HSE.

The second reason is that the criteria of investigation selected for the illustrative case (Oval) relate to the structure of the communication process rather than the details of the disputes between the different actors. To ensure consistency, we asked the same set of questions to all respondents (see Appendix 2) with a view to determine the nature of the communication process, how risks have been estimated and communicated and what the nature of stakeholders’ involvement is. These interviews were supplemented with more extensive triangulation than is usual in such studies, which has help to reduce the risk of “institutional capture”.

The restrictions linked to the selection of the Buncefield and Oval cases also came with some advantages. They allowed the researchers to investigate how, in practice, confidentiality may interfere with HSE risk communication.
3.2 BUNCEFIEL EXPLOSION CASE

This case concerns the investigation that followed the explosion of the Buncefield Oil Storage depot, which was an installation of critical importance based in Hemel Hempstead, Hertfordshire.

CASE OVERVIEW

The terminal, owned by a joint venture between TOTAL UK Ltd. (60%) and Texaco Chevron Ltd (40%) was the fifth largest oil-products storage depot in the United Kingdom, with a capacity of about 60,000,000 imperial gallons (272,765,400 l) of fuel. It supplied about 30% of the consumption of Heathrow airport. In the early hours of Sunday 11th December 2005, a number of explosions occurred at the facility:

“At least one of the initial explosions was of massive proportions and there was a large fire, which engulfed over 20 large fuel storage tanks over a high proportion of the site. There were 43 people injured in the incident, none seriously. There were no fatalities. Significant damage occurred to both commercial and residential properties in the vicinity and a large area around the site was evacuated on emergency service advice. About 2000 people were evacuated. Sections of the M1 motorway were closed. The fire burned for several days, destroying most of the site and emitting large clouds of black smoke into the atmosphere, dispersing over southern England and beyond (…).” (MIIB 2008a: vol.2, 12).

Shortly after the incident Hertfordshire's Chief Fire Officer declared that the explosion was the largest incident of its kind in peacetime Europe (Sky News 2005). Residents interviewed for this study have confirmed that they were “overwhelmed” and “upset”:

“We were in bed. It happened in the morning and we could feel the house shaking. We saw a big pillar of yellow flame. We also heard a very distinct noise that I still remember very clearly because it was very upsetting. We turned on the TV and we watched the news. Initially we thought a plane may have crashed. But Sky news picked up the story quickly and we received some information. They were very quick at reporting”

It soon became clear that the explosion was likely to have resulted from an escape of petrol that formed a vapour cloud, which subsequently ignited (MIIB 2008, vol. 1: 16). The investigation board set up in the aftermath of the explosion (see below) has reviewed hypotheses about what may have caused such a violent explosion. The more likely explanation is that the incident was the result of overpressures generated in largely unconfined spaces. The trigger, which resulted from the complex interactions of mechanisms, is not yet fully explained.

In view of the magnitude of the explosion, several respondents to this study considered that the absence of serious injuries and fatalities was “amazing” or “a miracle”. Given that the explosion reduced the vicinity to a “lunar landscape”, the assessment of the damage and recovery was from the beginning bound to be a complex process. As may be expected from this sort of incident, damage was not distributed evenly around the site. For instance, buildings were unevenly affected: some close to the site appeared miraculously spared, while others further off were seriously damaged. As is also to be expected under the circumstances, it has taken months to assess the scale of the damage and some delayed effects have been noticed. Impact assessment has proven a difficult task. In some cases the level of damage was underestimated. In other cases, hastily carried out repairs after the incident have been inadequate.
HSE’s response was proactive. According to Article 14 (2) of Health and Safety at Work etc Act 1974 the HSC may:

(a) Direct the Executive or authorise any other person to investigate and make a special report on any matter to which this section applies, or (…)
(b) With the consent of the Secretary of State direct an inquiry to be held into any such matter (...).

HSE used these two distinct procedures to clarify the circumstances of the incident and conduct the criminal investigations. It took the unusual step of combining an independent investigation under article 14 (2) (a) with a criminal inquiry under 14 (2) (b). Between 2006 and 2008 two streams of investigations were conducted in parallel, one to investigate the circumstances of the explosions and fire of December 2005 and the other to establish facts and liabilities and, possibly, bring civil and criminal charges.

The Buncefield Major Incident Investigation Board (MIIB) was established without delay, in early January 2006 and remained in existence until the end of 2008. The then Chair of the HSE board, Sir Bill Callaghan, appointed Lord Newton of Braintree as independent Chair. Lord Newton is a well-respected Westminster figure, as a former Member of Parliament (MP) (1974-1997), minister (1984-1992)⁰, and Leader of the House of Commons (1992-1997) and as a member of the House of Lords since 1997. Board members included three members of HSE and two independent academics. The lasting result of the Board’s work has been a comprehensive body of 9 reports published in 10 volumes (see MIIB 2008a vol 1 and 2). MIIB has developed an in-depth assessment of the issues. In the early stages of the investigation, the chief interest of the Board has been to look into the root causes and chain of action that increased the risk. After a few months, however, attention shifted to strategic and systemic issues, in particular four areas of concern that its fourth report introduced: (i) design and operation of sites; (ii) emergency preparedness; (iii) land use planning; and (iv) the Competent Authority’s policies and procedures. The Board also formulated detailed recommendations to prevent future incidents.

Taf Powell, the Head of HSE’s Offshore Division of the HSE’s Hazardous Industries Directorate, a man with a long experience of the Oil sector, was appointed to lead the Government’s investigation into the case (he was also appointed as one of the three HSE members of MIIB). The criminal investigation, therefore, has been under the leadership of the HSE, though it has been conducted jointly with the Environment Agency (EA). The investigation involved 250 inspectors, staff from HSE and EA, consultants and technical experts. The main focus of the joined-up team was on-site investigation. Its main purpose was to clarify on civil and criminal liabilities, including a search for any “breach of duty”. In contrast to the usual timescale of such a process, the first civil trial began in 2008. At the same time, and shortly before the publication of MIIB’s last report (December 2008), HSE and the Environment Agency announced that criminal proceedings had commenced against five defendants relating to the causes of the explosions and fires and to their environmental impact. The criminal case against the five defendants and all companies is expected to be concluded by 2010.

---

COMMUNICATION OF EVIDENCE

The main objective of the criminal investigation was to gather evidence and the team was bound by confidentiality rules, which restrict external communication. MIIB, on the other hand, has given the highest priority to developing an open and proactive communication towards local residents and businesses. According to Lord Newton:

“The HSC decision to establish this independent investigation was a significant move, highlighting the severity of the incident and the degree of concern for people living and working close to the Buncefield site, and the importance of the work to the wider industry” (MIIB webpage⁹).

The nine reports of the board have been the central vehicle of the Board’s external communication. They have been released in the following order:

1. 21 February 2006. First progress report by the Investigation Manager, describing the incident and the emergency response, the environmental, social and economic impact, as well as initial evidence on the causes of the explosion.
2. 11 April 2006. Second progress report by the Investigation Manager, describing the ongoing investigation.
4. 13 July 2006. Initial Report of the Board. The report reviewed what had been learned about the incident and set out the four areas of concern.
5. 29 March 2007. Report of the Board on the design and operation of fuel storage sites, the first of the four areas of concern identified in the Board’s Initial Report.
6. 17 July 2007. Report of the Board on the on emergency preparedness, response and recovery; the second raft of recommendations to address the four areas of concern set out in the Board’s Initial Report.

The release of these reports has been both timely and effective. After the incident, media attention was very high and any public controversy was likely to amplify the risk. Any communication vacuum may have been filled by highly critical media coverage, which could have jeopardised the entire review process. The investigation team prevented this from happening, however, since it was very quick to act. The first progress report was issued about two months after the incident, and only weeks after the first meeting of the Board on 24 January 2006. The two subsequent progress reports were issued shortly after (April and May). During the course of this study some local residents have highlighted that the three progress reports were relatively easy to understand, unlike subsequent reports, which they found too technical or “jargonistic”. By the time this information was released, however, the investigation team had already established a closer relationship with some residents, who could act as mediators within the community and turn to the team when clarification was needed.

Trust is based, among other things, on fairness, competence and efficiency (see Appendix 3). MIIB met these objectives. The speediness of the initial response, combined with regular updates and the consistency of its follow up actions, have reassured local residents and businesses about the existence of a due process that addresses their concerns. The overall cost of the investigation was also perceived as reasonable. The board did not rely on expensive public relation exercises. Instead, the investigation team interacted with the public through

personal contacts, low-key venues such as town hall meetings, as well as networking techniques. From the very beginning the Board had a clear strategy, which could be described as “trust-building”. One of its members described it as follows:

1- Identify all people to work with
2- Attend public meetings and be visible
3- Organise meetings and make major announcements
4- Commit to provide information -- within legal restrictions
5- Develop an understanding of who we need to target and make sure we have no surprises about who the audience is
6- Make sure people understand that we are “independent”
7- Be fully briefed

Risk theories suggest that individuals with good communication skills are a critical factor for success (see 1). One striking result of this research is that all respondents, with no exceptions, highlighted the key role played by Lord Newton, Taf Powel and their team in maintaining open communication channels. Placing the investigation team at the centre of the information exchange network has contributed to increase public trust further in the process. This has been particularly important since residents have expressed their disappointment at the responses of other critical actors, most notably ministers, the police and the insurance industry. In comparison, the chair of the Board and the Leader of the Government’s Investigation have been described as “very involved”, “very approachable” and “willing to leave no stone unturned”. Without the proactive role that these central co-ordination points played in the communication process, it is likely that the Government response would have been reduced to a cacophony of competing voices.

The interview process prompted a range of divergent views, from “this event was bound to happen, sometime, somewhere” to “the explosion was utterly unacceptable”. In a low-trust environment such polarised views have very destructive implications. In the Buncefield case, however, high levels of trust have helped to focus the debate. Scientific and evidence-based communications have remained an important feature of the debate. The communication approach followed by HSE, MIIB and the Environment Agency has been to maintain a flow of communication that addresses both expert and lay audiences. Reports from the investigation board, as well as reports from the HSE and the Environment Agency, contain material that is both technical and general.

To conduct a debate that both expert and residents would judge acceptable and useful was bound to be a challenge. When it established an investigation board, the HSE provided an independent platform for risk discussions. It could draw on the eagerness of local residents “to understand what had happened”. Yet in the aftermath of a major accident it is particularly difficult to concentrate on evidence rather than the emotional responses provoked. Several respondents from HSE have recognised that little room was left after the incident for speculations about probabilities and scenarios, especially when it was suggested that the risk was very small and that all due precautions had been taken. A respondent also highlighted the need to address public expectations in concrete terms rather than trying “to reason with the public” on the basis of numbers. The Board, however, did not pursue the path of popularisation and maintained high standards in evidence-based discussions. As one respondent highlighted, reports were typically designed for “an educated young graduate” rather than a general audience. This may be explained by the fact that an experienced figure led the investigation and that HSE experts were a majority in the board. The proactive nature of the communication process as well as the trust vested in the investigation team helped to ensure that the experts were listened to, with some local residents facilitating this process. In a high-trust environment this approach has succeeded in ensuring some meaningful communications between experts and laypersons.
These efforts were supplemented with an early commitment to review and reform policies. Shortly after the Buncefield incident, the Buncefield Standards Task Group (BSTG) was formed consisting of representatives from the Control of Major Accident Hazards (COMAH) Competent Authority and industry. The mandate of the group was to translate the lessons from Buncefield into effective and practical guidance that industry could implement rapidly. Similarly, the investigation process became increasingly policy-oriented. Before the publication of the Initial Report of the Board in July 2006, most of the material available concentrated on an investigation of the causes of the incident. The report indicated a shift of the team’s attention towards making recommendations to improve safety and environmental performance at high-hazard sites. This has been viewed by the HSE itself as a key development. Its effect has been to add a policy dimension to the scientific debate.

**STAKEHOLDER INVOLVEMENT**

Due to the nature of the case, risk communication has involved complex interventions and interactions of a large number of institutional and non-institutional players, some of them influential before the incident, others not. When the researchers asked respondents to detail the list of major players they received some inconsistent answers, which reflects the complexity of the situation. Major institutional players who have been mentioned include:

- Parliamentarians and senior establishment figures
- Ministers
- Local politicians
- Staff of affected Local councils
- Local services
- PCT
- HSE
- Environment Agency
- MIIB
- Criminal investigation team

Private sector players mentioned include:
- Oil companies
- Other large companies (e.g. Kodak)
- SMEs
- Insurers
- Lawyers

Residents were also mentioned as a distinct ‘stakeholder’ but in their case respondents did not refer to pre-existing organisations. Hemel Hempstead (Dacorum Council) has been described a family-oriented suburban town that was unprepared for a large-scale hazard. The explosion caught everyone by surprise. The facility was unknown to most residents. It was located on the outskirts of Hemel Hempstead, was hidden by a fence and employed very few people. Despite its national significance the site had not been the subject of local worries or controversies. The consequence is that, prior to the accident, local residents were not organised or prepared for the situation. There were no grassroots organisations to channel their demands. This situation had important consequences. Residents and small businesses felt extremely vulnerable and powerless when dealing with officials, the police, local authorities, and insurance companies. At the same time, the main business player, the oil companies, remained unengaged communicators throughout the investigation. Two reasons have been given. It has been argued that the oil companies did not want to jeopardise their position as it became clear from very early on that the case might end up in court. Some residents have also speculated that the importance of the site for the oil supply of Heathrow would lead in the end to an agreement, behind close doors, between oil companies and politicians.
At the initial stage of the investigation, HSE’s credibility was low. Residents were not sure whom to blame: Oil companies who were perceived to have let it happen? HSE, who failed to protect the community? In the early days of the investigation MIIB was also regarded with suspicion. Was the purpose of an investigation to find the truth or to cover it up? Could a body that looked like “HSE investigating itself” come up with anything useful? The local MP, Michael Penning, has frequently called for a full parliamentary enquiry into the case rather than an HSE investigation. In this difficult environment, Lord Newton had to establish the reputation of his Board. Referring to the first meeting organised with the business community, one member of the Board said:

“We had a very hard time. People did not understand who we were, what the purpose of the meeting was.”

In a context characterised by uncertainty and distrust, the proactive nature of MIIB’s risk communication built its strong reputation as a source of trustworthy information. One important aspect to consider is that other public sector organisations were afraid of talking to the people who came forward to them. Some residents, for example, have complained about the passive attitude of the police force. Many people had very straightforward questions. One of the first actions of the board was to appoint a full-time liaison officer to manage the interactions with the community. This approach is rare in independent investigations. It has proven highly effective, however, and it is in agreement with risk communication theories that emphasise the positive impact of a dedicated risk communication resource (see Appendix 3). The board sought out people and talked to them. In so doing, it led the stakeholder involvement process. Of course, this process was facilitated by the fact that the Oil companies remained silent and that ministers and the press were involved only at the initial stages, in the immediate wake of the incident. The local council did not conflict with the Executive and acted as a facilitator. This was especially useful for managing the relationship with small businesses. As trust grew between some local residents and the Board, some of the residents became increasingly involved in the process, therefore creating a virtuous circle of trust. At some stage some proactive local residents worked closely with the liaison officer and the board. They filtered technical discussion to the other residents through e-mails. They also set up an email account for residents. A walkabout was organised to handout leaflets with accurate information door-to-door. A task force was eventually established, where the council, HSE, the Police, the Local Council and others were represented.

### 3.3 OVAL PLANNING CASE

This case presents an unusual example of a wide range of potential risks associated with a large facility. It has taken place in a context where HSE may be described as acting as “watchdog” (BBC 2007) and advisor to Local Planning Authorities (LPAs) – HSE is a statutory consultee but the decision-makers are the local authorities and the Secretary of State for Communities and Local Government (CLG).

**CASE OVERVIEW**

Chemical installations are, after nuclear risks, one of the industrial risks that the public most dread (Ball et al. 1998; Covello et al. 1988). The Buncefield explosion raised a crucial question: are risks properly checked, should we be more cautious about planning? Ken Livingstone’s remarks about “barmy bureaucrats”, on the other hand, raises the opposite question: is HSE too risk averse? Does it concentrate on minuscule risks?

According to one respondent there are currently about 1500 major hazard sites in the UK. The UK is densely populated and there has been considerable interest in recent years in building
new developments in and around these sites. The current economic turmoil may slow down the rate of new developments but it is unlikely to affect this situation dramatically. Local authorities find themselves in a situation where they need to carefully balance ‘real risks’, perceptions and economic interests before granting permission to build. In the Oval case, it does not take much imagination to see that viewers may “face danger from an instant ignition of the gasholder, which would create a massive fireball” (Anon. 2008). The ignition could result from two main causes. One obvious cause would be an accident, as mentioned by HSE, the developers and Surrey Country Cricket Club. The Oval could also be the target of a malevolent human intervention, i.e. an act of war or a terrorist attack (for land use planning advice HSE does not include probabilities of terrorist attack).

Non-nuclear hazards involving dangerous substances are regulated through the Control of Major Accident Hazards (COMAH) 1999. These regulations implement the European Council Directive 96/82/EC on the control of major accident hazards involving dangerous substances (also known as the “Seveso 2” Directive). There are requirements under the COMAH regulations for HSE to be notified at various times, e.g. before an operator starts construction of a major hazard site. These requirements bear on the operator of the proposed major hazard site: according to COMAH Regulation 8 implementing Articles 9(5) and Article 10 of the Seveso II Directive (96/82/EC) the operator should notify the HSE before modifying the establishment of any installation. Planning authorities, on the other hand, grant planning permission for various developments and grant hazardous substances consent. Planning authorities have to consult HSE for advice before granting consent and in certain situations (i.e. in the vicinity of existing major hazard sites) before the planning authority grants planning permission to developments. The duties on the planning authorities to consult HSE fall under planning legislation (not under the COMAH [safety] legislation). In the Oval case, the planning authority consulted HSE for advice before granting planning permission for development/redevelopment at the Oval cricket club, because it is in the consultation distance of a major hazard site (the gasholder station).

HSE advises LPAs on the nature and severity of the risks that possible incidents at the installation present to people in the surrounding area in order that the LPA is able to consider those risks when making its decision. HSE may advise against the proposed development. The Buncefield investigation board has described the process as follows:

“Under the current system, once hazardous substances consent has been granted, the HAS passes the papers to HSE who defines on a map the area within which planning authorities have to consult HSE for other planning applications. This is called the ‘consultation distance’. HSE also sets three zones within the consultation distance which are the basis for HSE’s advice. Ultimately, HSE will either ‘advise against’ or ‘not advise against’ as it does for hazardous substances consent. Subsequently, when individual applications are submitted for off-site developments that are within the Consultation Distance, the planning authority has to make the decision having taken advice from HSE. Where the planning authority approves an application against HSE advice, and an opportunity has been provided for HSE to explain the nature of the risks to the planning authority, then HSE can invite the Secretary of State for CLG, and the relevant minister in Wales, to ‘call in’ the decision for review”. (Buncefield Major Incident Investigation Board 11-12)

The procedure does not go to the “call in” phase in most cases. The Oval cricket ground development project provides a rare, but highly relevant test case. The developers’ case started with the project to build a new stand and hotel at the Oval cricket ground next to gasholders operated by Southern Gas Networks plc. In the past, Lambeth had authorised significant new developments at the Oval cricket ground without consulting HSE. Despite the fact that it is a legal obligation, the initiative to consult HSE remains in the hands of local councils.
In 2002-2005 Surrey County Cricket Club started redeveloping the Vauxhall End, which included knocking down the outdated north stands and creating in their place a single four-tier grandstand known as the “OCS Stand”, with an increased ground capacity of around 23,000 seats. In January 2007 the Surrey Club announced plans to increase capacity, this time by redeveloping the Pavilion End and a 168-bed hotel at the ground. Estimates about the number of seats at the stand have varied, from over 1000 extra seats (HSE respondent), 1,632 seats (according to local Liberal Democrat councillors) to 5000 seats (according to the Telegraph) (Annon. 2008). The developer made an initial application in 2007 and HSE advised against permission. The local authority followed HSE’s advice and the permission was refused in October 2007. Surrey County Cricket Club along with developers Arora International submitted a new application including a new assessment report from consultants BT&P and Hyder. HSE officials, however, were not convinced that the new project was substantially different to the previous plan. HSE advised against. This time, however, the council approved the application and informed HSE that they were minded to go against HSE’s advice (January 2008). On 2 May 2008, after further consideration of the case, HSE requested through the Government Office for London that the Secretary of State for Communities and Local Government (CLG) should call-in this application for her own determination. The Secretary of State followed HSE’s advice. A planning inquiry was held during November and concluded on 2 December 2008. The inspector transmitted its report to the Secretary of State for CLG, who announced on 9 June 2009 his decision to grant planning permission for the development at the Oval cricket ground\(^\text{10}\). The HSE therefore ‘lost its case’.

COMMUNICATION OF EVIDENCE

This section concentrates on the critical interaction between HSE’s experts and planners within local authorities when implementing the protection approach. Due to the confidentiality restrictions of the Oval enquiry, HSE respondents have not discussed the technical arguments about the ‘pros’ and ‘cons’ of specific decisions.

HSE’s advice to local authorities is one aspect of the local planning system that highlights the importance of the flow of information between the Executive and planning authorities. For a long time HSE used to engage in a direct dialogue with LPAs. The Executive used to send maps to planning authorities physically, who in return used to send housing projects maps to HSE. Nowadays, planning applications are handled through a standardised and structured process, with the effect of a reduction in opportunities for proactive dialogue. This is important because, although HSE is a small player as a consultee, its advice to LA is critical for mitigating the consequences of major hazard accidents.

In the 1990s, the HSC suggested that HSE should codify the planning process. In November 2002 a computerised decision tool called ‘Planning Advice for Development near Hazardous Installations’ (PADHI) was introduced to support planning decisions. PADHI offers a 4X4 decision matrix (see Table 3) that reflects the sensitivity level of proposed development to each of the consultation zones. Each local authority has access to PADHI through an extranet system.

\(^{10}\) Accessed at: http://www.hse.gov.uk/landuseplanning/ovalcricket.htm
### Table 3 - PADHI decision matrix

<table>
<thead>
<tr>
<th>Level of sensitivity</th>
<th>Development in inner zone</th>
<th>Development in middle zone</th>
<th>Development in outer zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DAA</td>
<td>DAA</td>
<td>DAA</td>
</tr>
<tr>
<td>2</td>
<td>AA</td>
<td>DAA</td>
<td>DAA</td>
</tr>
<tr>
<td>3</td>
<td>AA</td>
<td>AA</td>
<td>DAA</td>
</tr>
<tr>
<td>4</td>
<td>AA</td>
<td>AA</td>
<td>AA</td>
</tr>
</tbody>
</table>

**AA Advice Against**

**DAA Don’t Advise Against**

This codification of thirty years of health and safety advice has involved a less interactive relationship between HSE and LPAs. As a result of using the PADHI software, the amount of personal contact between local authorities and HSE has decreased. After the new system was introduced, HSE organised a series of seminars to introduce the technology to the 460 local authorities in Great Britain. HSE employees interviewed for this study were in general satisfied with the training and argued that, in most cases, it had achieved its educational purpose, except for the local authorities that did not attend the training courses. They pointed to a clear difference of behaviour between the authorities that had taken the course and those authorities that had not.

A number of respondents indicated that some councils have attended training sessions, have built a strong capacity to deal with their legal requirement and have maintained an ongoing dialogue with HSE. Yet good practice has not been adopted universally. Although no statistics were provided to illustrate the point, respondents have also indicated that many local authorities have a far poorer performance. The extent of the compliance efforts is often proportionate to the number of hazardous sites found within the boundaries of a local authority. The Oval gasholders are the only major hazard site to be found in Lambeth, a residential borough located just south of the river Thames, within a walking distance of landmarks such as the House of Parliament and Westminster Abbey. Earlier developments at the Oval, for instance the first stand at the cricket ground, were undertaken without consulting HSE (these developments took place before advice was codified into PADHI - suggesting a legacy of infrequent interactions and poor communication).

New developments undertaken without consulting HSE may go unnoticed. The Executive, on the other hand, has a number of sticks. On the one hand, it may come to authorities who profess that they don’t know PADHI and make sure they use it. If a planning authority fails to consult the HSE in relation to a planning application, the HSE can start an action in Judicial Review. This may act as a deterrent in sensitive cases. In this case, the Local Authority sought HSE’s advice.

Lambeth council’s employees did not attend PADHI training and failed to maintain a relationship with HSE in this area. The result has been a lack of preparedness. Interviewees have highlighted that the council seemed to expect that HSE would interpret the case for them or apply PADHI for them. Faced with this situation, HSE decided to go beyond the standard letter and give more detailed advice to the Borough of Lambeth. This is not a unique situation, as HSE may go and talk to Local Authorities. The time and resources consumed, however, have been unusually high. HSE interviewees have remarked on the intensity of the
information exchange compared to the insignificance of the results. HSE did not manage to get its message through to the LPA, although it was relatively clear from the PADHI decision matrix that the project would be a highly-sensitive development placed in the inner zone. An unusual number of staff members were assigned to the case. On the other hand, the developer was very persuasive. The Times reported that:

“Paul Sheldon, the chief executive, admitted: We convinced Lambeth Council, who were very vigilant, that this would be a safe project. They were convinced there was no risk and were swayed by the area's regeneration and the employment that the hotel would bring.” (Tennant 2008)

From very early on the circumstances clearly indicated that it was a case where HSE would have to request call in if no substantial progress was made towards a proposal for a project that would address the safety issues. HSE participants have highlighted that this was made very clear to Lambeth Council from very early on. Apparently the council shifted from a position where it seemed ready to accept HSE’s advice to a position where it was minded to approve the development. The council seems to have vacillated between sending positive and negative messages.

Lambeth Council’s procedures (as for all councils) require a deferral of the issue to the Planning Application Committee for “applications which are recommended for approval where an objection to the current proposal has been received which is based on material planning grounds” (Lambeth Council 2009). The committee is composed of five elected councillors, who voted 3 in favour and 2 against the project. The vote was preceded by a number of phone calls and exchange of letters between the HSE and the Council. A review of the application by consultants, paid for by the developer, was also produced, which strongly supported the case. The impact on HSE staff was counter-productive, which meant that HSE was pressured to revise their position.

The Planning Application Committee confirmed the council’s approach, which led to them granting permission despite HSE advising against. For several HSE respondents this decision did not come as a surprise. HSE did not attend the planning meeting, arguably because senior members of the Executive felt that the planning report already contained enough information to back up their position and the councillors had all the evidence needed for a decision. On the other hand, HSE publicised its decision openly, so that its reasoning was in the public domain and therefore could be made available to the public. Some respondents regretted the decision not to attend the planning meeting and felt that the presence of Executive may have had an impact.

Under the Town and Country Planning Order 1995 Article 14, the Secretary of State may direct a LPA to not grant permission without specific authorisation by means of the issuing of a “stop notice”. This procedure buys time for all parties but does not obviate the need for a prompt decision from HSE (HSE 2008). In the present case a last chance consultation process was organised between HSE, Lambeth representatives, Surrey County Cricket Club and the gas company. The discussions did not resolve the matter and, as a result, HSE maintained its position. When LPAs are minded to grant a planning permission against HSE’s advice they are required to give HSE 21 days notice so that HSE has time to consider whether to recommend that the Secretary of State call in the application (HSE 2008). This time HSE was minded to recommend and the Secretary of State agreed to call in the application.

STAKEHOLDER INVOLVEMENT

The Oval case has been characterised by the active involvement of institutional stakeholders in the decision process and more limited involvement of the population around the site. In
addition to HSE and the LPAs, several stakeholders have been involved at one point or another in the discussion:

- The LPA
- Gas operator
- Surrey County Cricket Club
- Developer
- The press, especially the specialised planning press
- Consultants
- Planning inspectorate
- Security services
- Local MP
- Local residents

The Oval ‘story’ suggests that critical communication has taken place between local planners, Surrey County Cricket Club and developers on the one hand, and between local planners and HSE on the other. Multi-stakeholder discussions were limited to a single meeting in Summer 2007, which took place at the Oval. The HSE officials involved perceived the meeting as a show-case for the project. They felt that the meeting was a missed opportunity to conduct an informed discussion of the risks and benefits. Arguably, the presence of the developer put HSE officials in the awkward position of being asked to fight for their position, while representatives from the Lambeth Council and the gasholder company were “sitting back”.

The meeting was not open to local residents although a number of them were known to oppose the project. It was a one-off. HSE or the Borough of Lambeth did not reciprocate; they did not host similar meetings. At the end of the planning process, HSE was invited to the planning meeting where councillors granted permission to build. HSE’s management made a conscious decision not to attend.

Stakeholders were involved unevenly. Sometimes limited involvement was justified. For example, the planning inspectorate and the security services played a specific role at distinct stages of the process, as required by law. Although limited in time, the advice of security services has had a critical impact on defining the degree of openness and transparency of the communication process. HSE respondents have expressed discontent about the quality of information exchange with some stakeholders. For example politicians “did not seem to get it”.

To this day, the involvement of the local population has remained very peripheral. HSE has not sought active involvement or support among residents. HSE respondents indicated that they did not see the potential benefit in stakeholders’ participation because of the lack of risk-awareness among the public. Residents were interested in issues that have nothing to do with HSE, like avoiding the noise or even being able to continue watching the cricket match from their balcony.

As a consequence, none of the institutional players studied the perception of local residents. Without a proper analysis of the residents’ views it is very difficult to make generalisations about their perceptions and fears. We know from trust and risk communication studies that vocal citizens are unlikely to represent the views of the majority (Lofstedt 1999). The review of the website created by the grassroots initiative ‘UfO’ (United Friends of Oval) at the time of the first application (2007) suggests that the residents’ concerns have not focused on the health and safety hazard. Instead, residents expressed concerns about impaired “quality of life” resulting from noise, aesthetics, restricted access and blocked views. There has also been a call for environmental impact assessment (which would fall under the remit of the Environment Agency and not HSE).
Box 1: ‘UfO’ press release

The website of United Friends of Oval (UfO) displayed a press release, which sums up the main concerns of this group of residents:

“The Residents are supportive of a genuine world class scheme

Angered residents remain supportive of the ambitions of SCCC to build a world class stand at the South End of the Ground and are campaigning for:

1. Proper consultation with local residents about the development of a new stand.
2. Proper research and consultation on the impact of a substantial new hotel development on the area.
3. An architectural competition to produce a scheme which matches the grace, beauty and landmark status of the OCS stand at the North End of the Ground.
4. An undertaking that any proposed scheme be subject to an Environmental Impact Assessment before permission is given”

Source: UfO former website http://unitedfriendsofoval.co.uk

In 2007, UfO’s website commented the decision of Lambeth to reject the first application as follows:

“This Development has been refused due to the proximity of the Gas Holders and the level of risk involved for the occupiers. Lambeth Planning say this:

The decision on the planning application is a follows:

Refuse Permission
The following conditions for permission or reasons for refusal apply:

1. The proposed application site is located within Inner and Middle Consultation Zones - as designated by the Health and Safety Executive - in relation to the proposal's proximity to the Kennington Gas Holder station, and as such, would place new occupiers of the proposed spectator stand and hotel at an unacceptable risk of harm in the event of a major incident involving this same gasholder station. The proposal is therefore considered contrary to Policy 54(g) of the adopted London Borough of Lambeth Unitary Development Plan - August 2007

The attention of the political opposition has also focussed on “quality of life” aspects:

“We have been told that the result of the public enquiry into the proposed hotel at the Oval Cricket Ground will be available around the first week in June. Also, Surrey County Cricket Club are testing the new floodlights at the Oval Cricket Ground on the evenings of April 29th and 30th. The plan is to test both the level of lighting on the pitch and to check that no lights are shining into people's homes. Local councillors continue to raise the concerns of residents on match days to do with noise and anti-social behaviour.”

11 UfO former website http://unitedfriendsofoval.co.uk
On their blog, the main opposition councillors (Liberal Democrat) expressed regrets that local views had not been better taken into account:

“Our view as local councillors is that local views must be taken into account - in addition to concerns expressed by the Health and Safety Executive over the proximity of the planned new development to the Kennington gasholders.”

The blog has attracted very few comments, which suggests that the topic is a low concern for most residents. This is consistent with scholars’ observation that, beyond a small group of activists, the general population does not usually take an active part in public debates (Lofstedt 2005). On 8 October 2008 one resident posted on the councillors’ blog:

“I have concerns over enterprise being potentially stifled in the middle of one of the main cities of the world. Having successfully seen the new Arsenal stadium be given clearance (reaping huge benefits to London), I look forward to seeing the Oval being allowed to develop their exciting plans. One of the councillors answered: “Even the most exciting scheme in the world should be developed in consultation with local residents, all too often local residents are treated as though their views don't count”.

At the time of the second application, in addition to leaflets distributed by the Borough of Lambeth, Liberal Democrat. opposition councillors also circulated information about the procedure to follow for the expression of views as well as the contact details of the officer at Lambeth Planning to receive information about the call-in. Information from the Surrey County Cricket Club was also published on their blog.

3.4 MAJOR HAZARDS AND RISK COMMUNICATION

This section compares the findings of the two case studies from the perspective of risk communication. It concentrates on the structures and patterns of the communication model, including the role of expertise; the effectiveness of the communication channels between the critical actors; and finally, the main factors that could affect trust.

HAZARD-BASED V/ RISK BASED APPROACH?

Unlike toxics, where assessment takes place on the basis of risk probabilities, flammables have been dealt with on the basis of protection against the hazard itself without any Quantitative Risk Assessment (QRA). The Buncefield investigation board has criticised this model for not being scientifically robust and has supported the introduction of more robust risk assessment methods:

“We explain that the simplified, generic approach to risk assessment currently used around flammable storage sites needs to be replaced by a site-specific assessment of risks, using QRA methods, leading to a planning system that is more responsive to the levels of risk posed by each particular site” (Buncefield Major Incident Investigation Board 2008, p vii)

The Buncefield investigation has led to a number of policy recommendations and, most importantly, it has prompted a rethink of the local planning approach from a hazard-based model towards a risk-based model. The 8th report of the Board of July 2008 combined an

---

14 https://www.blogger.com/comment.g?blogID=8125418645407305042&postID=34245503443614207

15
analysis of evidence from the Buncefield investigation and the results of research into risk-based planning. It formulated 18 recommendations for “improvements in the UK planning system, including a fundamental review of the entire system, a consistent and fully risk-based system for planning controls at all major hazard sites, the incorporation of societal risk into assessments of planning applications, and for better alignment with the COMAH regime” (MIIB 2008b).

The Initial Report of the Board asked HSE to review its approach to giving advice to planning authorities, “with a view to taking greater account of risk”. The report restated the need for further research into the explosion mechanism, which suggests reliance on strong evidence. MIIB then commissioned a report from the engineering consultancy Det Norske Veritas to “describe what a risk-based system incorporating societal risk might look like at a flammable storage site” (MIIB 2008b:Viii). The result of this work has strengthened the case for a “fully risk-based land use planning system”, which may be described as an engineering/technical approach. Suggestions combine traditional probabilistic instruments (e.g. quantitative risk approach, estimation of consequences) with suggestions to estimate societal risks on the basis of an equally technically-sophisticated approach (e.g. through the use of F-N curves) (MIIB and DNV Energy 2008).

In a way MIIB set its own limits to how far risks could be dealt with. The Board emphasized that the key challenge in the Buncefield case was that the risk had not been considered a reasonably credible scenario for planning purposes and that the circumstances which led to the event were predictable even if the consequences were not. There was therefore a need to change current thinking towards managing certain major incident risks (MIIB 2008a). This remark, confirmed by interviews, suggests that a risk-avoidance strategy may be preferred in cases where the risk is considered too high to be accepted. This view is consistent with the ToR approach, which considers that some risks are deemed unacceptable.

The Oval case provides an insight into practices that define and communicate acceptable risks of flammables. The COMAH regulations define a major accident as “an occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of the operation of any establishment, leading to a serious danger - (a) to human health, or (b) to the environment, whether immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances”. Several participants have made it clear that the ToR model, or any other risk-based heuristic, is not applicable in the case of major hazards involving dangerous substances. Instead, HSE uses what it calls a “protection approach” (HSE 2007b). The approach defines consultation distances (CDs) and zone boundaries to advice on local planning decisions (see section 5.3). COMAH regulations cover, among others, two type of risks: the risks resulting from the release of toxic substances, such as contamination around a chemical plant, and the risks resulting from flammables, for example the explosion of a gasholder. The Buncefield report, as well as several respondents, have described the application of this model to flammables as “hazard-based”.

A careful look at the approach, however, suggests that describing the model as a hazard-based may be too simplistic, a view also expressed in the Det Norske Veritas report. First of all, this view tends to forget that cost/benefit and risk/benefit analyses have always been difficult and controversial concepts among the risk community (Viscusi, 1994; Graham and Wiener, 1995; Hattis and Minkowitz, 1997; Van der Sluijs et al. 2003; Goodwin and Wright, 2004). In a recent article published in Risk Analysis, Aven and Renn have explored “broad risk assessment” approaches that may help to characterise uncertainties “beyond probabilities and expected values” in cases of risks that have a high magnitude and are highly uncertain, for example terrorism (Aven and Renn 2009). Some HSE interviewees have suggested a more nuanced interpretation of their role in dealing with flammables. For instance, the Executive looks for risk minimisation measures in the vicinity of a hazard, and it implies an implicit weighing of risks and benefits. Yet, HSE’s advice on residual and normal risk may appear
complex to lay audiences. A single document that sets out clearly the difference between residual and normal risk, what the frequencies mean to laypersons, and how to treat voluntary versus imposed risks would clarify decisions.

Although risks from flammables are not precisely quantified – which many experts from HSE consider to be very difficult to achieve in practice – the protection approach is operationalised on the basis of a structured methodology. A spatial division between three safety zones (inner zone, middle zone and outer zone) is used to guide decisions. Each zone is defined according to approximate levels of actual risk. The inner zone is the zone where most people get a lethal dose of thermal radiation. Typically, only small shops could get planning permission. In the middle zone people may be seriously burnt. Big office blocks may be allowed. The outer zone is where the heat would still harm vulnerable people. Housing, a big shopping centre or a small school could get permission. However, big schools, hospital, football stadiums and prisons would only get permission outside the outer zone.15

Our view is that the very existence of planning zones constitutes an unquantified risk-based approach rather than a hazard-based approach because it applies different levels of protection linked to a rough evaluation of the likelihood and the magnitude of the risk. The protection approach falls in the category of the “broad risk assessment” approaches “characterising uncertainties beyond probabilities and expected values” (Aven and Renn 2009). Critical elements suggest that the Board’s approach is reminiscent of the Tolerability of Risk concepts, as they were developed in the UK in the 1980s and 1990s (Bouder et al. 2007). The suggested model combines probabilistic estimates of the technical as well as the societal attributes of the risk with, at least implicitly, a categorization of risks into zones, including an unacceptable zone.

Finally, a common feature of the ToR model, the Det Norske Veritas and MIIB reports is that societal risk should be formalised and quantified, which suggests a strong reliance on expert communication models. This approach, however, is likely to be insufficient in conflict situations and low-trust environments.

REGULATOR OR WATCHDOG?

HSE plays very different roles depending on specific circumstances. In the Buncefield case it acted as regulator, criminal investigator, and was also responsible for initiating an investigation board. In the Oval case, HSE is a “statutory consultee”. As such, it plays a more complex role and is also exposed to a much more complicated environment with more stakeholders and layers of authority. The regulatory power is exercised primarily by the Borough of Lambeth. HSE provides guidance to the LPAs, but also exercises what has been defined by one of the respondents as a mix of “watchdog” and “advisory” functions: HSE has no authority to forbid the granting of planning permissions but may advise against them.

Most HSE respondents, however, did not fully translate the specificities of different governance arrangements into its risk communication practice. They usually had difficulties characterising the role of their organisation and did not offer a concise description. This was particularly striking because they were extremely professional and it was obvious that they had excellent knowledge of the powers and duties of all the parties involved. They usually put the role of HSE under the general tag of “protector of the public”.

It was also indicated that protecting the public implies that HSE makes local authorities aware of the risks in land use planning. For local planning, HSE’s approach has been described as advising in such a way that developments in the vicinity of hazards are strictly controlled, maintaining a separation between people and hazards. We decided to push the questions

15 The PADHI guide is accessible at: http://www.hse.gov.uk/landuseplanning/padhi.pdf
We decided to explore corporate identity and stimulated self-reflection by asking HSE respondents whether the term “watchdog” would be appropriate to describe their role in the planning process. Only one respondent found the term “watchdog” adequate, but with some reservations. At the same time all respondents had difficulties coming up with an alternative description that would to capture their role:

**Box 2: Is HSE the watchdog of land use planning?**

<table>
<thead>
<tr>
<th>HSE staff responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What our exact role is, is something we debate long and hard”</td>
</tr>
<tr>
<td>“We are not as strong as a watchdog. I can see how others could see it like that though”</td>
</tr>
<tr>
<td>“I don’t like the word watchdog. But it is how other people may describe us. We are parts of the checks and balances in the planning decision”</td>
</tr>
<tr>
<td>“Actually, if we were really a watchdog we would be much more careful about what the local authorities do”</td>
</tr>
<tr>
<td>“Someone has to assume the function of overseeing everything and it makes sense for HSE to do it”</td>
</tr>
</tbody>
</table>

**REGULATOR AND REGULATED**

Institutional arrangements have conditioned the nature of the interactions between the regulator and the regulated.

In the Buncefield case, HSE has been able to use the momentum created by in-depth investigation of the case to strengthen its position vis-à-vis the oil industry. The move towards a “risk-based” model on the one hand, and the definition of unacceptable risks on the other, may influence future discussions and are likely to bring both costs and benefits to the Oil industry. On 21 February 2008 HSE Chair Judith Hackitt chaired an international safety conference hosted by the UK Petroleum Industry Association. HSE’s Chair and Chief Executive hosted a further platform for industry leaders to share good practice and learning from incidents such as Buncefield on 29 April 2008 at HSE’s London conference “Leading from the top – avoiding major incidents”.

The main public bodies involved in the Oval case, HSE and Lambeth Council, have been absorbed by internal arguments. To the Borough of Lambeth, HSE may have seemed risk averse and unhelpful. To HSE, the Borough of Lambeth may have seemed under-prepared to carry out a meaningful weighing of the risks. At the end of the process the relationship between HSE and Lambeth had become perceptively tense. The alternative risk assessment developed by consultants has been perceived as an attack against HSE’s credibility.

The Borough of Lambeth took a very different view of the matter. The council’s magazine *Lambeth Life* described HSE’s decision to advise against as follows:

> “Controversial plans to redevelop the Oval Cricket Ground in Kennington have been blocked again by safety officials. (…) The original planning application was refused last year because of concerns from the HSE about the risks to spectators. Lambeth Council obtained the views of expert consultants to address these concerns. The council approved the application in January, having assessed all the issues for and against the proposal” (Lambeth Life 2008)

The Borough of Lambeth obviously bought into the “barmy bureaucrats” theory. An informal report released by the Greater London Authority in July 2007 provides an interesting
perspective into the mounting criticism of HSE that developed under the former London Major and which, according to a HSE respondent, was based on misunderstandings:

“There is a concern that recent alterations to the guidelines and policy used by the Health and Safety Executive (HSE) to review planning applications for hazardous consent, would result in an increase in the number of developments that the Health and Safety Executive object to. This, in turn, would have implications on the ability of the Mayor to deliver strategic land use policies with particular relevance to Housing and Strategic Employment Locations as required by the London Plan. (…) Analysis of London’s safety records have revealed that there is no significant history of incidents for hazardous installations or pipelines that would warrant or justify the need to alter HSE land use planning policy (…).” (London 2007b, p1-3)

The report complained about “overly cautious rigid and inflexible” consultation zones, and considered PADHI “too inflexible, resulting in advice from HSE that is too rigid and not site specific”. The document expressed distrust towards the introduction of the concept of “societal risk”, which is perceived as move away from the “individual risk” method. A crucial question is whether HSE is changing its policy substantially towards risk aversion, or whether it is cracking down on lax planning practices. On the one hand, the Greater London Authority informal report argues:

“The HSE has adopted a revised land use planning process in 2006, which has resulted in an increase in the size of the area around a hazardous installation that the HSE should now be consulted on. These changes have been introduced as a result of alterations to legislation governing hazardous installations, as set out in the Seveso II Directive and the subsequent amended Planning (Control of Major Accident Hazards) Regulations 1999 (also referred to as COMAH), and the Planning Circular 04/2000 ‘Planning Controls for Hazardous Substances’. As a consequence of this increase in consultation zones around hazardous installation, the HSE will now be providing advice to planning authorities on an increasing number of planning applications.” (London 2007b p.2)

HSE respondents took the opposite view and argued that HSE had to step in because LPAs are not always competent at making decisions that require balancing risks. A number of respondents thought that HSE had to set a precedent for future cases. This case was an opportunity to test the methodology of the opposition in an enquiry. There are a number of gasholders in London, for example in Tower Hamlets and Greenwich, which may give rise to similar discussions.

During the interviews, two respondents argued that something needed to be done to improve the control of planning permissions in the future and that HSE had demonstrated that it was not complacent. They actually indicated that it is because the case was strong and crystal clear that HSE had made the unusual decision to advise against. Although they were generally supportive of the current framework, some participants suggested that the new “automated” decision method through PADHI has made the relationship between the LPA and HSE more formal. In addition, critical decisions tend to be deferred to a later stage. This situation may lead to an increase in the number of call ins. Possible reasons that the respondents identified include: the fact that HSE has lost the opportunity of putting its side of the story early in the process, and the fact that HSE does not have the resources to sustain a close relationship with local authorities.

Although it is not rare for the HSE to “advise against”, calls-ins have been a rarity (4 in 30 years). The consensual approach to dealing with conflicting views may be challenged. A usual response among HSE respondents is that PADHI should be given greater weight. The
question, however, is whether local authorities will embrace more training and whether a topdown educational approach would work in a low-trust environment.

MEDIA ATTENUATION/AMPLIFICATION

At the time of the Buncefield explosion, the scale of the damage attracted considerable media attention. The media, however, lost interest rapidly. Nowadays, reporting is confined mainly to anniversary dates. Several respondents have expressed disappointment about this lack of interest. Yet sustained reporting may have triggered other issues, such as risk amplification.

Unlike the Buncefield explosion, the Oval case concerns a “hypothetical/possible” accident without any precedent. In this case there has been no major event to report and the media’s attention has been far weaker. In addition, as one respondent indicated, safety is not the overriding factor in planning decisions. Speculations about the likelihood of an event at the Oval are difficult to separate from more tangible economic and political interests. It is important to highlight that the economic stakes are high, possibly about £35million. The development has taken place in an environment where there has been high economic pressure to develop the site. The media have played the role of a risk attenuator. Cricket is very popular in England. This factor may also explain why the press tended to play down the risk. The media expressed more sympathy for Surrey County Cricket Club and the developers’ arguments than HSE’s decision to advise against. The risk became “minuscule” and “hypothetical”. This attenuation process has challenged HSE’s position and, ultimately, its competence.

Interestingly, the views of the professional press, the local lamp post and broadsheets, converged. The director of the developer’s company who helped to prepare the case on behalf of the cricket club declared: “The executive has been overly risk-averse and has approached the case in a formulaic way.”16 The Telegraph reported that according to the developers and Surrey County Cricket Club “the chances of a major gas explosion that would endanger those in the ground was so low as to be ruled out”. The Times also argued that:

“The gasholders have been a landmark at the ground since Victorian times. There has been no sign of a crack, let alone a leak, from the gas supply that is still in everyday use, but the Health and Safety Executive deems them to be a risk to spectators in the new seating” (Tennant 2008)

The press suggested that the actual level of risk at the site was not the main reason behind HSE’s decision; instead, increased precaution had been “prompted by the massive oil depot explosion at Buncefield” (Annon. 2008).

CONSENSUS AND DELIBERATION

The Buncefield case presents a striking illustration of some of the distinct characteristics as well as the lasting influence of the consensual model of regulation in the UK (see Appendix 4). The investigation board was set up by the HSE at arms’ length of the organisation. The majority of its members were HSE employees, including the leader of the criminal investigation team. This board was chaired by a former minister. In other countries this situation may have created a perceived conflict of interest. In the UK, the board succeeded in being recognised and respected as an independent institution. It also succeeded in building trust with the local population. It was not openly challenged or dismissed by other powerful actors, despite the presence in Hemel Hempstead of some of the most powerful companies in

the country. The oil companies kept a low profile throughout the investigation. In many countries characterised by a more conflictual relationship between the Industry and Government, this arrangement would have been neither possible nor practicable.

The involvement of the public has been weak in both cases, but for different reasons. In the Buncefield case the proactive communication approach developed by MIIB strengthened the voice of the residents and contributed to a successful investigation. This process, however, did not involve formal bargaining. No structured organisation was able to come forward to impose some form of formalised negotiation. This illustrates once more the strength of the consensual model of regulation in the UK Health and Safety area and its impact on communication. Consensual models of regulation are usually built around small groups of highly-structured interests – typically Government, Industry and Business - which do not readily share their negotiating powers with newcomers (Schmitter 1982). Public involvement has been even weaker in the Oval case because in this case no deliberation with individual members of the public has taken place. One reason is obvious. Security restrictions have imposed barriers on the interaction between HSE and stakeholders. The implication of the public enquiry process is that evidence and more generally debates about risks have been strictly restricted. Several participants made clear that increasingly HSE may have to deal with difficult situations where it cannot speak openly about risks because of national security restrictions. This disadvantage would also affect attempts to move towards a risk-based model, because, for example, probabilities of harm resulting from terrorist acts would be difficult to build and discuss. These probabilities are not currently included in HSE’s land use planning advice.

This view may go too far on the ‘optimistic’ side, with regard to the limited communication that took place prior to the decision that the evidence should be closed and the enquiry bound to strict confidentiality. For instance, the active involvement of the developer was perceived by HSE as unwished for, inappropriate, and difficult to deal with. The Buncefield Investigation Board’s 8th report favoured stakeholder involvement, while at the same time suggesting that the role of HSE should be clarified:

“Our preference is for a system where the site operator plays a much greater part in informing the LPAs of the major hazards risks and their control measures; where key stakeholders such as the emergency responders have an input; and where the LPA takes a clear and expert lead in the decision-making process”.

“We see the role of HSE as agreeing the methods by which the planning consultation zones are derived, including the practical information that needs to be considered by the planning authority, but no longer being responsible for the actual technical assessment. HSE should adopt the role of regulatory overseer to the new regime aligning with the Competent Authority’s functions under the COMAH Regulations. It will be necessary to give public assurance that the site operators’ input into the system is sensibly technical and objective, and we see HSE as providing the regulatory technical oversight in this regard.” (HSC 2008:6).

This statement offers little insight into how, in practice, interactions with distinct stakeholders should be conducted in the future. In practice, formal legal requirements have had a critical impact on the nature of the communication process. For example the black and white requirement to remain silent or advise against creates an environment where HSE focuses on the evidence without including others’ views. One participant suggested that new planning legislation may introduce a novel approach where major developments would go through a panel of experts rather than the council. The measure may be controversial because it could be interpreted as a way to by-pass local democracy. This would definitely reinforce the technocratic and consensual tendencies of local planning in the UK.
4. CONCLUSIONS AND RECOMMENDATIONS

HSE may play different roles. It may act as a regulator, as a consultee, or as an investigator. The variety of these roles suggests that HSE should adapt its communication techniques to the external pressures that may challenge the trust that people vest in the Executive. What does the review of the Buncefield and Oval cases tell us about how far or close the HSE is to implementing “state of the art” risk communication? HSE, in both cases, has operated within what could be called a “consensual” model of risk communication. Consensual communication focuses on an agreement among experts and institutions rather than a debate with lobby groups and the general public. This approach remains similar to the practices that scholars described over two decades ago (Kelman 1981; Vogel 1986). In the Buncefield case, HSE has successfully “outsourced” the management of multi-stakeholder interactions to an independent body, but the set-up and functioning of this body has reflected to a large extent the consensual tradition. When it is directly engaged, HSE tends to apply a standard approach that does not take the societal factors into account, or, when it does so, tends to reduce them to a mathematical formula.

The review of cases suggests that the independent investigation board set up in the aftermath of the Buncefield explosion has acted in ways far closer to the “state of the art” risk communication practices than HSE in the Oval case:

- MIIB has developed frequent dialogue with regulators, industry and media as well as key politicians.
- MIIB has acted as a moderator to avoid confrontation between the key parties
- Although lawyers have been involved the separation between MIIB’s investigation and the criminal case has pacified the debate on the root causes of the incident
- MIIB maintained a strong scientific dimension to the debate throughout the investigation process
- MIIB has created partnerships with independent members of the public trusted to in their community
- NGOs have taken little interest in the issue, which means that they have not shaped policy outcomes
- Opinions of local policy makers have been respected, even when they were critical of the investigation in principle
- The existence of a criminal investigation has been a critical factor to demonstrate that the issues of responsibility and liability are taken seriously

Compared to the Oval case, the stakes and the pressures were much higher in a post-event environment such as the Buncefield case. Yet, HSE could have benefited from implementing some of these lessons to adapt its communication in this unusually challenging context.

How is the HSE expert model evolving? The answer is that HSE is likely to struggle with change and situations where its competence, fairness and efficiency are no longer taken for granted. The Oval case presents an accumulation of atypical factors: flammables are not subject to QRA, HSE acts as a “consultee”, discussion of the evidence is restricted for security reasons, etc. In addition, HSE’s reputation has been attacked and all the institutional actors, including HSE, have been subject to considerable economic pressure. Under such circumstances business as usual is no longer possible. The reliance on the “call in” decision to resolve the issue appears to be a reactive and defensive approach rather than a proactive move. Reactive management may backlash and jeopardise trust in HSE: the reliance on the Secretary of State’s decision may solve the technical issue, yet it does not address the magnitude of the reputational damage that a combination of attacks against HSE’s credibility may have caused.
Is the HSE risk communication model outdated? When the roles are clearly defined and HSE is still seen as a trusted authority, the Health and Safety regulator is able to demonstrate its competence and its commitment to fairness (e.g. in the Buncefield case). This indicates that the consensual approach to Health and Safety may still be appropriate to deal with traditional governance settings. Moreover, the study has not identified great public appetite for deliberative models. On the other hand, when the roles and the relationships are less conventional, HSE may become entangled in interest politics. In the Oval case, the standard HSE approach is clearly outdated.

How should HSE deal with post-trust environments? For situations that clearly require attention, HSE should seek alliances with trusted sources of information (opinion leaders, independent academics and editors etc), which have developed a balanced approach to Health and Safety. For example: why did HSE not push for bringing such parties around the table when the Oval case was discussed at the Cricket ground? Why did HSE not promote more balanced opinion reporting in the press? Framing the public debate more carefully could have helped to achieve a more balance reporting of HSE’s role and performance in the process. We recommend HSE to:

(1) Establish a risk communication task force that will develop a strategy to deal with local planning matters. Similar task forces may be established to improve the communication of other “post-trust” environments. Set up an External Advisory Board composed of reputable risk experts to advise the HSE task force on risk management matters.

(2) Clarify the concepts of “risk based” and “hazard-based” approaches in a way that makes sense to non-experts and does not suggest that HSE rejects evidence and balanced decisions in distinct areas. This also includes strengthening the peer review of assessments used by HSE, including external reviews. Such peer reviews could be based on the US Office of Information and Regulatory Affairs (OIRA) Office of Management and Budget (OMB) 2006 somewhat controversial Risk Assessment Bulletin.

(3) Re-connect research on societal risk with risk perception, risk amplification and trust studies so that the notion of “societal risk” becomes more intelligible to non-experts and more explicitly linked to society’s perceptions. Critical risk issues increasingly require an inclusion of the ‘social context’, that is, recognising that the public, stakeholders and regulators perceive risks differently. HSE needs to build a capacity to understand these perceptions and factor them into decisions.

(4) Rather than reducing perceptions to a “knowledge deficit” on the part of non-experts, take a proactive role in conducting a constructive debate in lay terms with the actors involved in planning processes or other complex governance processes. Some risks are better understood than others, or subject to more or less disagreements.

(5) Learn from risk communication techniques to develop proactive risk communication with the media, with a strong focus on “post-trust” environments where traditional practices are no longer effective. HSE officials need to improve their risk communication skills. Regulators should be encouraged to attend risk communication courses for continuing professionals such as the one given every summer at Harvard University.
REFERENCES


White, G.F. (1945) Human Adjustment to Floods, Department of Geography Research Paper no. 29. Chicago: The University of Chicago

APPENDIX 1 PUBLIC CONSULTATION QUESTIONNAIRE

This questionnaire was used for the consultation on ‘revised policies to address societal risk around onshore non-nuclear major hazard installation” (2007)

Question 1: What factors and issues do you believe should be taken into consideration when determining what might be unacceptable in terms of societal risk from major hazard installations?

Question 2: Do you think that assessment of societal risk should be used in the control of major hazard sites?

Question 3: Should societal risk be taken into account by site operators when considering reasonably practicable on-site control measures?

Question 4: In any cases where new development would raise societal risk levels significantly, should consideration be given to sharing the costs of any measures that might counter such an increase in order to enable development to go ahead?

Question 5: If so what arrangements do you think could be introduced to achieve this?

Question 6: As well as site operators taking account of societal risk when considering on-site control measures, should societal risk be taken into account by planning authorities when making land use planning decisions?

Question 7: Should HSE be consulted by planning preparation of development plans so that information risk could be considered at this stage?

Question 8: Do you think that it would be appropriate for HSE to provide societal risk advice (in addition to the advice it provides currently) for individual development proposals around major hazard sites?

Question 9: Do you think that societal risk should be taken into account when considering certain large developments outside existing consultation zones?

Question 10: If HSE is to be consulted about societal risk for individual planning applications (see question 8), should consideration be given to framing it in a different way from that currently provided and based on individual risk?

Question 11: If the answer to Question 10 is yes, what form might this advice take?

Question 12: Please provide any additional comments that you may have on these proposals.
APPENDIX 2 OVAL CASE QUESTIONNAIRE

1) British legislation requires the local planning authority to consult HSE about certain proposed developments. Could you describe how the system works?

2) Could you provide me with a quick update of the issues at stake in the Oval case? What is the problem and how is it being resolved?

3) Would you agree that the HSE’s role is to act as a watchdog in the Oval case? How would you describe the HSE’s role?

4) I understand that HSE has advised the authority on the nature and severity of the risks presented by the installation. Could you describe your procedure to estimate and communicate these risks?

5) To your knowledge, who are the stakeholders involved in the Oval case?

6) How does the HSE take into account the views of these stakeholders?

7) Could you describe the procedures- if any- to include their views into your own decision system?

8) In the face of future cases, would you see any room for improvement in the way stakeholders and the organisation interact?

9) Any other crucial point that I may have missed?
Executive Summary

What is risk communication? Is it a technique to make risks understandable to the public or is it more complex? This report conveys a succinct discussion of the most important theoretical developments that have emerged in the risk communication literature over the past forty years. It conveys key lessons on the theoretical underpinnings of effective risk communication. The first lesson is that risk communication must be viewed as an integral part of the risk management process. The foundations of risk communication as a discipline lay in cognitive science, but it has been enriched by many disciplines. Risk communication research has focussed on health and environmental risks, which makes it highly relevant to the field of occupational safety. This report also highlights that risk communicators need to pay attention to the policy climate that impacts on policy choices. Risk communication has been mostly successful when it has evolved into a two-way and proactive process; comprehensive and concrete guidelines have been developed to communicate risks effectively and maintain high levels of public trust, which are summarised in this report.

The practical applications of these theories to the public sector institutions in the UK and beyond will be analysed in a companion report.

1 INTRODUCTION

The sensitivity of modern society to technological risks (Beck 1992) places health and safety worries at the heart of public concerns about hazardous activities (Dunlap 1991, Dunlap et al. 1992, 1993; MORI 2005; Eurobarometer 2006; Renn 2008). In such areas, decision-makers appear to be extremely sensitive to public expressions of distrust, especially when there is evidence that serious risks have been neglected or that the regulator failed to protect the public. Regulations usually become more stringent as a result of major safety problems (Lofstedt 2005). The BSE crisis throughout Europe (Powell and Leiss 1997; Ratzan 1999) or the dioxin scandal in Belgium (Lok and Powell 2000) constitute examples of: (i) a failure that creates a sense of betrayal (ii) which leads to a collapse of the trust vested in the regulator (iii) that is conducive to tougher regulations (Lofstedt 2004). A general conclusion of risk research is that when not properly addressed, scares tend to generate further public distrust in regulatory processes and their key proponents. A more practical lesson for health and safety is that risk management must be relevant to the modern and changing world of work (HSC 2004)

In 1978, three prominent scholars raised the issue “how safe is safe enough?” (Fischhoff et al. 1978). This expression, which has been since used by the HSE (HSE 1988, HSE 2001a, Rimmington 1993, Bouder et al. 2007) highlights the fact that decision-makers cannot simply

---

17 This report follows the conventional view that risks are mental ‘constructions’ (OECD 2003, p. 67) that originate in the human mind (Renn 2007). According to the glossary of the Society for Risk Analysis risk is: “the potential for realization of unwanted, adverse consequences to human life, health, property, or the environment”. This view is consistent with the HSE’s understanding of risk (HSE 2001a). In the UK, this interpretation also acquired legal value when it was confirmed by a court ruling (Regina v. Board of Trustees of the Science Museum, 1993), which stressed that the word ‘risk’ conveys the idea of possible danger, rather than actual danger.
refuse risks altogether, because running a risk is often the price to pay to secure a benefit. We need to accept the likelihood of something bad happening, because we also expect good things to happen (Fischhoff et al. 1978; Fischhoff 1983; Fischhoff 1994; Fischhoff 1995; HSE 1988; Renn 2007). The recognition of this basic fact has allowed the development of probabilistic estimates to fine-tune the degree of risk that organisations are ready to take. This includes looking at distribution effects (who carries the risk), and defining the level at which we decide that the bad outweighs the good and to put in place control, mitigation or containment measures that will minimise the negatives.

But what if people don’t ‘buy’ such technical approaches? What if they do not understand or trust numbers? In democracies, public opinion is a particularly powerful driver of decisions when the regulator is hesitant about the right choice to make, especially when the risk is highly uncertain and difficult to measure (van Asselt 2000; Klinke and Renn 2002) or when relatively small risks create a potentially large or catastrophic loss (Noll and Krier 1990; Sünstein 2003). The relationship between these ‘calls for action’ and the inherent resistance to regulatory accommodation is not always clear (Hood et al. 1992; Hood et al. 1999; Bauer and Gaskell 2002), but there are strong indications that they may actually trigger ‘quick fixes’ and ‘knee-jerk’ reactions (i.e. simple precautionary decisions rather than complex risk assessment methods). Vogel has described what could be called public mood’s capture of regulatory decisions in the face of uncertainty:

“[T]he public’s perception or tolerance of particular risks often differs from that of experts and in a democratic system the former’s preferences — and values — often play and important role in the policy process. Thus governments can and frequently do chose to err on the side of caution, seeking to avoid or reduce particular risks that many citizens regard as unacceptable, even if the available scientific evidence does not or cannot prove evidence of harm” (Vogel 2003, p. 2).

In the past thirty years risk communication has emerged as a distinct discipline, and has proved to be a popular research topic. Numerous overviews are available on the subject (for instance; Covello et al. 1989; Leiss 1989; NRC 1989; Chess et al. 1995; Morgan et al. 2001; Lofstedt 2003a; OECD 2002; Breakwell 2007). This new discipline has developed primarily as an attempt to better connect expert knowledge to decision-making and lay perceptions. For obvious reasons these attempts have been strongest in those contentious areas where various actors have held conflicting views about risk. The art of communicating risks has been conceived as a rationalising process that may improve the relationship between the various actors that inform, take, influence, and bear the effects of risk decisions. These relationships evolve as society evolves and so does risk communication science.

2 FROM RISK PERCEPTION TO RISK COMMUNICATION

The form of risk communication practice needs to reflect the nature of the risk under consideration (Renn 2008). It needs also to comprehend the attitudes and mental representations of those involved in the two-way communication process (Fischhoff et al. 1993) as well as the level of trust vested in critical actors and organisations (Lofstedt 2005).

2.1 The sender-receiver model and its limitations

Recommendations and ‘checklists’ on how best to communicate risks still rely to a large extent on the so-called sender-receiver model of communication. This model, developed in
the 1940s (Laswell 1948, Shannon and Weaver 1949), is based on the analysis of information transfer among sources transmitters and final receivers. The process relies on the transmission of information by the transmitter, and the decoding, recoding and response by the receiver (Renn and Levine 1991).

The sender-receiver model seems perfectly adequate to conceptualise the top-down transmission of technical information about statistical evidence to experts, decision-makers and laypeople. It also acknowledges that communication is a complex process, which may involve some ‘distortion with background noise’ depending on the channels of transmission and the interference of signal amplifiers. The basic structure of the model, however, tends to oversimplify risk communication as a mechanistic one-way system of communication (Otway and Wynne 1989; Kasperson and Stallen 1991). To enrich the conceptual approach and reflect the complexity of transmission channels, scholars have coined the concepts of social amplification and social attenuation of risk (Kasperson et al. 1988; Kasperrson 1992; HSE 2001b; Kasperrson and Kasperrson 2005; Pidgeon et al. 2003). Social amplification/attenuation reflects the hypothesis that hazard-related messages interact with psychological, social, institutional, and cultural processes in ways that can increase or attenuate individual and social perceptions of risk and shape risk behaviour. Proponents of this explanation argue that amplification phenomena may have very dramatic consequences, for example the loss of confidence in institutions or alienation from community affairs (Burns et al. 1993).

The perfectibility of the traditional sender-receiver model is still a matter for debate. For instance, is the risk amplification theory robust enough to supplement the sender-receiver model with a comprehensive interpretation of interactions between senders and receivers? The analysis of global controversies over new biotechnologies has uncovered nuanced, multifaceted interactions between public perceptions, media coverage and regulation, which suggests multi-factorial determinants, some of them unrelated to risks (Bauer and Gaskell 2002; Gaskell et al. 2003; Gaskell et al. 2004). In this particular case risk amplification theories may be of little relevance because they would neglect those factors not directly related to risks used to frame decisions.

2.2 Risk communication and the central role of cognitive sciences

The complexity and multiplicity of risk phenomena encourages multi-disciplinary approaches, and, as a consequence, a wide range of theoretical perspectives and methodological approaches have influenced risk communication research (Fischhoff 1995; Renn 1997). The challenge brought by this diversity of thoughts and perspectives has often been overlooked in the literature, experts being primarily preoccupied with the implications of their own specific models. Baldwin et al. (2000) identified five philosophies of risk control:

- Technical perspectives, based on probabilistic estimates (e.g. number of deaths).
- Economic perspectives, including risk/benefit and cost/benefit valuations.
- Psychological approaches, focussing on individual cognition.
- Sociological approaches, attending to social relations and institutions.
- Cultural theories, preoccupied with cultural biases.

Psychology and sociology constitute the main disciplinary streams that have supplemented statistical approaches (e.g. game theory). Conceptual and theoretical innovation has spread primarily from these two disciplines, which is an evolution that is especially noticeable from the 1960s onwards. Recent efforts have tried to map out the respective contribution of psychology and sociology, their potential for cross-fertilisation, as well as existing issues to be overcome in order to reconcile some of their differences (Renn 1997).
Without overlooking these disciplinary outputs, this review follows Renn’s (2008) analysis that risk communication has first and foremost been conceptualised as a “follow-up of risk perception studies” with an extension to “the flow of information between subsystems of society” (Renn 2008: 190; Kaspersion 1986; Jasanoff 1993; Fischhoff 1995, Lofstedt 2003b). The fact that perceptions play a central role for shaping views about risks and benefits has been at the origin of risk communication as a distinct field because it highlights that there is more to risk decisions than ‘technical risk assessment’, i.e. estimates of probability and direct losses and individual and societal benefits. This remark seems self-explanatory in the case of lay people, who do not necessarily master the subtleties of a technical assessment of risks and benefits. Many ‘irrationalities’, however, also shape ‘bureaucratic expertise’ (Rothstein 2003). The contribution of psychology, in particular psychometric studies, has played a seminal role (Kaspersion and Stallen 1991; Lofstedt and Frewer 1998) and also deserves particular attention because of the robustness of its findings validated by numerous replication experiments.

Risk is ‘tangible’ and subject to probabilistic assessment of likelihood and consequences; risk is also ‘perceived’ and subject to contingent interpretation. Lessons from cognitive sciences offer detailed insights about how people perceive risks. As such they constitute an irreplaceable contribution to the design of context-based communication. In the past forty years, the understanding of how perceptions translate into decisions has improved significantly. In the 1960s, the pioneering work of Starr clarified the patterns of risk-benefit decisions, and suggested for example that acceptability for an activity is roughly proportional to the third power of the benefits for that activity and that the public will accept risks from voluntary activities that are roughly 1000 times as great as it would tolerate from involuntary hazards (Starr 1969). Fischhoff et al. (1978), on the other hand, have moved from this strict voluntary/involuntary model and have suggested looking at ‘expressed preferences’ for activities. Key characteristics such as familiarity, control, catastrophic potential, equity, and level of knowledge (Slovic 1987) influence risk decisions. Psychologists agree that these cognitive factors are broadly similar throughout the world (Rohrmann and Renn 2000). Major breakthroughs have illuminated our understanding of individual risk decisions and their wider impact on society. Of particular significance are psychometric studies, the understanding of affect and emotions (Slovic et al. 2002; HSE 2008), and the trust building/undermining mechanisms.

Individuals have problems interpreting numbers, especially low probabilities (Tversky and Kahneman 1974; Kahneman et al. 1982; Fischhoff 2002). This pattern tends to blur the rationality of economic decisions (Kunreuther et al. 2001). People also tend to overstate the frequency of rare risks and understate the frequency of common risks, a phenomenon known as compression (Fischhoff et al. 1993). Cognitive scientists, therefore, suggest that risk choices are much more complex than simple economic cost/benefit analyses. We do not comprehend numbers very well, but it does not necessarily mean that we are irrational, or that powerful interests necessarily succeed in capturing our views. There is some form of complex rationality driving our decisions to take a course of action; this rationality is the result of a combination of psychological factors. Most of the time people follow relatively consistent patterns of the creation of images of risks and their evaluating them. A mix of technical knowledge, common-sense reasoning, personal experience, social communication and cultural tradition shape perceptions (Brehmer 1987; Pidgeon et al. 1992; Pidgeon 1998; Renn 2004). Risk perceptions vary between activities (Boholm 1998; Fischhoff et al. 1978, Slovic et al. 1981; Slovic 1987; Wildavsky and Drake 1990) and they are not directly correlated to the valuation of potential gains and losses.

In practice, situations are complex and combine these various parameters leaning towards greater or lower levels of concern. Activities with very low ‘potential’ combine negative parameters, for example activities, that are technological, imposed and non-familiar at the same time. The difference between chemical installations and household chemicals offers a
good example. A study was conducted in 2001 on actual contact with several consumer products, specifically dishwashing detergents, cleaning products, and hair styling products (Weegels and Van Veen 2001). It focused on how and where products are handled, as well as the duration, frequency, and amount of use. Results showed that, for a given activity, users tended to follow their own routine, rather than trying to change their habits. Few relations were found among frequency, duration, and amount of use. It did not seem that specific worries about safety had a significant impact on behaviour. Additional useful data comes from specific work on labelling. In-depth research was conducted on exposure to methylene chloride, the active ingredient of stripper formulations. This approach represented the first known attempt to assess label effectiveness by predicting associated exposure outcome. Observations confirmed that most consumers tend to ignore or pay little attention to warning labels. The authors concluded that there are not many important messages regarding exposure risk that most users know well enough to assume that they will take the associated precautions (Riley et al. 2001).

Risk research shows that some of these activities, when they become associated with a powerful ‘dread’ factor, run the risk of being fully rejected and stigmatised (Fischhoff 1994; Kunreuther and Heal 2003). In the late 1970s and early 1980s, risk scientists built a matrix to compare perceptions, which looked at the perceived levels of ‘unknown’ and ‘dread’ shaping attitudes towards risks (Slovic et al. 1980; Slovic et al. 1982; Slovic 1987). Slovic et al. (1985) suggested a visual representation of eighty-one hazards displayed according to two factors, arranged on two axes. Factor One, labelled ‘dread risk’ was defined at its high end by the perceived lack of control, catastrophic potential, fatal consequences and the inequitable distribution of risks and benefits. Factor Two, labelled ‘unknown risk’, was defined at its high end by hazards judged unobservable, unknown, new and delayed in their manifestation of harm. The original figure is presented in Appendix 1. The matrix includes many hazards relevant to occupational and public safety, such as nuclear (reactor incidents, radioactive waste etc.) chemical plants, asbestos insulation, coal mining accidents, railroad collisions, gas accidents etc.

When it comes to nuclear risks, for example, people are expecting the worst-case scenario to happen, despite reassuring information from experts (Slovic et al. 1993). Nuclear risk constitutes a technological, imposed, uncontrolled, unfamiliar risk. It involves complex science, expert-led decision systems and a potential for large-scale accidents, which has resulted in driving public acceptance for nuclear activities down (Fischhoff 1983). In this case, the expected magnitude of the risk appears to be the key variable. In comparison, the oil or chemical sectors offer examples of alternative technological incidents happening more frequently than in the nuclear field but with less impact on people’s minds. Although these activities are also feared for being uncontrolled, technological and imposed they do not generate the same level of anxiety. Though, non-nuclear industrial incidents might have devastating effects on public confidence, especially when they are poorly managed and accompanied by ineffective risk communication. This was the case of the proposed dumping of redundant oil storage buoy, Brent Spar, in the North Sea in the spring of 1995 (Lofstedt 2005, pp. 103-124). A study by Slovic, Lichtenstein and Fischhoff (1979) found that, even before the accident at Three Mile Island (TMI), people in the US expected nuclear-reactor accidents to lead to disasters of immense proportions. When asked to describe the consequences of a ‘typical reactor accident’, people’s scenarios were found to resemble scenarios of the aftermath of a nuclear war. Replication of these studies after TMI found even more extreme images of disaster. These risks rest on a deeper foundation of fear and dread (Slovic et al. 1984; Slovic 1987). For many members of the public nuclear risks are considered immense, especially nuclear waste activities (Flynn et al. 1991; Kasperson 1992). On the other hand, however, nuclear experts tend to look at them from a very different perspective. In the nuclear community, nuclear waste, for example, is considered a low risk: it has even been labelled ‘negligible’ (Slovic et al. 1993). The blatant discrepancy between psychological observation and the grounded account of expert views indicates that contextual
information is crucial and that issues like, for example, levels of knowledge and professional affiliations play a major part in shaping acceptance. Table 1 summarises some of the most commonly recognised parameters.

### Table 1—Perception and level of concern (non-exhaustive list)

<table>
<thead>
<tr>
<th>Leaning towards less concern</th>
<th>Leaning towards more concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary: I use my mobile phone</td>
<td>Involuntary: they build a phone mast nearby</td>
</tr>
<tr>
<td>Control: I drive my car</td>
<td>No control: my spouse drives the car</td>
</tr>
<tr>
<td>Natural: a volcano erupts</td>
<td>Technological: a chemical plant blows up</td>
</tr>
<tr>
<td>High probability low consequences: I live near a river</td>
<td>Low probability high consequences: I live near a Nuclear plant</td>
</tr>
<tr>
<td>Familiar: I eat organic food</td>
<td>Non familiar: I eat GMO food</td>
</tr>
<tr>
<td>Adults receiving the yellow fever vaccine</td>
<td>Children receiving the MMR Vaccine</td>
</tr>
<tr>
<td>Male: I need smallpox vaccination</td>
<td>Female: I need smallpox vaccination</td>
</tr>
<tr>
<td>White: drugs against high blood pressure</td>
<td>African American: drugs against high blood pressure</td>
</tr>
</tbody>
</table>

Source: adapted from various talks and presentations given by R.E. Lofstedt, as well as Slovic (1987, 1992)

### 2.3 Computing complex cognitive factors

People are selective in what they decide is worth considering or worth ignoring (Beck 1994). The way perceptions may be interpreted and used for risk decisions is more complex than a mechanistic translation of people’s attitudes into decisions. In the 1980s and 1990s, cultural theorists highlighted the influence of cultural biases — that is, attitudes and beliefs shared by a group — on risk decisions (Douglas and Wildavsky 1982; Douglas 1990; Thompson et al. 1990; Rayner and Cantor 1987). They suggested that a dynamic may also develop between individual characteristics and the various groups to which an individual belongs, on the basis of gender, background, education, profession etc. Cultural theorists have built profiles and ideal ‘types’ of people with different values towards risk, e.g. ‘egalitarian’, ‘fatalist’, ‘individualist’ etc. (Adams 1995). In addition to these speculations, experiences in psychology have uncovered a number of factors that will make people move from their basic and rather predictable perception of risk to the level of more or less conscious decision. An account of the various ‘biases’ and ‘heuristics’ provides a finer scientific understanding of people’s attitudes towards a specific risk. Taking stock of existing risk theories, Sunstein (2003) has summarised the five overarching cognitive factors that may shape people’s attitudes:

1. **Loss aversion.** People dislike losses much more than they like gains (Tversky and Kahneman 1974 and 1981).

2. **The myth of a benevolent nature.** Unlike what, for example, toxicologists would tell, people believe that nature is essentially benign, while in reality it is often dangerous (Collman 2001).

3. **The availability heuristic.** People focus on the risks that are cognitively available and forget about others or cannot forecast them. Certain hazards will stand out whether they are statistically significant or not (Slovic 1987).

4. **Probability neglect.** People focus on outcomes rather than probabilities (Rottenstreich and Hsee 2001).

5. **System neglect.** Many relevant effects of risk, as well as potential benefits do not appear on everybody’s ‘screen’. It is quite typical for experts and non-experts to look at the same problem from different perspectives (Slovic 1987).
In the 1990s and early 2000s, scholars have analysed the key role that affect and emotions play in people’s decision-making processes (Shepherd and Sparks 1994; Shepherd and Frewer 1997; Loewenstein et al. 2001; Slovic et al. 2002). At a more empirical level, the crucial role of emotions in occupational safety has also been recognised (HSE 2008). These factors are particularly relevant when individuals face a decision that involves a difficult trade-off between attributes or where there is interpretative ambiguity as to what constitutes a ‘right’ answer (Renn 2007: 34). In these cases, people often rely on the strongest affective signals to resolve problems (Hsee and Kunreuther 2000).

Concrete examples facilitate the understanding of how these complex patterns may interact. A nuclear controversy that took place about a decade ago provides a concrete example of the complex mechanisms that affect risk perception. In 1993, a disagreement developed between Denmark and Sweden over the re-opening of Swedish nuclear reactor after an incident; a safety valve became stuck, causing insulation material to fall into the reactor’s water-cooling system, blocking the reactor’s inlet filter. The facility was located near the small Swedish harbour town of Barsebäck, only 20km from both Malmö (Sweden) and Copenhagen (Denmark). Danish opposition to the re-opening Swedish facility was fierce: 83% of Copenhagen’s population was against nuclear power and 82% of the Danes wanted their country to pressure Sweden to close the Barsebäck plant permanently (Lofstedt 1996; Lofstedt 2005). These figures were consistent with the psychological evidence that suggests that nuclear risks are the most dreaded. Nuclear experts may have been at ease with the risk, but the majority of the population were not. In contrast, residents of Malmö were overwhelmingly pro-nuclear, according to the same polls (81%). At a superficial level, this would seem to invalidate basic risk-perception theories and suggests that other factors are more important. 72 % of the Swedish respondents, however, said they understood and appreciated Danish concerns. Did they share some of their neighbours’ anxieties? Probably, but that did not mean the same thing to them. The conclusion to draw from this example is clear: Swedish people may have felt the same reluctance towards nuclear risk, which is why they understood the Danish view. Though, despite being more directly exposed to the risk, a large majority of the Swedish population leaving near the facility chose to live with it. They were able to ‘compute’ conflicting messages into a given choice.

A recent and crucial development in cognitive research reveals that trust — which can be defined as “confidence in the reliability of a person or a system” (Giddens 1990: 34) — plays a major role in shaping public views and risk decisions and may influence the outcome of this computation game to a very large extent. The issue of trust has come to the fore as it has become apparent that confidence in industry and government is declining in many countries. Lofstedt (2005) suggests a number of explanations of why the public’s trust toward these bodies has decreased dramatically, including:

- The ‘sheer number and size’ of recent regulatory scandals, e.g. the BSE crisis in the United Kingdom, the tainted blood scandal in France or the Dioxin found in chicken feed in Belgium.
- The rise of 24-hour television and Internet, offering alternative non-expert sources of information.
- The increasing concentration of political power.
- Media amplification.

In the area of risk, trust could mean “acceptance of decisions by the constituents without questioning the rationale behind them”, especially “risk judgements made by the regulators” (Lofstedt 2005 p.6). A number of factors have a critical impact on levels of trust, most notably fairness, competence and efficiency (Renn and Levine 1991). Perceived competence relates to the degree of technical expertise in meeting an institutional mandate. Fairness refers to the acknowledgement and adequate representation of all relevant points of view. Efficiency
is about the right allocation of financial resource. Other critical factors contribute to create a sense of fair, competent and efficient management, including objectivity, sincerity and faith. Consistency relates to the predictability of arguments and behaviour based on past experience and previous communication efforts. Sincerity, involves honesty and openness and faith is about the perception of ‘good will’ in performance and communication.

Paul Slovic has argued that trust is ten times easier to destroy than regain (Slovic 1993). The consequence of trust failures is that we now live in a ‘post-trust society’, in which relatively minor mistakes may jeopardise the social acceptability of specific risks. Media hypes often amplify regulatory failures, and the likely result is a ‘runaway’ from potential injury. In this context ‘knee-jerk reactions’ may tempt the regulator, with unfair, incompetent or inefficient policies as a likely result. This destructive path may only be countered by a dynamic approach that aims to rebuild trust through proactive risk communication (Lofstedt 2005). Figure 1 offers a visual representation of the post-trust society’s vicious circle.

**Figure 1- Post-Trust vicious circle of risk aversion**

![Post-Trust vicious circle of risk aversion](source: Bouder 2008)

**PRACTICAL MODELS TO COMMUNICATE RISKS**

The former section has highlighted a number of crucial findings about perceptions and decisions that decision-makers may use for the development of sound risk communication. Modern risk communication is operating in a fast evolving environment, which often requires far more than a standardised ‘package’ of recommendations about risk decisions or a generic call for ‘participation’. The discipline of risk communication has concentrated on hazards that affect health and the environment (Ball and Floyd 1998), especially nuclear reactors (Farmer,
1967 and 1977; Fischhoff et al. 1983), chemical plants (Covello et al. 1988), and radon (Bostrom et al. 1994). Some of these developments have been critical to the development of concepts used by the Health and Safety Executive (HSE), e.g. the Tolerability of Risk (ToR) framework, which deals with the central issue of risk acceptability (Bouder et al. 2007).

3.1 Risk communication and policy

A consensual view that has emerged from risk studies is that risk communication is needed throughout the whole risk management process, sometimes called ‘risk-handling chain’, from the framing of the issue to the monitoring of risk management impacts (Renn 2008). Risk communication, on the one hand, should enable stakeholders and civil society to understand the rationale from the results and decisions from the risk appraisal and the risk management phases when they are not formally part of the process; it should also help them make informed decisions about the risks and the benefits of a specific situation. In a nutshell, the purpose of risk communication is to overcome conflicts and reach a sensible risk decisions through the management of a rational process of information exchange. Risk communication performs these functions both for experts and lay audiences.

The practical organisation of the risk management process is therefore of critical importance to manage the risk communication function. Decision theories have explored the kind of risk decisions that managers need to take (Morgan 1990; Keeney 1992; Hammond et al. 1999). In practice, there are several ways too organise such decisions. The US National Research Council (NRC) seminal report on Risk Assessment (1983) envisaged, for instance, a key distinction between risk assessment and risk management. In the UK, on the other hand, risk assessment is seen as a ‘procedure’ of risk management, so the two processes are not separated (Royal Society 1983; Hood et al. 1992; Lofstedt 1997; Cabinet Office 2002). Depending on the selected approach, the communication function may take place at different stages of the management process. Renn (2007 and 2008) offers the latest systematic review in the area. Renn identifies five successive components within the risk management process:

- Option generation.
- Option assessment.
- Option evaluation and selection.
- Option implementation.
- Monitoring and feedback

The Royal Society’s report on Risk Analysis, Perception and Management (Royal Society 1992) has highlighted the key requirements of the selection of who should be in charge of risk decisions and how decisions should be met. Such choices, of course, are more than managerial decisions — they are eminently political. The Royal Society used Ostrom’s analysis of the dimensions of risk management (Ostrom 1986) to suggest a number of ‘rules’ that need to be considered and will affect the communication of risks (see Table 2):

<table>
<thead>
<tr>
<th>Rule type</th>
<th>Explication</th>
<th>Range of key types</th>
<th>Characteristic trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundary</td>
<td>Who is counted as a player?</td>
<td>Technocratic/ participative</td>
<td>More participative</td>
</tr>
<tr>
<td>Scope</td>
<td>What is managed and what can be decided?</td>
<td>Broad/ narrow</td>
<td>Extension of scope</td>
</tr>
<tr>
<td>Position</td>
<td>What is the hierarchy of the players?</td>
<td>single organisation/ multi-organisation</td>
<td>More multi-organisations</td>
</tr>
<tr>
<td>Information</td>
<td>Who is entitled to know what from whom?</td>
<td>Open/closed</td>
<td>More open</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Authority and procedure</td>
<td>Under what conditions must decision be made?</td>
<td>Formal/informal</td>
<td>More formal</td>
</tr>
<tr>
<td>Preference merging</td>
<td>How are individual preferences aggregated into collective decisions</td>
<td>Consensus (integration)/Conflict (aggregation)</td>
<td>More conflict</td>
</tr>
</tbody>
</table>

Source: Royal Society (1992, p. 149)

Boundary rules define who has access to the risk management process and who may be ‘counted’ as a player. Scope rules select what falls into the risk management category and the boundaries of the competence vested in risk-managing institutions. Position rules define who makes decisions and at what stage, what the hierarchies between competent institutions should be, and how individuals are appointed or dismissed from specific positions. Information rules specify who is entitled to what information from whom and under what conditions (incl. confidentiality, secrecy and access to information requirements). Authority and procedural rules specify the order or timing of decisions and how evidence can be defined. Lastly, preference-merging rules define the governance parameters of collective decision-making, which includes ways to generate consensus within a given community.

The NRC risk management framework, on the other hand, offers an early but comprehensive attempt to conceptualise a pluralistic approach to the inclusion of stakeholders (see Figure 2). The NRC model suggests an open involvement of stakeholders at the problem formulation and risk communication stages. The 1996 NRC document has suggested that “government should obtain the consent of the governed” and that “citizens have the right to participate meaningfully in public decision-making and to be informed about the basis of government decision-making” (NRC 1996, p. 23). The practical consequence of this approach is that risk communication in the USA is made on a broad, sector-wide basis through a very wide-ranging and open consultation process that obtains the views of all stakeholders (including the utilities) and in which the balance falls between risk reduction and cost (NEA 2002a).

The USA analytical-deliberative process covers “the exchange of ideas, opinions, reflection, or contemplation on others’ opinions”, and deliberation is defined as “any formal and informal process for communication and for raising and collectively considering issues” (NRC 1996, p. 73). In addition “uncertainty analysis can inform all the parties of what is known, what is not known and the weight of evidence for what is only partially understood” (NRC 1996, p.109). The NRC model has been described as “a political process where the emphasis is on communicating the results and educating the public in order to empower stakeholders to influence the risk management strategies that are the responsibility of government” (Marks 2007, p.12-13). This process may help to achieve reasonably achievable decisions about risks (NEA 2002b).
The NRC pluralist model may not be suitable for decision-making systems where experts remain in control, or where structured interests have priority access to the negotiation and do not wish to broaden the basis. In such circumstances, society would rather rely on an efficient technical solution. This is typical of cases where there is a high level of trust for technocratic control and expert-based decisions. In his seminal thesis, Steven Kelman compared the regulation of occupational safety and health in the USA and Sweden (Kelman 1981). Kelman analysed how health and safety policy is developed, including how the political culture shapes a specific policy ‘climate’ within an agency and affects policy outcomes. This study did not primarily focus on communication, but is of great importance for it because Kelman demonstrates that health and safety policy is subject to considerable variations. For instance, the strong adversarial and transparent tendencies of the USA system explain why conflicts in the area of occupational safety tend to be resolved at the disadvantage of business. In Sweden, on the other hand, decisions tend to be made behind close doors according to a consensual mode. The regulator tends to accommodate business’ interests against the assurance that trade bodies will ‘police’ their members to reach high levels of compliance. Vogel (1986) presents a rather similar view of the dynamics affecting environmental policy in the USA and the UK. One fundamental difference between the USA and the UK model, on the other hand, is that the traditional UK risk management practice does not favour open and structured deliberation, but prefers informal consultation between the government and the
industry (Vogel 1986). Consensual models involve a degree of secrecy, and the UK is no exception (Lofstedt 1997).

Different policy climates require different risk communication approaches, because of the critical variations of the channels and the relationships that link ‘senders’ to ‘receivers’, as well as the varying level of trust in critical actors. Scholars have developed typologies to capture context-based policy interactions. Understanding the requirements of Health and Safety risk communication implies one understands the ‘Politics’ of health and safety in a given context (Locke 1981; Vogel 2001). O’Riordan and Wynne (1987) have developed a classification of governmental decision-making styles, which offers an insight into possible procedural mechanisms. A modified version of this typology (Bouder 2008) offers a possible classification of common decision procedures arranged by ‘families’.

The first of these types, the adversarial approach, is characterised by an open forum in which different actors compete for social and political influence. Scientific evidence is a central element of the decision process and stakeholders are exerting control over the system through constant interactions. To be effective, the adversarial approach relies on a high level of involvement from formalised stakeholders. Most North American decision-making practices, which are characterised by a mix of transparency mechanisms, stakeholder involvement, conflicts, and litigations (Vogel 1986; Hattis and Minkowitz 1997) fall into this category. A key variable for this system to work remains the impartial nature of the regulator. Trust is undermined when the public no longer perceives the regulator as a neutral arbitrator between conflicting interests, as the case of the International Paper’s Hydro-Dam Re-Licensing Procedure in Maine, US suggests (Lofstedt 2005).

A decision making process confined to a group of patrons who are obliged to make the ‘common good’ the guiding principle of their actions characterises the fiduciary approach. This system relies on top-down controls and tends to exclude citizens and organised groups from day-to-day decisions. This type of decision-making is typical of classic democracy. Its legitimacy relies on strong confidence in the fairness of the electoral process responsible for the designation of the ‘patrons’. To remain legitimate, patrons need to reassert constantly their trustworthiness. Transparency and accountability mechanisms are of paramount importance in avoiding a disconnection between patrons and the rest of society. Patrons are held accountable for the decisions. Stakeholders’ involvement may even be regarded as a sign of weakness or a diffusion of personal accountability. It is unlikely that such system of decision-making would operate well in a post-trust environment. It also requires strong channels of information between science and policy, to allow patrons to make informed choices on behalf of society.

The last two approaches, the consensual and the corporatist approaches may be described as conscious attempts to organise and structure decision-making along ‘co-operative’ lines. They constitute alternatives to the pluralistic/liberal decision-making model, and have been described as a typical feature of European regulation (Vogel 1986; Vogel 2003).

The consensual approach is the less hierarchical of the two. This approach is based on a closed circle of influential actors who negotiate behind closed doors, where social groups and scientists work together and experts are highly influential. The ‘club’ of experts is expected to work in the best interest of the public good. This approach was the norm in Europe before the BSE crisis (Lofstedt and Vogel 2001), including the United Kingdom (Vogel 1986; House of Lords 2000; Cabinet Office 2002), where “until recently the British regulatory regime had very little room for either public or interest group deliberation” (Lofstedt 2005: 104). The Consensual approach is still significant in specific countries, for example Sweden (Anton 1969; Lofstedt 2005). In the United Kingdom, regulatory failures and distrust resulted in new institutional arrangements that gave a stronger voice to citizens’ groups in the decision-making process (Lofstedt and Horlick Jones 1999). The dramatic shift between pre-BSE and
post-BSE decision-making practices strongly suggests that the *consensual approach* is difficult to combine with a low-trust environment. In such cases people tend to be suspicious of government appointed experts (Lofstedt 2005). The *corporatist approach* is not fundamentally different from the *consensual approach*. It could be described as a formalised and more open attempt to reach consensus. Well-known experts are invited to join a group of carefully selected policy makers who represent the major forces in society, such as the employers, the unions, the churches, the professional associations, the environmental organisations. The ‘club’ is more open and more receptive to reasonable public demands. The groups represented within the club are often asked to organise their own risk management and communication programmes as a means of enhancing the credibility of the whole management process. Hammitt et al. (2005) refer to the observation — without necessarily endorsing it — that Europe is at the same time ‘lax and corporatist’, at least in some areas of regulation (e.g. food safety). Jasanoff (1986 and 1997) argues for a causal relationship between European corporatism and lax regulation.

### Table 3: Characteristics of Policy Making Styles

<table>
<thead>
<tr>
<th>Style</th>
<th>Characteristics</th>
<th>Risk Management &amp; Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>Adversarial approach</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
open to professional and public scrutiny  
need for scientific justification of policy selection  
precise procedural rules  
oriented towards producing informed decisions by plural actors  | main emphasis on mutual agreements on scientific evidence and pragmatic knowledge  
integration of adversarial positions through formal rules (due process)  
little emphasis on personal judgement and reflection on the side of the risk managers  
stakeholder involvement essential for reaching communication objectives  |
| 2 **Fiduciary approach (patronage)** |  
closed circle of ‘patrons’  
no public control, but public input  
hardly any procedural rules  
oriented towards producing faith in the system  | main emphasis on enlightenment and background knowledge through experts  
strong reliance on institutional in-house ‘expertise’  
emphasis on demonstrating trustworthiness  
communication focused on institutional performance and ‘good record’  |
| 3 **Consensual approach** |  
open to members of the ‘club’  
negotiations behind closed doors  
flexible procedural rules  
oriented towards producing solidarity with the club  | reputation most important attribute  
strong reliance on key social actors (also non-scientific experts)  
emphasis on demonstrating social consensus  
communication focused on support by key actors  |

---

18 The incompatibility may be even greater in the case of a *fiduciary model*. In a post-trust environment ‘patrons’ would probably no longer be recognised as a legitimate source of authority.
4 **Corporatist approach**
- open to interest groups and experts
- limited public control, but high visibility
- strict procedural rules outside of negotiating table
- oriented towards sustaining trust to the decision making body
- main emphasis on expert judgement and demonstrating political prudence
- strong reliance on impartiality of risk information and evaluation
- integration by bargaining within scientifically determined limits
- communication focused on fair representation of major societal interests

Source: Renn (2007)

**3.2 Two-way communication models**

Thirteen years after the release of the seminal ‘red book’ (NRC 1983) by the USA National Research Council (NRC), which became a lasting source of inspiration for human and ecological risk assessors (EPA 2000, EPA 2004), the influential NRC 1996 report suggested that government, when faced with risks, should focus on obtaining the “consent of the governed”, preferably through “broad public participation” (NRC 1996: 23). In 1989, an earlier report of the NRC highlighted, that:

“[Risk communication is] an interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions or reactions to risk messages or to legal or institutional arrangements” (NRC 1989, p.21)

Baruch Fischhoff (1995) and William Leiss (1996) have highlighted the evolutionary process that risk communication research went through before reaching this point. Leiss (1996) has identified three phases in the evolution of risk communication practice:

- Firstly, the necessity of conveying probabilistic thinking to the general public and to educated lay audiences;
- Secondly the persuasion of audiences and the management of public relations to convince people that some of their behaviour is inappropriate;
- Finally, a two-way communication process in which scientists, risk managers and various laypersons, engage in a social learning process.

Fischhoff (1995), on the other hand, has offered a history of risk management organised against eight development stages (see Table 4). During the first stage of risk management, experts focused on the development of technical expertise to control the risks, which involved the development of probabilistic estimates. This exercise took place behind closed doors. When technicians realised that their expert status did not necessarily mean that people would trust them, they decided to hand over the numbers in the form of corporate reports, briefings, press statements etc (Lave 1987). Sometime this process involved presenting their views in public, but the result was often poor, because many scientists do not necessarily have very high presentation skills, and, on the other hand, people do not understand numbers very well (Tversky and Kahneman 1974 and 1981).

At the third developmental stage, experts realised that they would need to go beyond the presentation of statistical facts. In addition to the difficulty that people have to comprehend statistical data, the interpretation of conflicting arguments – even when theories bear uneven scientific merits - creates additional barriers. Experts, therefore, have focussed on telling people what they need to know, assuming that people are rational decision-makers. Fischhoff
has highlighted that this elicitation process requires thinking in details about the recipients’ circumstances. This requirement has led to the creation of explicit models of people’s decisions. Merz’s model, for instance, assumes that recipients “(a) know nothing to begin with” and “(b) can stop learning once they have mastered a few quantitative estimates” (Merz et al. 1993). At times, however, people are not interested at all in numbers and just want to understand how the risky process “works”. Cognitive scientists have attempted to address this more direct need through the so-called ‘mental model approach’ (Bostrom et al. 1994; Morgan et al. 2001). This model begins by creating an influence diagram, also called ‘expert model’, which shows the scientifically known factors involved in inducing and controlling a hazard. Then, individual beliefs, called ‘mental models’, are elicited using a mixture of open-ended and structured procedures. Expert models are then used to characterise these mental models. On the basis of this analysis communications are defined to correct misconceptions, fill gaps, or reinforce correct beliefs, in a way that can be comprehended by all recipients.

The recognition that people’s interests lay in the risky process rather than its probabilistic attributes opened the door to the exercise of comparing situations. Experts have drawn comparisons between risks to convince lay audiences that a given risky situation may not be very different from a familiar situation. Anecdotal evidence has been frequently used, but with limited results due to the fact that public expectations are largely context-based. Risk comparisons, moreover, tend to postulate that people always expect zero risk, and that the task of the expert is to reassure the public through the rational demonstration that everything has risks. This communication approach, however, has not been very effective (Freudenberg and Pastor 1992). Emphasising the fact that everything has risks may just raise the level of concerns to the point of amplifying rather than attenuating unwanted risks. In the 1980s Paul Slovic (1987) developed the concept of ‘risk signals’, risk events/occurrences that suggest to the public that the risk is more serious than previously assumed. These findings have been formalised through the integrative framework called ‘the social amplification of risks’ to examine the various structures and procedures that may ‘dampen the flow of signals’ as in risk attenuation or amplification (Kasperson and Kasperson 2005). Renn (2008) has suggested to deal with risk comparisons as follow:

- Risk comparison should rely only on risks that are perceived as comparable by the public.
- Risk communication must address the basic qualitative properties of different risks and explain how deficiencies in those qualities have been compensated or will be compensated.
- It may be useful to insert anecdotal evidence or report about identifiable victims when communicating about familiar and unspectacular risks,
- It seems advisable to link numerical probabilities with verbal expressions of likelihood

The fifth developmental stage in risk communication emphasised the weighing of risks and benefits. This development came at a more mature stage of risk management history; the weighing of risk and benefit for any activity presupposes specific skills, including robust economic and statistical analysis. Risk/benefit communication is far more successful than risk comparisons, because it presents concrete benefits that will speak to people and help them re-assess their previous attitudes. Scholars, however, suggest a number of issues that may affect judgement about risk/benefit trade-offs, for instance ‘framing effects’ (Fischhoff 1991; Fischhoff et al. 1980; Hogarth 1982; Kahneman and Tversky 1984) and biased rhetorical comparisons of risks and benefits (Mazur 1985; Fischhoff 1994). Despite the fact that benefits have been included in the ‘risk equation’ very early on (Starr 1969), the benefit side of the story has often been relegated to the background. Forgetting about the ‘positives’ contradicts economic and financial theories, where higher returns usually imply higher risks (Morre 1999). The consequences can be very significant, because people tend to process the
same message differently, depending on whether it is framed as a risk or as a benefit (Tversky and Kahneman 1981; Rothman and Salovey 1997). One reason for this ‘benefit deficit’ may be that benefits are often highly contextual and individualised. They tend, therefore to be seen as a thing apart and distinct from the risks. Another reason may be that, as a society, we feel collectively responsible for the negative consequences rather than the positive ones. Finally, it may be only a further manifestation of the catastrophe-obsessed society portrayed in Beck (1992).

The next two developmental stages in risk communication have focused on the relationship between the senders and receivers rather than the content of the message itself. Experts and decision-makers have acknowledged the importance of the relationship between them and those affected by risk decisions. Their first reaction has been to focus on improving the form of the delivery of their message, for example through communication training, language simplification and inter-personal relationships with the receivers. Fischhoff has warned against the danger of a smooth delivery, which would not be accompanied by an adequate content: ‘the ignorant smiles of PR types are a good tool for digging oneself into a hole’ (Fischhoff 1994). The seventh developmental stage in risk communication has introduced the belief that people should be treated as partners, that is to redefine a relationship between experts and lay people, in ways that recognise the public’s reality and competence. This does not mean that expert knowledge and lay knowledge should be confused, but that whatever their degree of technical competence may be, people ought to be recognised as active players of the risk communication process. This approach also requires that experts reassess the relevance of their decisions for society as a whole and also implies to factor non-technical considerations into their decisions. The final developmental stage of risk communication acknowledges all the above stages. This stage may be described as a two-way model of risk communication.

**Table 4 Developmental stages in risk communication**

| All we have to do is get the numbers right |
| All we have to do is tell them the numbers |
| All we have to do is explain what we mean by the numbers |
| All we have to do is show them that they’ve accepted similar risks in the past |
| All we have to do is show them that it’s a good deal for them |
| All we have to do is treat them nice |
| All we have to do is make them partners |
| All the above |

Source: Fischhoff (1994)

**3.3 Toward a proactive model**

Modern risk communication has evolved as a way to ‘help companies, governments and institutions minimise disputes, resolve issues and anticipate problems before they result in an irreversible breakdown in communications’ (Lofstedt 2005, p.1). Thirty years of risk communication theory supported by empirical evidence has resulted in the development of consistent set of practical recommendations to achieve a proactive model of communication. Regulators, for example the Foods Stanards Agency (FSA) have used risk communication guidelines to improve their capacities in this area (FSA 2006; FSA 2007). In 2002, the OECD published the ‘Guidance Document on Risk Communication for Chemical Risk Management’
OECD 2002, which summarised best practices for risk communication applied to chemical risks. The OECD addressed a number of key issues, to:

- Inform the public about risks (emphasising the difference between hazards and risks)
- Inform the public about the process for conducting risk assessments and making risk management decisions, including a description of the various actors and procedures involved in both tasks
- Organise an effective two-way communication
- Enhance trust and credibility of all actors in the risk assessment and management process
- Involve stakeholders in the process and resolve conflicts

The OECD report on chemical risk management divides the risk management process into four stages, i.e. problem identification, setting up of objectives, making recommendations and implementation/evaluations. The document suggests selecting communication instruments according to three types of risky situations, ‘routine risk situations’, ‘risks with high uncertainty’ or ‘risks with high potential for controversy’. Depending on the specific situation and the degree of public concern, chemical risk managers are invited to use different information dissemination instruments, for example brochures and written leaflets, public presentations and discussions, education programmes, surveys and focus group, or press releases. The monitoring of the participatory process also requires to select the right type of public involvement, including, citizen panels, round tables, pre-tests, or systematic feedback from users, polls or internet-based instruments. Tables 5 to 7 summarise the recommended approach for each risky situation.

Table 5: Approaches to use in cases of routine risks

<table>
<thead>
<tr>
<th>STAGES IN THE RISK</th>
<th>AUDIENCES</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: Problem Identification</td>
<td>Individuals and General Public</td>
<td>Media</td>
<td>Institutional Stakeholders</td>
</tr>
<tr>
<td>Stage 2: Setting up the Objectives</td>
<td>A*, O, P</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Stage 3: Making Recommendations</td>
<td>A, C, D</td>
<td>I</td>
<td>C, M</td>
</tr>
<tr>
<td>Stage 4: Implementation/Evaluation</td>
<td>R, S</td>
<td>P</td>
<td>P</td>
</tr>
</tbody>
</table>

Source: OECD 2002
Table 6: Approaches to use in cases of risks with high uncertainty

<table>
<thead>
<tr>
<th>AUDIENCES</th>
<th>Individuals and General Public</th>
<th>Media</th>
<th>Institutional Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGES IN THE RISK MANAGEMENT</td>
<td>Stage 1: Problem Identification</td>
<td>A, B, C, O, P</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>Stage 2: Setting up the Objectives</td>
<td>E, F</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td>Stage 4: Implementation/Evaluation</td>
<td>R, S</td>
<td>P</td>
</tr>
</tbody>
</table>

Source: OECD 2002

Table 7: Approaches to use in cases of risks with high potential for controversy

<table>
<thead>
<tr>
<th>AUDIENCES</th>
<th>Individuals and General Public</th>
<th>Media</th>
<th>Institutional Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGES IN THE RISK MANAGEMENT</td>
<td>Stage 1: Problem Identification</td>
<td>A, B, C, O, P</td>
<td>I, P</td>
</tr>
<tr>
<td></td>
<td>Stage 2: Setting up the Objectives</td>
<td>G, H</td>
<td>I, P</td>
</tr>
<tr>
<td></td>
<td>Stage 3: Making Recommendations</td>
<td>A, B, C, D, Q, R, S</td>
<td>J, P</td>
</tr>
<tr>
<td></td>
<td>Stage 4: Implementation/Evaluation</td>
<td>Q, R, S, T</td>
<td>P</td>
</tr>
</tbody>
</table>

Source: OECD 2002

* Instruments:
  A- Brochures and written leaflets
  B- Internet website material
  C- Public presentations and discussions
  D- Exhibitions, educational fairs, participation in science centres, visit to schools
  E- Surveys and focus groups
  F- Citizens advisory committees
  G- Citizens consensus conferences
  H- Citizens panels, planning cells. Or citizens juries
  I- Press releases
J- Press conferences
K- Expert hearing
L- Stakeholders’ hearing
M- Round tables
N- Mediation
O- Pre-test of the material or the discourse procedure
P- Systematic feedback from users of communication material
Q- Experimental design
R- Surveys and polls
S- Internet chat rooms
T- Supervision and training

In 2003-2005 the Federal Institute for Risk Management (Germany) commissioned an evaluation and update of this work in the framework of the Federal Government’s Action Programme Environment and Health (Hertel and Henseler 2005). Recently, Renn (2008) has updated risk communication guidance, taking these developments into account as well as updating his earlier recommendations (Renn 1992). These efforts have converged to support a number of key risk communication principles. They are well summarised in Renn’s 16 guidelines on how to communicate risk effectively (see Box 1)

**Box 1**

<table>
<thead>
<tr>
<th>16 guidelines on how to communicate risks effectively</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Be clear about your intentions and make them the central message of your communication effort.</td>
</tr>
<tr>
<td>(2) Simplify your message as drastically as you think you can do without being inaccurate.</td>
</tr>
<tr>
<td>(3) Place your simple messages in the beginning of a text and gradually add the complex issues.</td>
</tr>
<tr>
<td>(4) Anticipate the interests of your target audiences and design your communication program to match their needs.</td>
</tr>
<tr>
<td>(5) Devise different communication programs for different target audiences.</td>
</tr>
<tr>
<td>(6) Messages should be distributed on different channels and feedback communication should be stimulated and encouraged as much as possible.</td>
</tr>
<tr>
<td>(7) Be honest, complete, and responsive in the composition of your message.</td>
</tr>
<tr>
<td>(8) Try to escape from role expectations by using a personal approach and by framing the communication to the personal experience of the addressed receiver.</td>
</tr>
<tr>
<td>(9) Allocate enough time for packaging your message, but do not change your message in order to make the package more attractive.</td>
</tr>
<tr>
<td>(10) Be careful in selecting the right cues for appealing to the peripheral audience without offending your central audience.</td>
</tr>
<tr>
<td>(11) Explain the risk rationale to your audience and demonstrate the logic and adequacy of this rationality without claiming superiority.</td>
</tr>
<tr>
<td>(12) Place risk in social context and report numerical probabilities only in conjunction with verbal equivalents.</td>
</tr>
<tr>
<td>(13) Institutional performance is the major key to trust and credibility. The more you can demonstrate that you did a good job the more you can expect trust in your message.</td>
</tr>
<tr>
<td>(14) Risk managers have to learn from the public as much as the public can learn from them.</td>
</tr>
<tr>
<td>(15) You can only convince the receivers of your message if it addresses their concerns and interests.</td>
</tr>
<tr>
<td>(16) Encourage or initiate attempts to conduct a rational discourse, in particular for third level debates.</td>
</tr>
</tbody>
</table>

Source: Renn (2008)
The 16 points represent a policy-oriented “checklist”, which may help meet the requirements implied by Fischhoff’s ultimate developmental stage in risk communication. The points are self-explanatory and easy to remember. Meeting each of these recommendations, however, may require dedicated efforts, investment and training. The best communication process will not lead to any success if it is meant to compensate shortcomings or failures in the task performance of the communicator or to hide management mistakes (Renn 2008).

The implementation of these guidelines may also face a number of practical obstacles. The objectives of the first guideline, for example, may be difficult to meet because many agencies tend to react quickly rather than following a scientific process to make up their minds. All departments may not speak with one voice, which could also jeopardise attempts to present a single government position. Meeting the second requirement, simplification, could also be a very delicate exercise, as many agencies tend to make excessive use of professional jargon. Understanding the interests of the target audiences, which is the essence of the fourth guideline, may imply to develop an understanding of worldviews and philosophies that govern the institutional performance, which may require a substantial research investment. The fulfillment of these guidelines also implies to meet people’s expectations about accuracy and honesty. ‘People do not mind if advertisement for margarine is entertaining or even silly, but they expect information on risks to be honest and serious’ (Renn 2008). This expectation can easily be jeopardized by internal politics, which are exacerbated in case of acute crises.

### 3.3 Risk management in post-trust societies

The use of appropriate communication techniques through the risk management process contributes to maintain a high degree of public trust. Though, recent developments in risk research suggest that standardised guidance on risk communication may not be enough to deal with the complex and difficult context of post-trust societies. Lofstedt (2005), for instance, has developed an in-depth analysis of four risk management cases, i.e. the siting of a waste incinerator in the North Black Forest (Germany), the re-licensing procedure of an international paper’s hydro-dam (USA), the Swedish-Danish Barsebäck nuclear plant controversy, and the case of Brent Spar (UK).

Case analysis offers insights into how decision-makers may cope with high levels of uncertainty and public anxiety, and how they may chose between different public involvement mechanisms. This analysis reaches a number of key conclusions on how and when decision-makers from the public sector may involve the public. This allows the building of a set of principles (see figure 3), where criteria are allocated into three headings, ‘context of the decision-making process’, ‘behaviour of the risk managers’ and ‘perception of the actors involved’.
**Figure 3 Risk Management principles in post-trust societies**

<table>
<thead>
<tr>
<th>Context of decision-making process</th>
<th>Behaviour of risk managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a high public trust, high/low uncertainty risk situation, deliberative risk management strategies are not required</td>
<td>In high distrust situations, charismatic individuals are extremely helpful in negotiating successful deliberative outcomes</td>
</tr>
<tr>
<td>In a low public trust, implement a risk management strategy, selected after the reasons for the distrust</td>
<td>Political actors (local or national) have to support the final outcome</td>
</tr>
<tr>
<td>Deliberative techniques can help create public trust regarding a contentious issue, if public distrust has to do with partiality, but are expensive and time consuming</td>
<td>The regulator also as to test and see whether there is public trust</td>
</tr>
<tr>
<td>Poractive regulations, who act before a crisis, are more likely to gain trust</td>
<td></td>
</tr>
</tbody>
</table>

**Perception of the actors involved**

- Interest groups will in many cases try to create public distrust of regulators, which in turn can lead to failures of the risk management process.
- Interest groups are needed, however, when the regulator is not seen as impartial and when one is dealing with national or international regulatory issues.

4. **CONCLUSION**

Risk communication is a relatively new discipline. Nevertheless, its relevance and potential for improving concrete situations has led to considerable theoretical developments over the past decades. Risk communication theories have been primarily applied to uncertainties in relation to health and the environment. This focus explains the usefulness and success of risk theories in the area of industrial and occupational safety. A number of policy-oriented recommendations have been developed, offering detailed guidance on how decision-makers and managers may deal with concrete risky situations. Checklists and guidelines contribute to maintain high standards and good practice. Such guidance is not the end of the story, however. The conclusion of decades of risk communication research is that communicating risk is a highly context-based exercise. It requires a dedicated effort to building insight knowledge rather than applying recipes.
REFERENCES


Hertel, R. F. And Henseler, G. (Ed. 2005): ERiK – Entwicklung eines mehrstufigen Verfahrens der Risikokommunikation, BfR Wissenschaft 02/2005


HSE (2001a, revised 2002) Reducing Risks, Protecting People, Sudbury: HSE books


Framework,’ Risk Analysis, 8(2): 177-187


ANNEXES

ANNEX 1

Location of 81 hazards (Slovic et al. 1985)

The location of these 81 hazards on factors 1 and 2 is derived from the relationship among 18 risk characteristics. Each factor is made up of a combination of characteristics, as indicated by the lower diagram (Slovic et al. 1985).
Executive summary

The increasingly controversial and political nature of debates about Health and Safety combined with challenges to the traditional expert model of risk regulation have urged practitioners to adapt their risk communication techniques to reflect lower levels of public trust. Communicating risks effectively requires one to understand specific national regulatory cultures, to select appropriate risk assessment methods and to define participatory mechanisms that are consistent with national or sectoral decision-making arrangements. Depending on the circumstances, practitioners may rely on top-down advice, decision heuristics and risk communication guidelines to develop effective risk messages.

1. Introduction: HSE and the risk debate

Academics who studied the trust vested in the HSE came to the conclusion that the strong legitimacy of the HSE results from its positive image as a fair and economically neutral actor (Pidgeon et al. 2003). Yet, the same study also suggested that the HSE’s regulatory culture remains rather ‘old school’, with only moderate inclusiveness of the processes that the agency promotes. Levels of trust are not a given and evolve under the effect of circumstances and societal concerns for specific events (Kasperson et al. 1999; Lofstedt 2005). Views on the role of science, the benefits of new technologies as well as political debates at a given time play a crucial part in shaping views about the competence, effectiveness and efficiency of public bodies.

A crucial question is therefore: does the HSE need to adapt its risk communication to a changing environment? There are some indications that it may need to do so. A number of recent news articles have challenged real or supposed HSE positions and decisions. The organisation has been exposed to expressions of criticism ranging from suggestions that the organisation is failing its duty to protect the public in some areas, to suggestions that it is being risk-averse, tedious and cumbersome in other areas. These critics partly reflect broader political debates about the role of regulators. Unions and the left tend to worry about the HSE being too lenient and pro-industry; on the other hand, some politicians, mostly Tories, are concerned about the effects of a ‘risk-averse’ society on the regulator and the consequences of risk-aversion on the economy. Similar disagreements have been analysed under relatively similar circumstances for example in Sweden (Kelman 1981) and in the United States (Kelman 1981; Vogel 1986). What matters most is that political debates tend to be exacerbated when trust in the regulator diminishes. The BBC has for example argued that the ‘the watchdog on workplace safety’ (the HSE) ‘is failing to investigate hundreds of serious accidents every year because of a lack of funds’\(^\text{19}\). The Guardian, on the other hand has argued that ‘those who walk under trees are at risk from these terrorising inspectors’\(^\text{20}\).


---

\(^{19}\) BBC ‘HSE failing to probe accidents’, 27 July 2007, accessed at: http://news.bbc.co.uk/1/hi/uk/6918532.stm

\(^{20}\) Simon Jenkins, ‘Those who walk under trees are at risk from these terrorising inspectors’, in The Guardian, Friday 17 November 2006
positive side, the report argues that advisors and consultants are to blame for trivial and pointless restrictions, not the HSE: ‘over-zealous health and safety advisers encourage employers to produce over-burdensome risk assessments’ (p.5). The HSE has used pro-active communication to confront similar misconceptions before they may grow out of proportion. For example, in a letter to the Daily Mail the head of the HSE, Geoffrey Podger, wrote:

“Roy Donaldson (Letters, 20 August 2008) is right to object to trivial and pointless restrictions allegedly due to health and safety – but he is wrong to blame the Health and Safety Executive. We do not, as he asserts, issue “bans, warning and threats” in this area. Nor do we seek to abolish all risk and so encourage a culture of compensation seeking. Our role is far more important than that. The HSE is dedicated to addressing the real risks that people face in the workplace, where there were more than 228 deaths last year.”

On a more negative note, however, the Government response to the Work and Pensions Committee suggests ‘a 28% increase in construction fatalities’ resulting from ‘inadequate resources’. It also reports ‘extremely concerning’ numbers of incidents and fatalities involving tower cranes’ (p.9). The report also expresses a general concern for the declining number of inspectors and a specific concern for the failures to manage risks in the offshore industry.

Is the HSE too cosy with critical industries, while SME and individuals would suffer from bans, warning and threats? Over time, the persistence of conflicting and politicised messages about inadequate protection – even when they are a ‘health and safety myth’ (House of commons 2008) - may indeed confuse the public and affect trust negatively. Recent debates suggest that the HSE may be slowly moving to a position where it could be more severely affected by any high profile incident or dispute. If so, how could HSE adapt its communication approach to new conditions? This report offers a succinct analysis of years of risk communication practices. Its purpose is to help frame discussions about possible solutions in the face of changing circumstances.

2. Challenges to the expert model and risk communication

We may observe everyday the tragic consequences of risky events that materialise. The news report all sorts of accidents, from drug trials that went wrong to tower crane or falling trees accidents. Hazards abound in industry from hazards related to the handling of machinery or the transportation of heavy objects to health hazards, which result from exposure to chemical or to physical agents, such as noise and radiation (Kelman 1981: 1). A constant challenge for regulators – especially in the Health and Safety area where lives are often at stake- is to balance need for high safety standards with economically sound decisions. An USA official interviewed for this Study highlighted:

“We don’t feel comfortable shutting down plants for safety reasons; sometimes we are blamed for being pragmatic”

On the other hand, society’s demands for more protection have often increased as a result of regulatory failures. The whole European debate surrounding the communication of health risks dates back to a number of safety controversies that took place in Europe in the 1990s, in particular the UK mad cow (BSE) crisis, the French tainted blood scandal and the Belgian Dioxin scandal (Lofstedt 2005). The main effect of these events has been to challenge the top-down form or risk communication that pre-existed in major European countries notably ——

France, Germany, the Nordic countries and the UK. As an effect a post-trust society has emerged where such forms of communication no longer work. Compared to other regulators – especially in the food area – the HSE has retained a higher level of public confidence.

Society’s increasing sophistication may therefore create new ‘systemic’ risks that challenge conventional risk assessment because of their higher degree of ambiguity, complexity and uncertainty (OECD 2003). This creates urges regulators to adapt their risk management practices to new challenges:

“One reason is that the nature of the health and environmental hazards we face has changed. When rivers were bursting into flame, as Cleveland’s Cuyahoga River did in 1969, or when smog was so bad it made your eyes tear, we did not need elaborate risk assessment to tell us something had to be done. The newer generation of environmental threats are different; they’re often no less serious, but they’re harder to measure and harder to eliminate. When toxic chemicals leak onto an open field for decades, and a neighborhood grows up around that field, and some of the chemicals seem to be reaching groundwater used for drinking, should the field be cleaned up, and if so, to what extent?” (Finkel 1996: 48).

The higher degree of uncertainty calls for a dramatic but difficult adaptation of our risk-management practices (Morgan 1990). We appear to be at a turning point where, increasingly, individuals and societies will have to make critical decisions about what risks they are prepared to take and what risks they should refuse. The main challenge is to ensure a balanced approach and to avoid the risk aversion position — no trials without prior guarantees against error — that has infiltrated the entire arena of public life (Wildavsky 1988).

From a managerial perspective it has been argued that such complex interactions between risks and society call for a better ‘governance’ of risk, which is defined as an horizontally-organised structure of functional self-regulation encompassing state and non-state actors, and which brings about collectively-binding decisions without superior authority (Renn 2007; Wolf 2002). Good risk governance is expected to provide guidance for the development of comprehensive assessment and management strategies to cope with risks (Cabinet Office 2002; IRGC 2006; NRC 1996; OECD 2003; Renn 2007; Rothstein et al. 2000). There is a paradox however, for the major systemic uncertainties, e.g. global climate, do not necessarily engender tangible discomfort yet, at least in the industrialised world. In additions, emerging risks that have already appeared on the ‘hazardous radar’ of experts may remain meaningless to the general public, who in return may fear risks that experts feel more confident with. These complex patterns highlight the importance of translating the lessons from cognitive sciences (see Appendix 3) into actual communication practice.

When they become exposed to the public eye, new technologies – e.g. cell technologies, nanotechnologies, xenotransplantations etc. – often provoke apprehension. These may be heightened when concerns also develop from within scientific communities regarding the uncertainties that surround new technological developments. This is especially the case when commercial developments are ahead of science. For example the lack of progress in addressing uncertainties about the health and environmental impacts of nanomaterials – increasingly used for activities as diverse as food packaging, sunscreens and coating – was one of the main concerns raised by the 2006 Royal Society and Royal Engineering report on how the UK government has addressed the Council for Science and Technology’s call for evidence

---

22 Nanoscience is the study of phenomena and manipulation of materials at atomic, molecular and macromolecular scales, where properties differ significantly from those at a larger scale. Nanotechnologies are the design, characterisation, production and application of structures, devices and systems by controlling shape and size at nanometre scale (Royal Society and Royal Academy of Engineering 2004, p.2).
(Royal Society and Royal Academy of Engineering 2006). The joint academies concluded that very little has occurred in this area since their 2004 joint study was published (Royal Society and Royal Academy of Engineering 2004), a very worrying trend. This view was confirmed by the report of the Council for Science and Technology (2007). The report highlighted that most of the research has focused on the science and its potential applications, but with very little on characterising the potential risks. In the face of uncertainty a number of environmental NGOs have take a proactive and rather negative view of the potential risks stemming from nanoparticles. Some have asked for a moratorium regarding both the development and release of nano materials (ETC 2004a and b; Greenpeace 2004). Howard and Ikah argue that one needs to be concerned about the release of free nanoparticles into the environment and hence a precautionary approach should be adopted (Howard and Ikah 2006). Similarly, Greenpeace and the Canadian pressure group ETC have been arguing for a moratorium on the development and release of nanoparticles (ETC 2004a and b; Greenpeace 2004). A recent report by Friends of the Earth highlighted that “Untested nanotechnology is being used in more than 100 food products, food packaging and contact materials currently on the shelf, without warning or FDA testing” (Friends of the Earth 2008). The same report also called for a moratorium on the further commercial release of food products, food packaging, food contact materials and agrochemicals that contain manufactured nanomaterials until nanotechnology-specific safety laws are established and the public is involved in decision making. It also argued that all deliberately manufactured nanomaterials must be regulated as new substances and that the size based definition of nanomaterials must be extended.

What are the effects of higher levels of public concern? When something goes wrong regulators are more exposed to dramatic failures, as shown in the Brent Spar controversy (Lofstedt and Renn 1997), the MMR and Hepatitis B scares (Bouder 2006). What should be done and what has been done? Arguably, regulators may face two possible courses of action. They may follow a risk avoidance path where their efforts focus on demonstrating that they are committed to ensure ever higher levels of safety. Or they may re-think their risk communication approach.

The main practical instrument to demonstrate that the regulator is tough on risks has been the precautionary principle. The 1992 Rio Declaration contains the most commonly used definition of this principle:

“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNEP 1992).

The precautionary principle is usually invoked in situations bearing a high level of uncertainty. The magnitude of a risk, and its irreversibility have been advanced as key arguments in favour of this principle (Klinke and Renn 2002). The precautionary principle does not necessarily equal risk avoidance, but restrictive interpretations of the principle clearly do. Per Sandin has listed 19 formulations of the precautionary principle, ranging from the requirement to act when we have indications that something might go wrong with a technology to cases where we expect industry to demonstrate that their products are entirely ‘safe’ before releasing them onto the market (Sandin 1999). This last requirement would require that duty holders engage in risk reduction measures with little consideration for the time or money involved. It seems a convenient approach because it does not require very sophisticated messages about the evidence underlying decisions. A risk that is to be eliminated does not
require to be justified. In practice, however, risks are not always easy to reduce and the attempt to eliminate risks all together may be unrealistic or create new risks. The precautionary approach also misses the positive utility of balancing of costs, risks and benefits (Sunstein 2002). Legal obstacle may also exist: in a number of countries a balanced and reasonable approach may be a legal duty. Another issue when regulator move away from tackling risks and chose a precautionary path is that they may trade risk management for sophisticated "hazard-related signal-management" processes. This evolution has been observed in the medical field (Bouder 2007, Bouder 2008a) and it is arguably what is taking place in the chemical field with the new REACH framework in the EU (Registration, Evaluation, Authorisation and restriction of Chemicals). Academics from both side of the Atlantic have developed a number of case studies that have highlighted the excess of precaution. For example, academics regard the European regulation of genetically-modified organisms (GMOs) and hormones in beef as overly precautionary (Lynch and Vogel 2000), while others point out that the FDA is excessively precautionary with regard to refusing Americans who have spent more than 6 months in the UK from giving blood, because of the fear of the spread of variant Creutzfeld-Jacob Disease (CJD) (Wiener and Rogers 2002).

3. Understanding regulatory cultures

The industrial revolution produced a concern with work-related accidents. For example, occupational safety laws - the so-called ‘factory laws’ of 1842- were among the first protective laws passed in the UK. Similar developments took place in the US and Sweden at the turn of the 19th Century (Kelman 1981). As a result of the rapid economic development of the post-war era, most Western countries experienced major industrial accidents in the 1960s and the 1970s:

“[C]onsider the following examples of issue convergence: the construction and expansion of airports facilities, highways, and offshore energy facilities […], the safety of nuclear power (Windscale and Three Mile Island) […], the effects of pesticide use on the health of both birds and agricultural workers (DDT, dieldrin, 2,4,5-T), the environmental impact of energy production (the North Sea and North Slope), the pollution produced by the burning of coal in power plants (acid rain), offshore oils spills (Santa Barbara and Torrey Canyon), the disposal of toxic wastes (Love Canal, Nuneaton), health hazards to workers (asbestos and vinyl chloride), the safety of ethical drugs (thalidomide, Oraflex)” (Vogel 1986: 222).

Some of the major accidents of the 1970s concerned particularly dreaded activities, for example the Three Mile Island incident in the USA that involved a nuclear plant, or, in the Netherlands, the release of propane at a chemical production unit in South Limburg that killed 14 people (Ale 2005). These and similar industrial accidents heightened public concerns for possible negligence on the part of regulatory authorities. The results were specific calls for action and have resulted in the development of distinct frameworks. The specific professional culture of the various policy fields involved in these changes (for example nuclear engineering), as well as specific national regulatory styles, have been influential in shaping risk management models.

The report at Appendix 3 has introduced the significance of national styles of regulation (Kelman 1981; Vogel 1986) for risk decisions. For instance, occupational safety and health regulation differs significantly across countries, as well as rule-making arrangement and enforcement mechanisms. A consequence of this variability is that practical risk communication solutions may need to pay attention to common challenges on the one hand and specific national arrangement on the other. Limitations to this general rule exist, as a number of common principles may bind countries together. For example since the 1982 Post-
Seveso Directive of the European Community (81/501.EG), the regulation of chemical installations has been subject to common requirements. Yet, national styles of regulation have influenced the implementation of common regimes in areas where national authorities still retain an appreciable level of discretion (e.g. the energy sector).

The socially acceptable amount of ‘time, money and trouble’ spent to control risks will greatly influence the environment in which risk messages will be developed. Again, insights into country variations and regulatory cultures are essential to address this issue. Kelman’s book *Regulating America, regulating Sweden* (1981) offers one of the most detailed comparisons of national health and safety arrangements. Kelman has shown that the broad context of occupational safety and health regulation differs dramatically in the two countries, for instance the proportion of the labour force unionised and the role of political parties. Unions in the United States are weak and there has never been a significant mass-based socialist or communist party. Swedish unions, on the other hand, are stronger than in any other democratic industrial country, and the Swedish Social Democratic Party, with close ties to the unions, has held power almost continuously since 1932. Yet, Kelman’s findings suggest outcomes in terms of levels of protection and enforcement that are far more complex than a coercive Swedish model and a lax US model. According to Kelman (1981):

- Rule-making decisions of the Swedish and American Health and Safety Agencies were quite similar and usually favoured more protective alternatives over less protective ones
- These decisions were fought persistently by business in the USA but accepted meekly by business in Sweden
- The American agency was bound by a detailed set of procedural requirements, while the Swedish agency was bound by virtually none
- The American agency adopted a far more punitive approach to compliance that the Swedish agency did
- The American agency was far more concerned with controlling field inspectors than was the Swedish agency
- Lawyers and courts were highly involved in American model and virtually uninvolved in Sweden.

Kelman’s own words may be used to summarise the importance of his contribution. The general problem his work has helped to unplug is:

“under what circumstances some people can get other people to change their behaviour. Assuming initial disagreements between labour and business, achieving agreement over the content of occupational safety and health regulations involves inducing some people to accept things they would not have accepted without inducements to do so. Achieving compliance with regulations, once adopted, requires the same process” (Kelman 1981: 7)

In other words, different cultures will use different means and arrangements to get to relatively similar results. Addressing the challenge of communicating risks in post-trust environments requires therefore to understand the context-based mechanisms that will make behavioural change ‘worth enough’.

4. Agreeing on facts: the key role of risk assessment

Researchers, like Dominic Golding at Clark University and Adam Finkel from the University of Pennsylvania, have for many years been involved in the study of risk in the area of health and safety, a field of inquiry that combines an understanding of the environment, psychology, and management of hazards. One of their critical contributions has been to analyse and compare risk assessment methodologies. A shared conclusion is that national priorities about
risk assessment methods – e.g. discussions about what should be subject to probabilistic assessment and how calculations should be done – is far more than a technical debate. It reflects broader societal and political choices (Finkel and Golding 1995). Such findings are particularly important because risk assessment methods have a critical impact on the nature of the communication process. For instance, the absence of quantification challenges the first two developmental stages in risk communication (Fischhoff 1995) that require to ‘get the number rights’ and ‘show the numbers’ before building more sophisticated forms of communication. The management of the Hepatitis B scare in France has shown that the absence of probabilistic assessment makes balanced risk decisions more difficult to achieve (Bouder 2006). In the UK hazard-oriented methods found in the environmental field such as BATNEEC (Best Available Technology Not Entailing Excessive Cost) and Best Practical Environmental Option (BPEO) have been highly quantitative, but are not risk-oriented:

“Environmental legislation relies of fixed discharge and emission standards, authorisations of polluting processes and nuisance provisions. Food safety legislation is slowly incorporating some risk-based concepts but it is not a central theme of regulation […]. Even environmental nuclear risks which are regulated on the basis of the risk versus cost/feasibility criteria of As Low As Reasonably Achievable (ALARA) are subjected to a ‘justification’ test before risk concepts are introduced” (Fairman 2007: 120)

Essential questions that regulator may ask themselves include: is quantification risk-oriented and evidence-based and what is the nature of the evidence used? A key issue is about the extent to which risk decisions are supported by probabilistic assessments of the likelihood and magnitude of the risk. Marks has observed that “assessing risk involves developing predictive mathematical models, using interpretation of data that are based on scientific assumptions and knowledge of how data were created” and that, on the other, these predictions “are used for developing strategies that affect many people in society” (Marks 2007:7). This approach has allowed the development of the USA model of risk management (NRC 1983; NRC 1989; NRC 1996). Though, comparative analysis of regulatory models (Bouder 2008b) suggests that there are countries or areas of regulation where Marks’ view would be considered controversial. In France, for instance, members of the private sector commonly use a probabilistic assessment method to prepare danger studies for which the legislation calls, for example to conform with the so-called “Seveso legislation” (law of 19 July 1976) that regulates the technical risks in the chemical and petroleum industries. This model “consciously adopted by the Dutch Parliament or the British Health and Safety Executive to guide risk decisions” is, however, “consciously avoided by French regulators outside the nuclear sector” (Poumadère and Mays 1997: 34). The fact that the exception comes from the state-controlled nuclear and transport sectors may be driven by a high degree of ‘risk numeracy’ of the engineers involved in the policy process. Even in such cases, however, probabilistic assessment is not combined with a precise numerical evaluation of unacceptable consequences in terms of human death (Poumadère and Mays 1997: 42). In the French system, elected officials and those to whom they delegate responsibilities are the ‘legitimate’ authorities that make risk decisions. This approach reflects the fiduciary nature of the regulatory culture (for classifications see Appendix 3). The consequence is that the risk communication function is not very developed and, when it becomes vital, for example when it is forced by a crisis, it may take the form of an extension of standard political communication (Bouder 2006). Art. L230.1 of the French code of work (1991 version), drafted by the Ministry of the Environment, gives a statement of intent that reveals the overall approach to hazard identification and prevention in France:

“[T]he head of an establishment (will take) the measures necessary to ensure the safety and protect the health of workers in the establishment […] including actions to prevent occupational risks, information and training, and appropriate work structure and means […]”.

86
These measures are based on the general principles of prevention requiring that risks should be avoided (i), evaluated when they cannot be avoided (ii) and combated at their source (iii).

With their long experience of being exposed to the whims of nature the Dutch people have been conscious of living with risks for many centuries. The 1953 flooding (Delta Commissie 1960), as well as a number of accidents that took place in the 1970s23 (Ale 2005; Beroggi et al. 1997) have framed the modern risk approach in this country. Unlike the French approach, the Dutch model focuses primarily on the probability of the loss of human life, in which incidences of death form the main indicator. Interestingly, the risk of injury is also taken into account. In addition to material costs, other types of benefits, such as recreational values, agriculture, and operational losses are not integrated (Beroggi et al. 1997).

The USA also have a long tradition of using probabilistic risk assessment. The Food Sections of the Food, Drug and Cosmetic Act (1938) contains the origin of the risk approach that evolved into the so-called NOEL concept (No Observed Effect Level). As a consequence of historical developments underpinned by court decisions (e.g. the so-called ‘Benzene decision’ in the Health and Safety area) and institutional innovations (e.g. the central oversight role played by OMB/OIRA), federal agencies have managed risks-based on quantitative estimates of individual risks. The thoroughness of probabilistic assessment may vary however. Although it is strong in the environment field, other fields of regulation have used such techniques to a lesser degree (Bouder 2008b). Hattis and Minkowitz, (1997) provide a useful account of the history of US health and safety regulation, including the seminal importance of the Benzene decision. The Supreme Court decision Industrial Union Department v. American Petroleum Institute clarified the quantitative definition of the occupational health standards for benzene. The main relevant section of the OSHAct directed the Health Agency (OSHA) to ensure that no worker would suffer material impairment to health, to the extent feasible. The leadership of OSHA deduced from this rather general wording that the agency could modify safety standards without using a precise quantitative risk assessment. The industry, on the other hand, demanded a clear quantitative assessment of the benefits that a change of the standards was expected to bring. The Supreme Court was deeply divided on the issue, but finally required OSHA to provide some significant quantitative range, suggesting that $10^{-3}$ could be considered ‘significant’ and that $10^{-9}$ would have to be considered insignificant. In practice OSHA has interpreted this $10^{-3}$ value as a ‘ceiling’ defining a risk level that should always be considered significant enough to require regulation. Prominent scholars have confirmed that OSHA still pays limited attention to the need to set priorities or to balance the costs of achieving regulatory goals against anticipated benefits (Sunstein 2002). OSHA remains a relatively small agency with limited capacities, and, when compared to other agencies it “does not classify carcinogens via its rulemaking processes or anywhere else—scientific heavyweights such as EPA and NTP do so” (Finkel 2007: 128). Yet, this lack of quantification does not necessarily equal over-conservatism (Finkel 1996). As one interviewee from the Occupational Safety and Health Organization (OSHA) suggested:

“The purpose of OSHA risk regulation is to reduce significant risk to the levels technologically and economically possible. We don’t quantify as much as one would think and we don’t go very far out to think of alternative technologies. The outcome is not as irrational as one would think.”

23 In particular: the 1971 Butane explosion at Marbon Europe in Amsterdam (10 deaths); the 1975 Explosion at the chemical-production units of Naflakraker DSM in Beck (14 Deaths); the 1978 Road-tanker crash in Spain near a campsite, which killed 180 Dutch campers; the 1978 Fire under a road tanker loaded with LPG, which destroyed the tank station.
One similarity between the USA and UK system is that Britain has also utilised risk management tools that have flexible, cost-effective, and positive benefits for the general public (Lofstedt 1997: 61). The *modus operandi* that the British regulation and case law established requires a comparison of the risk and the sacrifices (money, time and trouble) involved in taking measures to avert risk. If the sacrifice appears to be disproportionate when compared to the benefit from the reduction of the risk, then the requirement has been met and implementation of additional measures is not required (Walker 2001). The Royal Society (1983) report has defined risk management as “procedures by which the Government and regulatory bodies “determine what controls are needed, whether these controls are reasonable, and are in fact carried out, and whether they and their costs are acceptable to the public” (Royal Society 1983: 149). This definition reflects the prevalent view in Britain that risk management relies on ‘reasonable’ measures and ‘reasonable’ controls, which a sound weighing of costs and benefits supports. This approach is deeply ingrained. The UK regulators, since the factory laws have introduced the term ‘Best Practice’, which expresses the belief that regulation should be as flexible as possible. Regulation in the UK should follow a ‘reasonably practical’ or ‘best practice’ rule (Fairman 2007).

Another distinctive feature of the UK system, is that it relies on smooth enforcement and self-regulation (Lofstedt 1997). For the last fifty years, safety has been conceived according to the following principles: it is the responsibility of duty-holders to ensure that risk is maintained as low as reasonably achievable:

> “From the outset the inspectorate responsible for safety at the workplace operated on the assumption that while inspectors might do all they could to see that manufacturers and mine operators complied with the law’s technical requirements, the ultimate responsibility for improving the working conditions for employees rested upon the owners and managers themselves” (Vogel 1986: 196).

While comparing the USA and UK law enforcement practices, Vogel (1986) has argued that, unlike the United States, where enforcement is highly politicised, rigid and legalistic, the success of the various inspectorates in Britain was to be judged not by their ability to secure compliance with minimal safety requirements but by their success in persuading employers and managers to assume greater responsibility for the physical welfare of their employees. For example, the role of British Government inspectorates is often to persuade rather than prosecute:

> “It is extremely rare for a general inspection not to result in a ‘discovery’ and formal notification of a number of breaches of the law for which criminal proceedings could be instituted. But in the vast majority of cases such matters are not regarded as criminal offences in the any ordinary sense either by the Inspectorate or by the employees concerned” (Rhodes 1981:75)

In this context favouring ‘self-regulation’, the duty of the regulator is to provide a framework and incentives that enable regulated entities to come up with appropriate solutions. In the UK the Health and Safety regulatory philosophy favours risk assessment combined with exposure limits that can be measured and therefore successfully controlled and in use and properly enforced” (Rimington 1993: 7). Things are not usually either ‘safe’ or ‘not safe’, but they can be made to be ‘safe enough’ (Mc Quaid 2007), and that several parameters should be including in the decision-making process. In practice, this equates to compliance with the legal principle that the risks have been reduced so that they are as low as reasonably practicable (the ALARP principle). In most cases, adherence to authoritative good practice determines whether risk decisions are ALARP; where good practice has not been developed or is of doubtful relevance, there is a need to anticipate what might go wrong and to examine the effectiveness, including cost-effectiveness, of options for reducing risks. This approach has led to the “Tolerability of Risk” (ToR) framework (HSE 1988; HSE 2001).
5. Taking society’s expectations on board: different traditions, different solutions

A proactive two-way model of communication requires to acknowledge societal views before developing effective risk messages (see Appendix 3). In practice, however, organisations have used very different methods to include societal views. These methods partly reflect the characteristics of various policy-making styles. Consensual models have favoured technical solutions, while pluralist models have favoured a deliberative approach. In Europe, attempts to develop a reliable quantitative approach for the inclusion of society’s views have been noticeable in the United Kingdom (Bouder et al. 2007), in the Netherlands (Ale 2005) and Norway (Aven and Vinnem 2005). The main form in which societal risk is presented is as a relation between incidents, which cause number N or more fatalities and the frequency of F of such incidents. This is represented as a F-N curve. In the UK the criteria has been historically based on ‘an examination of the levels of risk that society was prepared to tolerate from a major incident affecting the population surrounding the industrial installations at Canvey Island on the Thames’ (Le Guen 2007: 117). An illustration is presented in Figure 1, with three hypothetical curves representing the evolution of societal risk from three distinct types of hazards.

Figure 1- F-N curve

The basic F-N data may be integrated to obtain a value for the equivalent annual fatalities, which is termed as “Rate of Date or Potential Loss of Life (PLL)”. Societal risk is difficult to quantify and it is generally agreed that such measurement carries intrinsic problems (Ball and Floyd 1998; Ball and Bochmer-Christiansen 2002). In particular, the extreme variability of patterns that probabilistic estimates and F-N curves display offers a tangible illustration of the difficulty of making generalisations about societal risk (see HSE 1989:16). Evans and Verlander (1997) have presented interesting objections to the use of criterion lines. They argue that these lines are seriously flawed for the following reasons:
1) FN-criterion lines were conceived as an analogy to individual risk tolerability criteria. The justification for individual risk criteria is equity: it is unfair to impose too high risks on particular individuals, whatever the benefits may be. However, there is no corresponding equity argument for accidents as distinct from individuals, and therefore the analogy is false.

2) Even if limits to the tolerable frequencies of accidents of different sizes were desirable, they would need to be based on clear and preferably empirically-derived criteria. There are, at present, no such criteria.

3) Even if such criteria could be derived, FN-criterion lines are a technically incorrect method of implementing them. This is because they do not meet the requirements for consistency in decision-making in the face uncertainty.

There have been no attempts to build societal risk criteria in the USA. A strong economist culture may have hindered attempts to invest time and money in the province of ‘public irrationalities’. Yet, the USA model has ways to include societal views, which result from political rather than technical developments. When compared to other systems, including the British regulatory system, the USA policy style is fundamentally pluralist (Eckstein 1960, Salisbury 1979; Vogel 1986). European systems, which have traditionally been more consensual (Kelman 1981, Vogel 1986) accept that administrators may be given substantial discretion; it is not the case in the USA (Eckstein 1960). The idea that the relationship between public officials and lobbyists should be “free, easy, open and intimate goes against American’s traditional mistrust of the role of interest groups in the political process” (Vogel 1986: 279). Americans are often deeply suspicious of possible interests ‘capture’ (Salisbury 1979). Risk decisions are controversial and political; the idea that bureaucrats could be given the discretion to define societal risk criteria according to their own technical standards — or, even worse, in co-operation with private interests — is unlikely to be seen as a source of strength to build public trust in the decision process. The pluralistic and adversarial nature of the USA system usually requires formalised and transparent stakeholders’ consultation at the policy formulation stage, as well as bargaining “among lawyers” (Vogel 1986:185) at the implementation stage. Informal relationships may endure but are not seen as a positive factor.

OSHA practice typically reflects the pluralistic/antagonistic nature of decision-making in the US where politicisation has contributed to more stringent approaches to enforcement than, for example, in consensual Sweden (Kelman 1981). Standing committees (general construction, construction, maritime) may play a taming role but are subject to public scrutiny, which prevents corporatist tendencies to develop. As an effect they do not prevent confrontation to take place. OSHA official interviewed for this study confirmed that:

“We don’t get into cosy relationships. Public hearings are much more formal than EPA hearings for example. Compared to the EPA, OSHA is very confrontational, especially if you consider how little we do. Witnesses often get crossed-examined and industry and unions get involved. And then, final rules are subject to judicial review and in one case (‘Ergonomics’) the US Congress even voted that OSHA could not put a rule into place”

The USA analytical-deliberative process covers “the exchange of ideas, opinions, reflection, or contemplation on others’ opinions”, and deliberation is defined as “any formal and informal process for communication and for raising and collectively considering issues” (NRC 1996:73). In addition “uncertainty analysis can inform all the parties of what is known, what is not known and the weight of evidence for what is only partially understood” (NRC 1996: 109). It has been described as “a political process where the emphasis is on communicating the results and educating the public in order to empower stakeholders to influence the risk management strategies that are the responsibility of government” (Marks 2007:12-13). This process may help to achieve reasonably achievable decisions about risks
(NEA 2002a). Of course it also involves a fair amount of conflict and litigation. An OSHA administrator declared:

“Unions take a very active role pushing for the regulation they want to see. They write petitions, sue the agency and also try less formal channels”

The risk assessment methodology developed by the NRC (1983; 1996) offers one of the most sophisticated approaches to support the management of dissent in the risk area. It combines scientific ‘appraisal’ with ‘broader value-based assessment’ (NRC 1983; NRC 1996) and has inspired the practices of a number of agencies, especially the EPA (EPA 2000; EPA 2004). This approach suggests that risk characterisation should be based on an analytical-deliberative process, which involves an analysis of the entire risk assessment, including the questions that are being addressed within the risk assessment, the scientific issues of premises used in the development of models, and the treatment of expressible and non-expressible uncertainties (Marks 2007: 7). The practical consequence of this approach is that decisions are made on a broad, sector-wide basis through a very wide-ranging and open consultation process that obtains the views of all stakeholders (including the utilities) and in which the balance falls between risk reduction and cost (NEA 2002b).

6. Dealing with simple issues: top-down advice and decision heuristics

UK Health and Safety legislation relies on a tripartite system that enables workers’ representatives and employers to participate in the development of standards (Fairman 2007; Vogel 1986). The Health and Safety at Work Act etc. (HSW Act, 1974) organised duties to establish and maintain safe working-conditions and practices in the workplace. Similarly, the Management of Health and Safety at Work Regulations (MHSWR), made under the HSW Act, requires employers to assess the risks to their employees at work and to take all ‘reasonably practicable’ steps to eliminate those risks or, where that is not possible, to reduce them to as low as practically reasonable (ALARP) levels. When decisions about safety are not too difficult, the regulator may use direct channels of communication to remind those in charge of managing the risk of their duties and suggest simple measures. The HSE has for example issued safety alerts on tower cranes to raise the level of awareness among duty holders (see box 1).

Box 1: HSE safety alert on the use of tower cranes (2006)

The HSE is issuing a safety alert to the construction industry to remind those working on projects where tower cranes are in use of the importance of the safe erection, operation, maintenance and dismantling of such cranes. This alert has been prompted by a number of serious incidents involving tower cranes in recent years. Those responsible for the management of tower cranes on site should ensure that:

1. Tower cranes are erected and dismantled by competent people who have the necessary training and experience. Companies should draw up written procedures for each type of tower crane and these procedures should be based on the manufacturers instructions. These procedures should be available on site and those involved in the work be familiar with them;

2. A thorough examination of the crane is undertaken after its erection by a competent person who is sufficiently independent and impartial and is not involved in the erection process;

3. Only competent people are allowed to operate the crane;

4. Pre-use checks are carried out by the crane operator at the start of each shift to ensure that the crane has not suffered any damage or failure and is safe to be used;
5. In-service inspections are carried out by the crane operator, generally at weekly intervals, and records kept of these inspections;

6. A properly planned maintenance system is established and used. Competent people should undertake this maintenance at intervals specified by the manufacturer and records kept of the work completed including any parts that have been replaced. In general the original manufacturers parts should be used. Where parts are sourced from suppliers other than the original manufacturer a competent engineer should assess that the parts selected meet the original manufacturers specification and are fit for purpose. Any parts replaced should be installed in accordance with the manufacturers instructions;

7. Further thorough examinations are carried out by a competent person at specified intervals, after major alterations or repair or after the occurrence of exceptional circumstances which are liable to jeopardise the safety of the crane; and

8. Lifting operations are properly planned and appropriately supervised.


Yet, compliance with safety requirements is not always straightforward. Risk managers are often confronted by difficult or competing choices. Safety improvements rely primarily on their capacity to make informed choices, to take into account the nature of the hazard, to balance probabilities about their materialisation, to weigh costs and benefits, to take into account the views and acceptance of individuals and society for a particular risk. In distinct industries, such as nuclear or chemical sectors, the nature and magnitude of the risks, the potential effects on the public and the high levels of expenditure associated with risk-reduction options led to the idea that a unifying philosophy and procedure should be developed to deal with the risk situations. This is precisely what the HSE did when it developed the ToR framework (HSE 1988). This framework takes the form of triangle (the ‘carrot’) which represents increasing levels of ‘risk’ for a particular hazardous activity, as one moves from the bottom of the triangle towards the top. It allocates risks into three zones – broadly acceptable, tolerable and unacceptable- on the basis of probabilistic assessment and societal risk criteria (see figure 2). The framework has been generalized subsequently for wider application to industrial risks (HSE 2001).
The ToR framework may be described as a heuristic that reflects the self-regulatory environment from which it has emerged. Developed from a corporatist ‘tripartite’ culture (Bouder et al. 2007) it enables workers’ representatives and employers to participate in the development of standards (Fairman 2007; Vogel 1986). From the perspective of communicating risks the ToR model combines probabilistic assessment with societal risk criteria: “criteria for individual risk are a necessary but cannot by themselves always be a sufficient condition [...], societal risk is known to have been an important, and sometimes dominant, additional issue ” (HSE 1989: 14). This approach suggests that the role of open deliberation remains modest. A mix of instruments such as risk perception studies and F-N curves are the implicit route to quantify the “societal criterion”. Though, this appreciation
must be tempered by recent efforts to develop public consultation. An HSE official pointed out that:

“The HSC undertakes public consultation on all new proposals for legislation and this in fact extends in many cases to public consultation on how the approach to legislation should be framed” (HSE respondent in Boudier 2008b).

“The integration of societal concerns and perceptions takes place primarily through engaging stakeholders by means of consultation documents and, to avoid capture phenomena, by bringing together a broader spectrum of people” (HSE respondent in Boudier 2008b).

The ToR model has played a somewhat pioneering role in the UK. Yet, other regulators have also developed specific heuristics to facilitate risk decisions in their area. In the food area, for example, the Food Standards Agency (FSA) launched a signpost labelling scheme in 2006-2007 (FSA 2006 and 2007). The scheme introduces a new system based on traffic light colour codes (‘green’, ‘amber’ and ‘red’) allocated according to nutritional criteria. The end user remains the consumer. The system has not been designed to reduce direct health risks such as food poisoning, but to help the consumer make informed choice about his or her diet, for example to identify healthier options and better compare the nutritional attributes of various products. Companies have been encouraged to join the scheme and the FSA has developed guidance to guide their efforts. The system has proved to very popular among public health bodies. Figure 3 presents examples of this new labelling model:

Figure 3: Foods in the UK: the traffic light model

---

24 For more information on the scheme and how it was developed see for example: http://www.food.gov.uk/foodlabelling/signposting/siognpostlabelresearch/
26 A list of supporters includes: http://www.food.gov.uk/foodlabelling/signposting/supportfsasignp
7. Taking a broader view: risk communication guidelines

One of the crucial consequences of modern technological development is that complex technologies tend to introduce new uncertainties (see section 1). In the face of complex situations, one-way messaging or simple decision heuristics will not suffice. The ToR model, for instance, is known to work better in the case of fatal accidents than delayed effects and chronic diseases where the risks are less apparent (Bandel 2007). The authors of this report take the view, consistent with risk theories (see Appendix 3) that complex and systemic risk situations require more than top-down advice and direct messaging. It is equally important to pay special attention to the inclusion of public views into the risk debate. For example, an expert-led model that relies on the definition and calculation of a technical ‘societal criterion’ will not be sufficient to address the complexity of public worries in a low trust environments. When a technology like GMO, which was once considered a marvel amongst scientists, becomes a ‘Frankenstein’ technology in the eyes of lay audiences (Gaskell et al. 2004), a two-way communication process will be needed to bridge the gap between expert and lay perceptions (Fischhoff and Fischhoff 2001).

Low-trust environments typically call for deliberative processes (Lofstedt 2005). Yet, ill-conceived interactions between scientific, regulatory and lay audiences may create their own problems. Recent examples from the food area provide a good illustration, especially the debate about the safety of aspartame (Lofstedt 2008). Aspartame is a well-known high-intensity sweetener, with no evidence of harm (AFFSSA 2002; European Commission 2002). In July 2005 the Ramazzini Foundation called a press conference to release the initial findings of a study published in its in-house journal, European Journal of Oncology. The study argued that aspartame caused cancer in laboratory animals. Sensational headlines followed such as “Cancer linked to Sweetener” and the controversy even took on a political dimension when a UK Liberal MP proposed a ban on the sweetener (Lawrence 2005). Subsequent analysis of the study’s results by the European Food Safety Authority (EFSA) has shown that a number of cancers observed were irrelevant as they were specific to rats and not humans, and that the increase in cancer was unrelated to the aspartame treatment. A key feature of the incident is that it took several months for EFSA to obtain full access to the data and review the study. It was not before May 2006 that EFSA could release its reassuring scientific opinion. Why did it take so long? Lofstedt (2008) has shown that the Ramazzini foundation tried to convince the regulator, the media and the public that the base line risk was high. The foundation acted as a risk amplifying agent. It used a number of means to raise the profile of the issue, including press conferences, in-house publications and symposia. At the same time it consciously delayed EFSA’s access to the basic data, arguing that:

“...we do not think it is appropriate for slides to be reviewed on data that has already been published. It’s 34,000 slides and eight years work. Dr. Soffritti is not open to a third party reading a small subset of slides and issuing an opinion on the study” (Kathryn Knowles, quoted in Lovett 2006).

The aspartame case shows that, in an open environment, it may be tempting for a respectable scientific institution to use a risk controversy to raise its visibility even when the result may be risk amplification. For decades the mixture between consensus, self-regulation and secrecy has led to criticism of the UK model of regulation (Carson 1982). The aspartame debate offers a warning message: open information and deliberation can also go wrong. How could more openness be introduced, while ensuring at the same time that scientific facts about risks are communicated in an efficient and appropriate manner? How should we deal with transparency without triggering amplification?

Guidelines offer a possible answer to these questions and have proved popular among practitioners, including regulators, journalists and industry. In the mid-1990s public sector
organisations in the English-speaking world started to develop comprehensive risk management guidance, with early initiatives coming from Australia and New Zealand in 1995 (AS/NZS 4360:1999) and Canada in 1997 (CAN/CSA-Q850:1997). In the 2000s major UK-based documents that considered risk communication from the broader perspective of risk management followed, including the Cabinet Office report on “Risk: Improving government’s capacity to handle risk and uncertainty” (Cabinet Office 2002) and “Risk, Responsibility and Regulation” (BRC 2006).

More specific steps towards developing detailed advice on risk communication have complemented this holistic approach. In the United Kingdom, the Inter-Departmental Liaison Group on Risk Assessment has publicised guidance on achieving risk communication in the regulatory context. In 2002, the OECD published the ‘Guidance Document on Risk Communication for Chemical Risk Management’ (OECD 2002), which summarised best practices for risk communication applied to chemical risks. In 2003-2005 the Federal Institute for Risk Management (Germany) commissioned an evaluation and update of this work in the framework of the Federal Government’s Action Programme Environment and Health (Hertel and Henseler 2005). Recent developments include joint guidelines put forward by the Social Issues Research Centre, the Royal Institution (RI) and the Royal Society (SIRC 2006). Increasingly, individual industries tend to developed risk communication guidance to fit their own purposes. For instance, the media, most notably the BBC, has produced communication guidelines, which have gain attention (Harrabin et al. 2003). These various efforts may converge to create a “community of practice”. The BBC guidelines, for example, have inspired government bodies, most notably the Cabinet Office (House of Lords 2006a and b).

Different guidelines target different audiences. The BBC guidelines, for example, are primarily intended to be used internally, and their expected outcome is to improve the quality of reporting. The SIRC (2001 and 2006) guidelines concentrate on the relationship between science and decision-making and the difficult issue of communicating scientific uncertainty. Concerns about practicability and feasibility explain why these principles often take the shape of a checklist that conveys a small number of ‘golden rules’. This is for example the case of the HSC Principles of sensible risk management, or, in the United States, the EPA’s seven cardinal rules on risk communication.

Risk communication has therefore become a very fashionable topic among practitioners. The Internet offers a good benchmark of this infatuation for principles and guidelines on how to conduct good risk communication. Expressions such as “risk communication principles” and “risk communication guidelines” attract respectively 10 700 and 1940 hits. Yet, it is unclear how these guidelines have been received by their target audiences and there have been very few evaluation of them. A senior academic at the core of years of risk communication developments suggested:

> “Common errors when developing risk communication principles include preferring a number of wishful recipes to robust scientifically-tested messages and paying lip service to a task that should be central to the organisation’s mission”.

In the worse case risk communication guidance could be mistaken for a ‘trick’. In the absence of in-depth evaluation of existing guidelines, how could regulators make sure that they do not take the wrong path? Risk communication theories (see Appendix 3) offer a framework that regulators may use. The authors of this report suggest taking cognitive sciences as an essential

---

27 The initial document was developed in 1995 and a revised version was published in 1999.
28 ILGRA reports can be downloaded from: http://www.hse.gov.uk/aboutus/meetings/committees/ilgra/
31 Search performed on 01 December 2008 using the search engine ‘Google’.
starting point to define evidence-based risk communication guidance. Guidance documents should apply the fundamental lessons of risk communication to allow a two-way process to take place. For example, communication principles would encourage the release of targeted information rather than standardised ‘packages’, they would encourage decisions that involve a balancing of the technical attribute of individual risks with public perceptions, existing heuristics and biases, levels of trust etc. The formulation of simple questions based on cognitive research findings may also guide scientists and regulators; they would contribute to improve the quality of the scientific debate about risk. Examples of simple questions may include:

- Is the hazard natural or technological?
- How significant is the likelihood and magnitude of the risk?
- Does the hazard imply taking a voluntary or involuntary risk?
- Will the hazard affect children?
- Is the hazard in question stigmatised?
- Can the risk be compared to other similar risks?
- Is the risk likely to be amplified or attenuated by the media?
- Is risk communication taking place in a high trust or low trust environment?

Though, regulators need to be aware that the most professionally crafted “guidelines” and “checklists” will never be enough to capture the complexity of context-specific risk communication demands. Ten years ago, the Interdepartmental Liaison Group on Risk Assessment summed it up when it stated that “Communication activities and approaches must be tailored to the specific objectives of each individual risk regulation activity. The guidance is framed primarily in the context of policy and management, rather than in the context of staff ‘in the field’ interacting with the public” (ILGRA report of 1998 p.1).

References:


Bouder, F. (2008b) Defining a Tolerability of Risk framework for pharmaceutical products in a context of scientific uncertainty, PhD dissertation, King’s College London


ETC (2004a) *Nanotech news in living colour: An update on white papers, red flags, green goo, grey goo (and red herrings)*, Communiqué, no.85

ETC (2004b) *UK Report: More hits than misses on nanotech*, news release 29\(^{th}\) July


Hertel, R. F. and Henseler, G. (Eds.) (2005) ERiK – Entwicklung eines mehrstufigen Verfahrens der Risikokommunikation, BfR Wissenschaft 02/2005


Improving health and safety
An analysis of HSE’s risk communication in the 21st century

What constitutes state-of-the-art risk communication? Which practices may be considered anachronistic? Does HSE use the most effective means to communicate risks? Which theories and tools are most apposite for the appraisal of HSE’s risk communication? What policy recommendations would help the Executive to improve its performance in this area? To answer these crucial questions this report develops an in-depth analysis of HSE’s communication practices. The researchers explore HSE’s risk communication in two specific cases: that of the Buncefield oil storage incident of 2005 and that of the proposed development at the Oval cricket ground in London. The researchers conducted face-to-face interviews of the critical actors involved in each case. These interviews support a robust qualitative analysis of current risk communication practices. The analysis employs the latest theoretical and empirical knowledge from the academic discipline of risk communication. The authors conclude that the HSE has engaged third parties successfully to develop a proactive risk communication when faced with a major incident. For most decisions, however, HSE still relies on communication practices derived from the consensual, expert-led model with which the Executive operates. The authors formulate five critical recommendations to adapt HSE’s risk communication towards a more proactive model.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.