Public perceptions of risk, science and governance: main findings of a qualitative study of six risk cases.

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Chapter One: Introduction and research design

Risk perception context

Risk perception research as a field is marked by considerable theoretical and methodological differences. Psychological studies, which initially defined the field, have addressed the cognitive and attitudinal processes through which risks are interpreted and represented at the individual level, the ways in which particular types of hazard come to be viewed as risky (or not), and the factors that influence the acceptability of particular risks to experts and the public (Pidgeon and Beattie 1998). In of the most influential such studies Slovic *et al* (1980) asked lay respondents to rate 90 hazards, according to 18 qualitative characteristics - for example whether the risks were judged to be voluntary or involuntary, known to those exposed or not, immediate or delayed. Two principal factors emerged from ratings of these characteristics. The characteristics combined in the first factor, labelled by the team as 'dread', included perceptions of the risk as being uncontrollable, potentially catastrophic, dangerous to future generations, and involuntary. A second factor, labelled 'unknown', combined characteristics related to the observability of risks, whether the effects are immediate or delayed in time, the familiarity of the risk and whether the risks are judged to be known to science. The authors concluded that perceptions of risk and acceptability closely relate to the position of a hazard in relation to these two dimensions. Nuclear power, for example, scored extremely highly on the dread dimension and highly on both of these factors, standing out from other technologies at that time as a focus for public concern.

Whilst psychological approaches have extended knowledge of people's responses to risk this work has also been subjected to a good deal of critical scrutiny. One of the main criticisms relates to the instruments of quantitative investigation, and particularly the inherent restrictions imposed by the questionnaire survey. The researcher-defined rating scales, common to most psychological methods, mean that participants are not able to say what really matters to them about the question under investigation (Pidgeon *et al* 1993). It has also been argued that psychometric research has not yielded substantive theoretical progress towards explaining perception (Pidgeon and Beattie 1998). Crucially, the focus upon the analysis of aggregate data elides individual and group differences in risk perceptions.

Since the publication of the Royal Society's major report in 1992, which recognised risk perceptions as involving "people's beliefs, attitudes, judgements and feelings, as well as the wider cultural and social dispositions they adopt towards hazards and their

benefits" (Pidgeon *et al*. 1992:89), there has been a growing acknowledgement and consolidation of work which recognises the contextualisation of risk definitions. Crucially this research recognises that public perceptions of and responses to risk are shaped by their social and cultural context (Wynne *et al* 1993). The quantitative, questionnaire-based research tools typically used for psychological research in this field have inherent limitations when it comes to capturing complex processes of social interaction and mediation (e.g. Sjoberg 1995). Reflecting these limitations a growing number of researchers have been working with approaches that draw on qualitative methods, typically interview or observation-based, which enable more in-depth elicitation and contextualisation of the meanings attached to risk. (e.g. Wynne *et al.* 1993, Bickerstaff and Walker 2001, Bush *et al*. 2001, Hinchliffe 1996, Irwin *et al.* 1999, Horlick-Jones *et al.* 2003). It is this more recent qualitatively based research tradition that informs the comparative design that we describe in the following section.

Research design

Focus groups have become a widely used methodology for qualitative social science research and more specifically environment and risk perception research (Macnaghten *et al.* 1995, Petts *et al.* 2001, Irwin *et al.* 1999, Marris *et al.* 2001, Wynne *et al.* 1993). In particular, focus groups offer a contextually rich insight into the complex reasoning behind people's understandings of a particular situation, their feelings and actions (Wynne *et al.* 1993). Instead of the researcher asking each individual to respond to a question in turn people are encouraged to talk amongst themselves, challenge others, and develop their views in a more dynamic and in some senses 'authentic' social situation. The use of this methodology can provide an insight into the operation of group processes: that is the similarities and differences between participants, the discourses that people deploy to persuade others, and the factors which influence individuals to change their minds. The interactive nature of the focus group format is therefore able to capture the essential qualifications, ambiguities and ambivalences in how people make sense of environmental and technological risks. Another key strength of the focus group methodology and qualitative research designs more generally, is that participants are able to discuss issues in their own terms. With an audience of peers, participants are more likely to describe their experiences in 'locally' relevant terms rather than attempting to use language and concepts that they believe to be the researchers. Importantly, focus groups do not provide access to the views of large and statistically representative samples of people and are sometime criticized for furnishing less detailed individual views than one-to-one interviews would. However, and central to the aims

of this research, the focus group format does produce data which derive from social interaction between people (Burningham and Thrush 2004).

The qualitative study that we report on here was designed specifically to complement a major national survey (n=1547) of public perceptions of five risk cases: climate change, radiation from mobile phones, radioactive waste, genetically modified food and genetic testing (see Poortinga and Pidgeon 2003).

The aims of the overall qualitative study were as follows:

1. To explore how people frame and balance different risks and benefits both within the case study issues and between risk issues that share areas of commonality.
2. To investigate the role of context (specifically sources of risk proximity) in the construction of risk perceptions and responsibilities.
3. To explore patterns of public ambivalence towards new technologies and, particularly, the social negotiation of 'mixed feelings'. There is a good deal of social science research that indicates considerable public ambivalence to key new technologies and patterns of socio-technical change, but far less that actually analyses, in empirical or conceptual terms, the social and psychological basis of these conflicting attitudes.

With these aims in mind the research design incorporated two novel aspects:

1. An explicitly comparative dimension in the design of the groups, as well as comparing results across groups and issues.
2. Conducting a number of groups in areas or with individuals where we might expect to see some proximity or greater familiarity with the different risk cases.

The format of the national survey did not include detailed comparison between the individual technological risks nor did it deal with aspects of proximity to or familiarity with the different issues. These two elements of the focus group design are therefore novel, not only in relation to wider risk perception literature but also the complementary comparative quantitative study (see Poortinga and Pidgeon 2003).

1. *Issue Pairing:* Rather than conduct separate groups for each of the six issues, we introduced a comparative dimension by discussing the issues in pairs. By linking two issues around a common theme we were able to consider both commonalities and differences in public perceptions of the different technologies and/or risks. In this way we

explored in the groups how people balance different risks and benefits (or make trade-offs) as well as deal with value conflicts.

The pairings were:
(a) **Climate change and radioactive waste** - linked by the theme of energy and the environment (and an implicit risk trade-off). Both issues are also characterised by very long time-scales.

(b) **GM crops and genetic testing** are both very new technologies and involve the application of the new genetic sciences. Both are characterised by acknowledged scientific uncertainties, by rapid developments of knowledge and application, and by disputes over their relative risks and benefits.

(c) **Mobile phone handsets and mobile telecommunications masts**.
Discussing these two issues together enabled exploration of the various risk-benefit trade-offs implied by both personal and societal choices in relation to this technology. This pairing brings together the very different hazards presented by the two 'faces' of the technology, one place-related and associated with perceived threats to the health of a spatially defined 'population' who might or might not be users, the other specific to the body of the phone user.

2. *Issue proximity:* Previous research has demonstrated that contextual factors can have a considerable influence on public views of particular hazards and their associated risks (Irwin *et al.* 1999, Wynne *et al.* 1993, Bickerstaff and Walker 2001, Burningham and Thursh 2004). Rather than simply drawing groups from the 'general' population we therefore convened a number of groups where participants would (potentially) have some greater 'exposure' to or familiarity with the issues.

In subsequent chapters we draw on data from a series of 12 paired focus groups conducted between September and December 2002 in locations across England: Cromer, Lyng and Norwich in Eastern England; Heysham, Lancaster and Liverpool in the Northwest; and London (see table 1). Each group met on two consecutive evenings, resulting in a total of 24 two-hour sessions, and discussed two related technological risk issues (either: GM crops/foods and genetic testing; mobile phones and mobile phone masts; or radioactive waste and climate change). The groups covered four broad themes: (in order) imagery and associations; the (distribution of) costs and benefits; knowledge and uncertainty; governance and citizenship. Each risk issue was therefore discussed by four different groups.

Altogether 92 participants took part, 52 women and 40 men. In general, groups were recruited to achieve a mix of social class, age and gender. In most cases the location or group composition had no particular significance for the issue being discussed. Some locations were however chosen because an issue had particular salience in the area (see **bolded locations** in table 1):

Issue	**Location (number of participants per group)**			
Climate change	**Cromer** (8)	Heysham (8)	Liverpool (8)	Norwich (8)
Radioactive waste		**Heysham**		
GM food and crops	**Lyng** (8)	Liverpool (7)	Norwich 1 (9)	Norwich 2 (5)
Genetic testing		**Liverpool**		
Mobile phone handsets	**London** (8)	Norwich 1 Mousehould Heath (7)	Norwich 2 (9)	Lancaster (7)
Mobile phone masts		**Norwich 1**[iii]		

Table 1: Locations of the focus groups and risk topics

Climate change: A group was convened in Cromer, a town on the Northwest Norfolk coast that is prone to coastal erosion. The potential effects of climate change (sea level changes, more extreme weather events, and accelerated coastal erosion) had been discussed in the local media and were hypothesised to hold relevance for people living in coastal communities in this region of the country.

Genetically Modified Crops: A group was convened in the village of Lyng in Norfolk, which was a location for field trials of genetically modified fodder maize begun in May 1999. In July of that year a public debate on the issue was held in the village. Soon after, Lord Melchett (a Norfolk farmer and at the time Executive Director of Greenpeace UK) and 27 other environmental activists were arrested for destroying a GM crop being grown near Lyng although subsequently, and in the spotlight of media coverage, they were found not guilty of causing criminal damage.

[iii] An initial focus group was convened in a neighbourhood of Norwich where there was some controversy over a planned mobile phone mast. However there proved to be little awareness of the planning proposal amongst our participants. For comparative purposes we therefore chose to convene a second paired discussion where the controversy centred on an existing mast. It is this second pair of discussions that we draw upon for analytical purposes.

Radioactive waste disposal: Heysham, situated near Morecambe, on the North West coast of Lancashire, is the location of two nuclear power stations, commissioned in 1984 and 1988 respectively. On the basis of previous research it was thought that their presence in this relatively small community would result in greater awareness of and familiarity with nuclear and radioactive waste issues.

Mobile phone masts: The mobile phone mast group was convened at Mousehold Heath, a neighbourhood in Norwich which is the site for two mobile phone antennae; one under fifteen metres and one over fifteen metres, only the larger of which required planning permission at the time of construction. The radiation exposure index from the larger antenna is the third highest for all of the antennae in the Norwich area. The antennae are sited near to an infant school and at the time of data collection a neighbourhood campaign was seeking removal of the masts (Norwich Evening News 2002)

In two cases, where geographical location did not affect the everyday salience of a risk, an issue specific recruitment criterion was used.

Genetic testing: The group in Liverpool was constituted entirely of women with very young babies, who had recent experience of the pre- and post-natal medical regime

Mobile phone handsets: The group in London was made up of parents with older children, for whom the issue of children's usage and exposure was likely to have personal significance.

The discussions were recorded and the data transcribed and coded with the aid of the NVivo qualitative data analysis software package. The coding schema was developed using an iterative procedure – with nodes and links identified and refined through an interaction between emergent themes and the findings of previous risk perception research. Verbatim quotations have been selected to illustrate sentiments or understandings expressed. In all cases names have been changed to protect participant anonymity.

Outline

The research presented here summarises the preliminary descriptive findings of the study. The discussion is organised around three thematic areas: risk and proximity (chapter 2); science expertise and trust (chapter 3) and finally, risk and responsibility (chapter 4). We end with a brief summary of key insights from the overall study (chapter 5).

Chapter One: Risk and proximity

Burningham and O'Brien (1994) use the idea of 'localisation' to argue that environmental (or risk) concepts are always made sense of in particular socio-economic and cultural contexts. In other words (global) concepts of the environment and risk are not simply made sense of in relation to a particular territorial space or set of local social networks, but are also contextualised in terms of a range of everyday problems and routines as well as significant events and processes. We open this chapter with a discussion of the spatial and temporal framings of risk, both global and the more persistent local or territorial sense-making practices that people employed. This account draws strongly on what we describe here as the proximate focus groups, where participants had some geographical or personal familiarity with the different risk cases. In understanding some of these risk proximity patterns we move on to consider the role of a range of cultural practices and resources in bringing 'closeness' to what were often seen to be 'distant' (in spatial and temporal terms) risks.

Spatial and temporal proximity

Across the six issues we can identify a general discourse which constructs the various risk issues as global in scale – in other words hazards were not neatly bounded in space and time (Beck 1992). This framing of the issues was most apparent when people talked about the uncertainty of risk – where impacts were seen to extend beyond the locale, and affect large geographical regions. Climate change was rarely discussed in these terms. So, whilst many participants talked about the range of possible global effects to result from climate change (ice caps melting, sea level rises etc.) these impacts were disconnected or detached from the individual and the local place. These impacts would happen somewhere else and to someone else. By contrast people were able to link the 'distant' effects of radioactive waste to the *local* and *immediate*.

> Anthony: *But Chernobyl we've got affected here and that's a couple of thousand miles away* [laugh].
> Dan: *I mean, I know we have this on the doorstep but it's on the doorstep for everybody isn't it?* (Heysham, radioactive waste)

Similar modes of talk, connecting the local or personal level to a sense of globalised risk, were apparent with other new technologies, where the sheer scale of use and pace of developments meant that for most people danger was inescapable: *"If there is going to be*

damage the damage has already been done - nationwide probably all over Europe probably all over the world" (Lyng GM crops).
This sense of universal exposure to risk (Beck 1992) was evident in the widespread use of the experiment metaphor: people were the real-life test subjects or guinea pigs. *You can't persuade people that it is a controlled experiment because there are too many variables. I mean - we aren't scientifically minded if it's in a test tube in the laboratory that's great, but when you become part of the experiment it's very different* (Norwich 2, GM crops).

Overall, references to a global sense of risk were limited. In the main people made sense of the various risks and their implications through a diverse range of 'local' place-based or embodied frames. As noted in Chapter 1, exploration of 'proximity' was a central feature of the research design. In the analysis which follows we therefore look specifically at the distinctive discursive strategies employed by participants in the proximate groups. We draw comparisons and contrasts with the 'general' or mixed groups where appropriate.

It is useful to begin by highlighting the distinctiveness of the climate change group. What is noticeable here is that very few participants in Cromer (a town badly affected by coastal erosion) made a personal or spatial link with the likely effects of climate change. However, if we turn to the other three *spatially* proximate groups we can identify a number of common themes. Where GM crops (field-trials), mobile phone masts, and the nuclear industry were physically proximate to participants, the issues were talked about as more immediate than in the mixed groups. In particular, people had a more diverse range of experiential resources to hand (anecdotes, rumour, technical information, place-based evidence etc.) through which they were able to weigh up the relevant risks and benefits: "*Yeah we've got two friends that work there* [at the power plant] *yeah, and there was a leak in March and there's been a few scares that they've not really done any correct checks on. They are supposed to send the men away to somewhere else for medical checks but it depends on the scale… So there's been a few that's not been really stepped upon or reported properly."* (Heysham, radioactive waste)

For many of those in the proximate groups, and quite unlike the mixed sessions, the relevant technologies were topics of immediate relevance and on occasion active debate in the local community. In other words they had become, to a much greater degree, socially proximate: *"It's [GM] on the news, it's in the papers, it's everywhere in the media and we all discuss it in the pub or wherever we go."* (Lyng, GM) In the case of the mobile phone mast group some talked about the mast as physically and socially intrusive – it was not only invasive in aesthetic terms (described as by one man as 'a beast') but

also psychologically disturbing. In the case of Heysham, the local facility was a source of dread and of fear for some. Nuclear risks were however 'local' threats that people grappled with in their day-to-day lives: *"The thought of it still being in and around Heysham fills me with dread. I mean just look at, you can see the power station through my bedroom window."* (Heysham radwaste)

It is worth adding that people in the mixed groups often similarly employed modes of geographical localisation in order to make sense of or bring closer the implications of a particular technology. Across the various issues (but particularly with phone masts and climate change) participants would draw upon 'local' experience – often relating stories from wider social encounters. For instance, evidence of changes in the local environment and in weather patterns over time were the principal analytical resource people utilised to make solid the physical impacts of climate change: "*I think I've noticed very different seasons, seasonal weather changes - in so much as we don't seem to have, I don't think definite seasons in so much as summer, autumn, winter, spring. It seems to drift one to the other.*" (Liverpool, climate change)

In the case of mobile phone handsets and genetic testing (where proximity was social in nature), few people saw themselves as entirely distant from the technologies (and their implications) and most related to the issue, to some degree at least, through personal experience and social networks. In the case of genetic testing people talked about the technology as increasing health choices – benefits that were all too personally immediate. Participants (and particularly mothers) often identified with a parental role and responsibilities: "If my child had……". Indeed, conversation amongst the group made up entirely of mothers with babies was distinct in that judgements and understandings were primarily mediated through the experience of motherhood:

> *I think you've got to think that, I mean as well as yourselves, you've got to think of your children as well haven't you. […] like the way there's children waiting for things like new hearts and whatever, and you know, the percentage of them, children that are dying through needing transplants and everything. You know, if you can bring that down, and I'm thinking of my own child, I'd hate the thought of him to be on a waiting list for months and months, even years, when I know that something can be done. You know, and I think that's what, that's what I tend to look more to, like myself and my children, family or anybody, you know.* (Liverpool, genetic testing)

Similarly with mobile phone handsets participants were able to draw on a wide range of anecdotes and stories to demonstrate the functionality and convenience of the technology. Indeed for the majority of phone users handsets were talked about as a necessity. The mobile phone had increased feelings of safety and security (for the individual and family). It was also noticeable that concerns about the health risks of mobile phones (and base stations) were heightened when people, and particularly parents, talked about the impacts upon children.

In other issue contexts, concerns about technological risk centred on the transgression of a more immediate scale of spatial proximity, that is to do with boundaries of identity and corporeality. So, in the case of genetic testing, the intensely personal nature of genetic information was identified across the board as posing a serious threat to the maintenance of individual identity and autonomy: *"You would become more under the scrutiny. Or even under the microscope".* (Norwich 1, genetic testing) Similarly, but focused on a more corporeal (rather than socio-political) sense of transgression, people raised concerns about the GM foods. The taking inside of modified food stuffs was a source of unease for many.

A second link that can be drawn across the spatially proximate groups refers to expressions of pragmatism and the strength or consistency of position. To take the mast issue, all of those in the group that were aware of the local presence of a mast, and the possible risks associated with it, adopted a consistently pragmatic position (in contrast to the majority of people in the mixed groups). Several people were sceptical of the risks and whilst most were not particularly happy with living close to a mast they simultaneously recognised its social necessity. Where people in this group were not aware of the mast or its function (and also the general groups) there were more shifts of position over the course of the discussion (from fear and anxiety to more resigned toleration), but with an overall much stronger position against the infrastructure.

If we turn to the issue of radioactive waste, whilst concerns about the nuclear industry and waste were to the fore for the Heysham group, for the mixed groups fears and anxieties surrounding radioactive wastes, particularly around the potential for disaster, were if anything more acute, although geographically less salient or specific. In other words we saw less of the pragmatism and resilience – almost a 'making-the-best-of-it' attitude – associated with the Heysham group (see also Wynne *et al.* 1993). As one Liverpool participant put it: *"It [radioactive waste] just spells danger to me. That's probably the most obvious thing that comes to me, in the disposal of it and the storage of it and if it gets into the wrong hands, it all spells disaster unfortunately*."

Indeed, we can identify a degree of acceptance within the group that places like Heysham with existing nuclear facilities, and thus with an available workforce, greater local familiarity with and also economic dependence on the industry, were best placed to accept the siting of a disposal facility for radioactive wastes. Another feature of the Heysham group was that people appeared to hold more consistent opinions on nuclear power and waste (more so than was true of their responses to climate change). In other words participants seemed to have reasonably well-rehearsed views about the nuclear industry which modified little over the course of the discussion (this was quite different to the mixed groups). So, what we see here are positions that are relatively well defined, reflecting an issue or technology that is firmly embedded within the social fabric of the community.

Finally, in the Lyng (GM) group, more than any of the other genetics' discussions, we see a consistent ambivalence expressed towards the technology which moderates little over the course of the discussion. Again, this contrasts markedly with how the group approached the issue of genetic testing where we see many more shifts in individual positions – from overall support to a more critical interpretation of the technology. The ambivalence expressed by the Lyng group around GM technologies is well illustrated in the following extract:

> Andy: *I think the opinion of most of the group is that there is something there but we're concerned about the level of control that's demonstrated and the potential side effects of the technology*
> Jenny: That's probably where we all started from
> Liam: *I've heard nothing to change my opinion in the hour, hour and a half that we've been talking though*
> Jenny: *Because none of us can come down one side or the other really can we*
> Liam: *No*
> Jenny: *Someone said earlier that 50% for and 50% against but that isn't true really, it's 95% undecided - right in the middle* (Lyng, GM)

Related to the ambivalence and pragmatism that characterised the proximate groups we can identify a range of discursive strategies employed by people to distance themselves (or their neighbourhoods) from risk. If we take radioactive waste, in the Heysham group alone we see recognition of the economic importance of nuclear power to particular regions of the country and the tensions this raises for those living and working in these places. In his study of Cumbrian sheep farmers following contamination from the Chernobyl fire (1992) Brian

Wynne showed how the farmers he interviewed expressed fears and suspicions about the effects of radiation from the Sellafield site, while at the same time recognising their social dependence on the plant (cf. Irwin *et al.* 1999). In other words the industry's regional dominance had led to something of a 'dependency syndrome' – which manifested itself for local people in the 'burying' of a range of personal ambivalences and anxieties about the nuclear industry (Wynne *et al.* 1993). Our data reveals similar modes of distancing where a particular technological risk raised tensions for aspects of one's life or values. So in the case of climate change where the benefits of energy production technologies were all too personally (and socially) salient we arguably see a distancing of the negative side effects. Likewise, the benefits of mobile phones were very immediate and direct; in this sense it was better not to contemplate the possible dangers of handsets or the masts.

> *I think we could do so little without affecting us. I mean realistically we should not be driving our cars, we should not have ... people couldn't live without electricity, I mean people need electricity and as it goes at the moment we're using the gas stations to burn it. I mean people have an opinion on it but they don't want it to affect their lives and if it does affect their lives then they won't do anything about it*. (Cromer, climate change)

Looking to the issue of genetic testing it is worth noting here that people, across the four groups, emphasised the psychological (stress and fear) consequences of having personal genetic information available – effectively making health risks that much closer. For many, it would simply be better not to know – to keep these future risks distant or unknown.

> *[We] Maybe destined to live the life of a butterfly and then die in a few years, maybe to live a longer life, but that's what we are, it's all about variety and living with that means accepting the unknowable. ….this risk society ….it's pedalled at us. You know, the risk there, the risk there, everything gives you cancer. And I think we've got to resist it.* (Norwich 2, genetic testing)

The research literature reveals a complex and equivocal relationship between spatial proximity to a hazard and risk perception. Recent studies have established associations between residential proximity to potentially hazardous industry and concern (e.g. Irwin *et al.* 1999; Moffatt *et al.* 1999, 2004). However, in a discussion of the relationship between spatial proximity to industrial plants and

concern, Moffatt *et al.* (2004) also cite work which suggests the contrary relationship. For instance, a study by Wiegman *et al.* (1991) in the Netherlands, showed that residents living close to a chemical complex were less concerned than those living at least 15km distant. The authors attributed this to a 'social learning' effect based on day-to-day experience of the site. Indeed, Burningham and Thrush (2004), in a study of accounts of risks associated with living close to potential sources of pollution, observed a similar response within local communities. They argue that whilst a problem may be apparent to 'outsiders' looking in on a neighbourhood, the 'insider' view can often be very different. However, we would argue that such responses cannot be explained purely in terms of social learning. Rather the pragmatism described above can also be linked to a more psychological form of denying one's own vulnerability. In other words when individuals or communities are exposed to chronic risks they suppress an explicit recognition of the unsatisfactory situation with which they are faced, or create boundaries around familiar and secure areas of experience, which could cause unsettling psychological disruptions to daily life (Wynne *et al.* 1993:41). To cite another example, Burningham and Thrush (2004) more recently found that it was much easier for people to characterize distant pollution as problematic and as an issue that demanded redress than it was for them to regard pollution within their own neighbourhood.

> Anthony: *And the methods of storage and everything I think that would put people's minds at a bit more rest if we knew more about what is inside that processing plant and what's going to happen.*
> Penny: *I don't think so*
> Jane: *I know a few that work up there and they say, "you don't want to know what happens".*
> Penny: *You won't want to know 'cause its too scary.*
> (Heysham, radioactive waste)

In the discussion which follows, we argue that in understanding the patterns in how people were reasoning about the different risks, and particularly where we see differences between issues that share apparently common characteristics, we need to account for the sorts of cultural resources people were mobilising to makes sense of and bring closer the various technologies and there associated risks.

The cultural mediation of risk

The argument that we develop in the final section of this analysis stresses the role of everyday cultural resources in the practices of sense making. In people's talk around three of the risk cases, radioactive waste, genetic testing and GM crops, high levels of

concern were linked to the cultural salience of the issues – and the array of images and metaphors people were able to draw upon to bring salience to the likely risks and benefits. In other cases, principally mobile phone handsets/ base stations and climate change, the cultural imagery of risk was far more limited. Our account falls into two sections: the first deals with images; the second with comparative resources.

The imagery of risk

When talking about or making associations with radioactive waste (and nuclear issues more generally) people across all groups mobilised a profoundly negative symbolic imagery of contamination, death and disaster. *"I'm talking tens of years, twenty years, fifty years, and they're still putting all this stuff back into the ground with lead lined coffins."* (Liverpool , radioactive waste) Things nuclear had what one person termed a "dark side" and its uses were invariably viewed critically – linking to concerns and fears about the military's use of nuclear materials: *"Well energy is going to be the biggest [use of nuclear materials] I suppose. The military, well God knows what they're doing.* (Cromer, radioactive waste)

In all groups, participants made connections to the Chernobyl disaster and images of the associated local and global impacts on human and environmental health – reflecting the volume of media coverage of what was all too visibly a global catastrophe. Chernobyl gave both a language and conceptual space for fixing nuclear disaster (Zonabend 1993). In effect past accidents provided the imaginative resources necessary to bring the distant (spatially and temporally) consequences of nuclear waste risks up close.

> Carl: *I mean if it was perfectly safe I don't think we'd have a problem with it would we. But when you have a nuclear catastrophe, it really is a catastrophe. It's mega, I mean, they had four mile island in America and when one of those nuclear reactors melts down, it's just unbelievable the consequences*
> Moderator: *The scale…?*
> Carl: *Chernobyl's another one. Yeah, it was just massive wasn't it* (Liverpool, radioactive waste)

For many participants, the issue was immediately connected to a rich cultural repertoire of images associated with the history of the nuclear industry, centring on past nuclear accidents, errors and concerns about institutional control and hubris: *"It sounds to me like a bunch of people decided to start out this nuclear power thing and*

it's like, well it's like the Homer Simpson thing isn't it? You are putting it in the hands of these people and they have no idea what's the consequences of it are. They are not even gonna be around. And yet we are playing around with it like you know it's jelly and ice cream or something", (Heysham, radioactive waste)

The deeply embedded images of nuclear disaster and warfare, linked with more recent images of terrorism in the US, increased the scope for and scale of global catastrophe.

> Kevin: *These environmental people in my view have got a point. If you listen to the radio or the television this morning there was an Irish minister and he was saying close Sellafield, and the reason was when it was designed and built it wasn't envisaged that an aircraft would plough into it, could plough into it, and what a disaster that would be. And they've got a point because Sellafield, I don't know if you've been, is open, you know, if an aeroplane ploughed into that it would be a world catastrophe.*
> *Joyce: But isn't the bit that's dangerous really very much protected, because it's not all dangerous is it.*
> *Kevin: If an aircraft could bring the world tower down, it could plough into...* (Cromer, radioactive waste)

The prominence of these resources in making sense of the radioactive waste issue help to account for the divergence we see with people's perceptions of climate change. Both risks are to some degree the result of personal and collective actions in terms of energy use. The impacts also involve extremely long timescales. Yet in the case of climate change people expressed little immediate concern: the dangers were distant and remote. It is noteworthy then that in responding to climate change people rarely made linkages to wider cultural ideas or images. Added to this, there was a clear recognition of the social necessity of energy producing technologies. In this light, pollution and climate change were for many people constructed as inevitable consequence of the conveniences of modern living (electricity, motor cars, etc.). In other words the cultural resources people most immediately drew upon to make sense of climate change centred on the benefits of energy production rather more than their negative impacts.

Indeed where we do see images associated with the impacts of climate change these were often positive or at the very least ambiguous. So, whilst people grasped the basic principles of global warming they were unable to make solid the likely consequences – with impacts diffuse and often contradictory: "*Well it's something that you can actually ... I suppose because the temperature has to go up*

such a small amount and everybody thinks "what difference is that going to make" you know, great, we get warmer summers." (Cromer, climate change). Whilst we similarly see some recognition of the social necessity of nuclear power in terms of energy production such references were far more infrequent – revealing the more immediate imagery of risk available to people.

> *But we never really get to hear the good things about it [nuclear power] do we so we're sort of negative about nuclear power. I've got negative views anyway about nuclear power. The only thing that I know, you know, is that it's not, you know, greenhouse gas emissions and things like that. But then, you know, you just hear about threats and things*. (Liverpool, radioactive waste)

The types of images associated with mobile phone handsets and base stations centred on practical experience and in the case of masts the physical intrusiveness of the infrastructure. Health dangers were generally talked about as removed from people's day-to-day lives. People simply did not connect the technology to any wider cultural ideas or resources. In the case of the two genetics technologies the purposes and, in particular, the consequences were sometimes difficult for people to make sense of. In the extract below we see one participant literally grasping for more immediate metaphor to bring salience or relevance to the technology: "*The idea also you were talking about, the cross over from plant life to human life through blood products and that, again, it's almost beyond my imagination as to how you can do that. It's….the word…I am grasping for metaphors and I can't find the, it's just beyond comprehension...But its such a massive step and it seems like …it is, it's all science fiction really isn't it?* (Norwich, GM)

In trying to make sense of the consequences of these new technologies (where people had little prior experience to draw upon), and what they might mean in social as well as personal terms, participants repeatedly drew on a range of available metaphorical and symbolic resources. Immediate responses to both GM crops/food and genetic testing drew upon circulating cultural images (particularly from the media) of monsters and mutations. "*I don't know, it's like when they grew the ear, the human ear on the mouse, I thought it was a bit freaky you know*." (Liverpool, GM)

In conversation around both genetic technologies people mobilised a powerful cultural iconography of the impacts of moral and corporeal transgression: Mary Shelly's Frankenstein's monster, the eugenics of the Third Reich, Huxley's Brave New World, Orwell's 1984 and John Wyndham's Day of the Triffids. In talk they function almost

a conceptual short-hand through which impacts and fears are made immediate and salient.

> *It's just the part where they're saying okay we'll mix humans and plants and things, it's like a triffid thing to me.* (Lyng, GM)

> *People are going to lose their identity, because you are going to walk into a shop and go 'I'll have the model beta child please.* (Norwich 2, genetic testing)

Comparative resources

Another discursive strategy that people used in order to make sense of the various risk issues was to draw a comparison with another (often more culturally proximate or familiar) risk issue or situation. In other words the use of comparison enabled people to judge a risk (which they may not be familiar with) relative to some more meaningful issue or idea:

> *It's like you say, with it being invisible and that. When you said when you're mining for coal there's the danger of the cave-ins and on that, was it Piper Alpha, the oil rig, it's dreadful what happens and it's dreadful the loss of life but it's there and it's contained and that. But with the nuclear it just spreads so… I mean Chernobyl, it affects us and it just seems to, it's… It's not, I mean, it's not instant, it doesn't kill you like that, it's something that's gonna carry on through generations and generations are gonna be…* (Liverpool, radioactive waste)

> *I mean my husband works on […] windows and they do these checks on them every now and again and um, 'cause they work with lead. And he said, "I would rather live near the mast than think how much lead I'm taking in every day at work" you know, so …* (Norwich 1, Masts)

Often the comparison functioned to support a risk that the individual already accepted as part of day-to-day life (most notably mobile phone handsets). Under these circumstances people would often recognise that hazards were inherent in all aspects of human experience. Repeated exemplars here were road traffic accidents and cigarette smoking:

> *And going back to your point of, I mean, we seem to manage to kill quite a few people on the roads and injure them a year and we don't do without the motorcar. You know, in spite of the evidence people still jump in cars.*

Twenty-odd people get killed a day. (Lancaster, mobile phones)

In a similar way comparative modes of reasoning enabled participants to better situate the regulation and policy surrounding a technology - and to make judgements about the trustworthiness of government, scientific, regulatory or commercial bodies. So whilst people were not necessarily familiar with the detail surrounding specific regulatory frameworks they would often make a judgement about those responsible and their motivations based on comparison and analogy – drawing on a stock of previous incidents or experience. Specifically, this mode of reasoning served to demonstrate the potential for institutional failure:

The government'll never let it be know that's 100 %, or whatever the figure, that bad for you because at the end of the day that's the government's what reaping the money, and they won't turn round and say I don't want to go on but cigarettes, don't smoke the cigarettes but the government don't want you to stop smoking because of the revenue from. (Norwich, mobile phones)

Summary

In this chapter we have argued that interpreting patterns of public risk perception through a proximity framework, which accounts for a range of local but also non-local resources, can offer new insights. Specifically, we have set out two particular concepts of proximity that emerge strongly from our interpretation. First of all are the spatial and temporal frames people used to interpret risk. This includes on the one hand the mobilisation of certain global constructs of risk, revealing recognition of a shift in the scale of technological risk and of the scientific uncertainties associated with assessing risk. Yet in the majority of cases these global discourses were intermeshed with recognition of local (or immediate) level of impacts. In other instances, risks were distanciated in space and time. In the case of climate change this abstraction of risk meant that few talked about the problem as salient or a source of personal concern. We have also demonstrated that in most cases (climate change was an exception) people living in communities with a more direct spatial and temporal connection to the risk issue (notably radioactive waste, mobile phone masts and GM crops) were more able to bring salience to the problem, drawing on locally accessible experiential or socially mediated resources. However, the distinctiveness of the proximate groups was not confined to these processes of geographical framing. Participants also tended to display more pragmatic and often ambivalent positions – revealing both fears and anxieties about the

risks but at the same time a recognition of the social and economic necessity of the technologies. Added to this, these groups seemed to hold more stable discursive positions than those dealing with the issue as new (or geographically and temporally remote). Where the scale of risks (and benefits) was focused upon the individual or family level – mobile phones and genetic testing - people were all able to engage with the technology at hand. Taken together the evidence suggests that geographical proximity to risky technologies produce a response of social learning. However, we have also argued that such responses may also mask economic processes and forms of psychological denial of risk – in short the practical realities of living with geographically proximate risks (see also Wynne *et al* 1993, Burningham and Thrush 2004, Blowers and Leroy 1994).

As we have suggested, in engaging with technological risk issues, in particular at an affective level, people invariably relied on making a 'local' connection. This localisation is not simply about territorial proximity but also the linkages that can be made between a technology and a wider set of cultural ideas and values. In this regard, we have looked at the sorts of cultural resources people drew upon to bring closeness to or keep at a distance risk or danger. These visual, symbolic, metaphorical and comparative resources were critical in bringing affective salience to a particular problem. In the cases of climate change and mobile phones the benefits of the technologies were culturally and personally immediate – with risks far more distant. In contrast, the benefits of nuclear power (and waste) and GM crops/foods were more distant, whilst people were able to draw on a diverse range of highly negative cultural images, symbols and metaphors.

Chapter Two: Science, expertise and trust

In this chapter we examine how people negotiate the term 'science', the particular knowledge producing practices associated with science and how these ideas are mobilised in discourse around risk. To do so we utilise the distinction in how citizens relate to science set out by Mike Michael (1992), between science as an abstract entity or principle (science-in-general) and as an activity directed at specific phenomena or problems (science-in-particular). In this discussion our aim is to map out the content of people's talk about science and consider how far these two discourses of science can be traced across the different issue settings.

Science-in-general
There are three principal themes, following Michael's work, that we can usefully employ in terms of how people talked about science-in-general: these refer to the uniqueness of science; the inaccessibility of science; and science as socially abstracted.

The uniqueness of science

Michael (1992) identifies science-in-general as an impenetrable entity that the individual is at some distance from. That is scientists are in possession of a particular type of specialist knowledge, from which the individual was permanently barred from entering. So, if we consider our data in relation to this idea, we find that science as a principle, for most people, represented the best and truest knowledge system available. The very word scientific demarcated in people's minds an accuracy that no other source of evidence could deliver (see also Irwin and Wynne 1996).

> *Is there any research around that's sort of conclusive well not conclusive obviously but more than, more than alarmist, not unscientific?* (Norwich 2, masts)

> *If people know, and we could only start with science, then they could decide. And instead of being just swept along in the whole momentum of technology or marketing they will actually have scientific and empirical evidence.* (Lancaster, mobile phones)

Often the actual style of argumentation reproduced the principles of scientific methodology; people talked of control groups, rules of causation, evidence-based research and (lack of) scientific rigour.

Stuart: *Personally I hate the third one. I hate stuff like that when people say… it's so unscientific that you just can't, you can totally disregard that one if you ask me.*
Moderator: *Why do you say it's so unscientific?*
Stuart: *It's just an anecdote from one person, it doesn't prove anything*. (Norwich 2, masts)

In a similar way, other people spoke of the neutrality or utilitarian drivers underpinning science and its methods – that scientists, on the whole, were motivated to serve the best interests of society:

I think it is to an extent it's about what your experience is or whether to trust people in authority […] and how much you trust them to do a good job and to do a job that's based on, you know, the best benefit of everyone rather than their own selfish interests for earning money and stuff. I think it's naive to expect that everybody is going to kind of be like, you know, looking for the public good rather than their own pocket and that's why you have to look at where people are funded from because I know that there are scientists out there that are in the pocket of the industry and say what they've been told to say and they will get away with it. But it doesn't mean to say that I think all scientists and all researchers are like that. You know, and I really don't think so. A lot of people get into that, those areas, because they want to make a difference, because they want to help people, because they want to find out a truth and get it out there. (Lancaster, mobile phones)

Many talked about science as an intrinsically good thing – it was progressive and an important force for human improvement. Indeed, across the groups it was assumed that the unique and specialist capacities of science or scientists ('they') would produce solutions to the ills created by technological innovation. However, rather than an absolute confidence, these comments reveal a sense of hope or faith that science would be able to deliver solutions, 'they had to be able to'.

But then again I just think everyone should be responsible at some point these scientists, everyone should be responsible for it. If they're so amazingly you know, um intelligent and everything … then surely they should be able to come up with something. Come up with something in … in another direction. (Heysham, radioactive waste)

You've got scientists out there that could create another system that could be user friendly for everybody you know. (Norwich 2, mobile phones)

Science as inaccessible

Participants across the six risk cases implicitly or explicitly referred to the exclusivity of science in terms of its inaccessibility and their own sense of ignorance of the principles and activities of science. Participants talked of a lack of the necessary technical background to comprehend and assess risk in a meaningful way: "*So the problem is we're talking about something that we don't know anything about .."* (Cromer, radioactive waste) Michael (1992) observed a similar phenomenon in a study of public perceptions of the risks of radon, which he termed a discourse of ignorance, centring on mental constitution. In other words people presented themselves as being mentally incapable of grasping the science: they did not have a scientific mind. However, what emerges from our data is not so much a discourse of ignorance based on mental capacities but rather epistemological weakness or deficiency. In other words non-scientific or lay knowledge was automatically assigned inferior status relative to 'Science'. In this sense statements or views were often prefaced by phrases such as 'I don't know I'm not a scientist', or 'I'm just a layperson'.

You see we're made aware that nuclear energy is bad. I mean I don't know nothing about it, I'm not a scientist or anything, but you hear on the news, I mean you see these tankers coming in. (Cromer, radioactive waste)

I haven't got a scientific background so I will never in a million years understand the science behind it, so I can only go by what I am told. I tend to lean towards someone that I might believe, that I might find a bit more credible, but that might be totally wrong from my point of a view as a layman. (Lyng, GM)

For Michael (1996) the process of reflecting upon one's unscientific mind (or lack of scientific skills) is interpreted as a tacit relation to science – one in which the self is subordinate to and dependent upon the experts - at least in the relevant scientific matters. Again, many of the remarks people made about science, and expert knowledge in general, reveal the playing out of such an identity of dependency. So whilst most participants recognised science as the best (approximate of) truth available it was simultaneously a knowledge system which few had access to and could therefore challenge.

> Dave: *We leave everything to the experts.*
> Kevin: *We assume they've got our interests at heart and their own children's' interests.* (Cromer, radioactive waste)

Indeed, the exclusivity of science-in-general, and the underlying power/knowledge relations between citizens and science, meant that for many it was automatically granted a privileged position in policy decision-making. It was up to scientists to make decisions about future risk management. The esoteric nature of scientific knowledge systems also served as a powerful and persistent argument against widening citizen participation in risk decision-making. In other words form many it was ineffective and counter-productive to seek the (uninformed) public's input on policy issues – these matters should be left to the technical experts. Again, in many of these comments we see the implicit articulation of feelings of social dependency upon science in the abstract: "*Hopefully all of us through our taxes… we pay the government to pay scientists to do the best with it for the good of everybody and that's all that I hope we can do. There's no use having discussions about it*". (Liverpool, radioactive waste)

However such discourses of ignorance displayed more than simply a deficit of knowledge and dependency on science, serving we suggest also as resources through which individuals fashioned other relations with science including co-operation or a division of labor ("I'm not a scientist", "It's not my job") to moral / political challenges ("I don't know") (Michael 1996). Indeed reflecting a relation of co-operation (in terms of a division of labor) it was argued by many participants that science in an abstract and neutral sense was best placed to make decisions about the solutions to the various risk problems: it was their job.

> Valerie: *So it's no use debating this is it, because it's already there, it's already happened. So hopefully all of us through our taxes … we pay the government to pay scientists to do the best with it for the good of everybody and that's all that I hope we can do. There's no use having discussions about it.* (Liverpool, radioactive waste)

The social abstraction of science-in-general

The same characteristics (epistemological difference and inaccessibility) that were invoked by participants to present an image of science-in-general as uniquely objective and authoritative served to simultaneously problematise the nature of scientific truth. In other words we see an argument about abstract (or de-contextual) science-in-general that draws upon its real-world application.

One of the problems…because it's the UK Science Institution, it's a science institution so therefore it has a bias towards the promotion of science. It comes back to that mobile phone thing again when I saw someone…..it wasn't this institution obviously, but somebody said "we can find no problems, there's no evidence to suggest that mobile phones damage your health, but we do recommend that children only text", so again it's that way of saying things. You know they've got a need obviously to back science and obviously that's what the GM techniques are all about you know. (Norwich, GM crops)

I bet there are scientists who don't agree with it as well and you don't hear about them. […]They're all on an ego trip I think trying to invent something new. (Liverpool, GM)

Some stressed the uncertain and inherently open-ended nature of scientific inquiry. Here people talked about the limits to scientific knowledge – that sciences were not necessarily exact, and that 'truth' was essentially provisional.

You take a best guess. So in this case you would either say my hypothesis is that telecommunications technology is potentially dangerous and I need to find out and test that hypothesis. And I either accept it on the evidence or reject it on the evidence. Alternatively you put an alternate hypothesis up which says the industry says it's probably safe and you trawl over the same evidence […] I think there are prejudices with people but most scientists do their best to be objective on the basis on the evidence they find. If through peer group pressure other evidence occurs to reject or accept a hypothesis the show moves on. That's how science has always been. It's not value free but I don't, I think I believe in cock-ups more than conspiracies and I think that's the way scientific research is carried forward. It's based on our best guess. (Lancaster, masts)

So what we have overwhelmingly identified in this discussion is the construction of science-in-general as a more or less homogenous knowledge system, in possession of a unique ability to apprehend the 'real' nature of environmental or risk phenomena and a privileged status in influencing policy decisions. The relation of the individual, as holder of inferior and subjective skills and abilities, to this abstract entity, was therefore primarily, but not solely, one of dependency.

Science-in-particular
Michael's concept of science-in-particular relates to specific examples of science in practice and addresses the nature of knowledges and identifiable, often practical goals. Judgements of science-in-particular address issues of the competence and subjectivities (or interests) of science in its particular social contexts of practical application. So what we can identify here is a critical (and contextual) approach to assessing science-in-particular. There are three particular modes of discourse that we distinguish here; the competences, the subjectivities and the social realities of science-in-particular.

The competences of science-in-particular
For a number of people the specific techniques and principles associated with science lacked sophistication and in this sense the conclusions being drawn were often talked about as being at best approximate at worst erroneous. Here we see a more critical construction of scientific knowledge as overly simplistic and imprecise when applied to particular questions or problems.

> Rupert: *And again we're talking about using computer models and how accurate can we?*
> Jack: *And we all know how reliable computers are.*
> (Heysham, climate change)

> *We have to be sure what we're pro or against we've been talking about trials that have already been conducted well to some extent I'm against that because I don't think there's been enough accuracy and precision gone into it.* (Lyng, GM)

Doubts about the competences of science were particularly to the fore where technological risks involved considerable temporal uncertainties. People across the board identified a lack of precaution or consideration of long-term consequences in developing and introducing new technologies. This was all too apparent in the historical development of nuclear power – which reflected a failure to address the longer-term problems associated with managing wastes. The long-term consequences (or unknowables) of disposing of nuclear wastes could not be mapped-out. In this sense the capacities of scientific knowledge (alone) could not be relied upon as a sound basis for policy decisions: *"Well I don't think we should be asked anyway. I'm quite angry about that. To think that they went ahead with that before they thought about what they were gonna do with the waste. That is really shocking. It's fairly, it's irresponsible of them and everything."* (Liverpool radwaste)

> *I know all these eminent scientists you read about …. but at the end of the day they're saying well a hundred years down the line x y z is gonna happen. And the hundred years down the line was, you know, might be a third world war and we won't be here in a hundred years time. […] and that's all based on a chain of events and a lot of things can happen in a hundred years.* (Liverpool, radioactive waste)

On similar grounds, people were largely unconvinced by the science surrounding newer technologies (mobile phones, GM crops and genetic testing). Scientists simply hadn't had time to establish the 'truth' or 'reality' of the health and environmental risks posed by these technologies:

> *Well I expect the industry to say there's no evidence. Don't we? And I just don't think that they've been here long enough for anybody to prove anything. It is a new thing. In twenty years time, you know, we'll probably know a lot more*. (Lancaster, masts)

For some, the apparent inconsistency or confusion of messages or conclusions being drawn within the scientific community served to raise doubts about the competence and skills of the 'so-called' experts. People did not know who (if at all) to believe.

> *I think in both areas nobody can say "right this is the problem we can solve it, we can do this". Nobody can solve the problem in either of the areas. In fact they're still so busy in everything like this between the experts arguing with each other and all the public hears is, one argument comes up and somebody says something else. And this goes on forever and ever and ever.* (Cromer, radioactive waste)

In such comments about the competence of science-in-particular we see something of a blurring of the (exclusive) science/ (excluded) layperson boundary so apparent in relation to 'science-in-general'.

> *Because you realise this is what this is about, the experts don't know what to do with it so they're going to take all our suggestions.* (Cromer, radioactive waste)

Indeed, a small minority argued for a fuller meshing together of scientific and social knowledges in achieving the shared goal of developing more resilient and informed mechanisms for assessing and managing uncertain risks.

Given the terms of the debate I think it is something that probably has to initiate from… be initiated from a specialist field, but they are not an island entire of themselves, they would have to consult and bring that into part of the debate in the way that sort of (cosmologist) scientist now are asking fundamental questions about what life is, and you know, you have to involve people and wider sort of academic fields […] and people. (Norwich 2, GM)

The subjectivities of science-in-particular

We can identify more sceptical constructions of science, where individuals discursively situate science-in-particular within problematized social and political fields. For many, science-in-particular was aligned with specific interests that militated against it serving the societal good.

Scientific (and political) actors were represented as secretive: the true facts (or risks) associated with the different technologies were being hidden from public scrutiny. Science-in-particular lacked social transparency and as such subjective (political or economic) motives were often inferred:

Because kind of everyone's gone 'oooh crops! Splash, splash' you know big warning, newspaper signs, media….and meanwhile the scientists are doing …quietly carrying on there human genetic testing anyway. (Norwich 2, genetic testing)

Following on, for many participants the claims made about the various technologies by science-in-particular detracted from the real issues - namely the funding of science. For most people political and industrial funding were central to criticisms of science-in-particular. In other words the findings of scientific research would be appropriated by particular industry and government actors to stress the uncertainty or apparent absence of risks. However what may be presented by 'expert' communities as 'good science-in-particular' may well be recast by publics' suspicious of the drivers of research, as industry's or government's bad science-in particular (Michael 1992):

Well I mean the thing is…, when you use the phone constantly you know, when your using it close to your head, I mean it's the radiation and whatever problem it may cause we don't know. The only people that know that are the scientists but do they really know conclusively it does cause damage and are they really letting us know, you know 'cause all this is about money. (Norwich 1, mobile phones)

And like big polluters in America they want more and more don't they? So if you've got scientists coming from America saying, "oh it's not that" […] They're with the car industry on that one, you know. (Heysham, climate change)

Who is actually funding the scientists, you know? It could be like say one scientist getting funded by the firm that will eventually make all the things for that. Another set of scientists could be funded by the Government you know. So you'd have to hear like lots of different arguments because I think it depends who's paying them. (Liverpool, GM)

The social realities of science-in-particular

Reflecting these issues of competence and subjective goals or interests, people repeatedly made reference to a sense of disenchantment with science: that experience had demonstrated that scientists often get it wrong. In the following extract an analogy is drawn between genetic testing and other areas of medical experience (of which the participants have greater familiarity). In this way past exemplars of the limits to science-in-particular are mapped onto new technologies.

Well the thing is, you've heard in cases where they've said that the baby's, there's going to be something wrong with them and all that and they've been born and there isn't something wrong with them, so, you know, if they tell you like there's something wrong with your baby and all that, and you get rid of it, might you be getting rid of a healthy foetus as such. You know, because it has happened, mistakes are made don't they all the time. (Liverpool, genetic testing)

In other cases we see the impacts of the bovine spongiform encephalopathy (BSE or "mad cow disease") crisis BSE crisis and other recent failures of science (in-particular) actually being used to cast doubts more broadly over the competences and interests of science *per se*.

I think it's like what I said earlier about … I mean of discounting things into the future in the knowable way, and it's because we are going into these unknown, uncharted territories that is quite disconcerting. I think this notion of scientific authority is broken down to a large extent in society that we have had you know the mad cow disease, scares and all the rest of it, and I think there is a bit more, perhaps a healthy cynicism about scientists claim to have

the truth and I think certainly in my peer groups people can handle the fact that we are looking at versions of the truth and interpretations of the truth and perhaps we feel though we are not scientists we feel more capable as consumers, as citizens perhaps to criticize and question without necessarily having the answers. (Norwich 2, GM)

But the problem is I guess, for realists or cynics or whatever is that, as you say, "trust me I'm a doctor" doesn't tend to work anymore. There's enough examples of "trust me I'm a doctor" and "oops". (Lancaster, masts)

Michael (1992) also shows, in his study of public perceptions of the risks of radon, how one particular individual with a science background judged that 'scientifically' there were other more important problems to attend to (than radon). The focus of research activity on radon was thus constructed as 'bad' science within the broader scientific context to which this individual had access. A similar criticism of science can be identified with a number of the risk arenas we talked to people about (in particular new genetic technologies). Here, bad science is science-in-particular treated in isolation – divorced from broader political and social problematics. A focus on purely scientific framings was inherently partial, dangerously narrow and of itself a poor use of limited resources:

Yes, I don't think I've got too much more to add I agree wholeheartedly with what's been said, again in a sense that it's being looked at far too simplistically and you are looking at cures for symptoms rather than addressing the cause. (Norwich 2, genetic testing)

Summary

In this discussion we have considered how people across the different technological/ risk domains constructed science in relation to themselves and other citizens / society more generally. The data that we have presented broadly supports the distinction that Michael (1992) has observed in public discourse between science-in-general and science-in-particular. For most people science-in-general was viewed as a specialised and exclusive epistemological system – from which the individual is barred access. Science is objectified as an abstract and a-social entity. These (power) relations of knowledge were embedded in the discourse of lay ignorance through which people related evidence they considered scientific and knowledge which did not meet the strict criteria of what constituted real science. However through these discourses of ignorance, we can identify people establishing particular relationships with science – not only of

dependency but also in terms of a division of labour ("it's their job") and in some cases challenge. By contrast, the discourses of science-in-particular were concerned with the detail of the competence (skills, abilities, methodological limits) and motivations (interests and subjectivities) of science situated in specific social and political contexts. So what we see in the case of science-in-particular is something of a levelling in the abilities of different actors to make truth-claims (and thus the power/knowledge relations between science and citizens). In this sense, as Michael argues, science-in-particular can be used to downplay the privileged status of science – to shift the emphasis from the mystique of science to its more mundane character.

However, in developing this argument it is important to recognise that the boundary between science-in-general and science-in-particular is not clear-cut. As we have shown experiences and scepticism of science-in-particular were in some cases building to a more general critique of science (or at least recognition of its limits and contingencies). Much of this discussion has focussed on issues of knowledge and trust in expert systems. In the following chapter we turn our attention to the duties and responsibilities people attributed to the range of expert bodies and actors – as well as the duties they themselves acknowledged or ascribed to other citizens.

Chapter three: risk and responsibility

In the early 1990's a study of discourses of responsibility articulated by environmental activists identified a lack of research attention given to the ways in which people construct environmental (or risk) duties in different situations and with respect to different agents (Eden 1993). Whilst we have subsequently seen a range of studies of how people invoke notions of responsibility in particular risk or environmental situations (Harrison *et al.* 1996, Bickerstaff and Walker 2002, Kerr 2003) there has been a failure to make connections across risk issue contexts. Furthermore, in work which has directly dealt with issues of responsibility, we see a surprisingly uncritical approach to defining the concept. Bickerstaff and Walker (2002) have, for instance, pointed to two principal dimensions of responsibility. First, to be responsible (for something or some action) is based on identifying an actor's role as an agent or cause. There is also the sense of responsibility as a duty, an obligation or a burden. This second meaning of responsibility is not always negatively construed and the attribution of role-responsibility refers to those duties that the individual or group is considered (morally) bound to perform to manage and control risks (e.g. Freudenburg 1993). These role-responsibilities for individuals and institutions can be multiple. Yet in the research literature, there is little work which has explored the conditions and contingencies of responsibility.

If we turn our attention to research that has addressed institutional responsibilities, William Freudenburg's (1993) notion of recreancy provides an instructive perspective on the topic. Freudenburg defines recreancy as a retrogression or failure to follow through on a duty (or responsibility) of trust. Recreancy can involve failings in technical competence and / or fiduciary responsibility. For the interests of the society at large to be properly protected the relevant specialists and institutions need to be both competent and properly reflective of their responsibilities to society at large. For Freudenburg the key question is whether experience shows that the behaviours of specialized individuals and institutions can be counted on.

In this chapter we develop an analysis of the kinds of discourses of responsibility mobilised by participants across the six different risk settings. To do so we map out the multiple roles and obligations for managing and controlling risk that are identified both for the individual and for the state, paying particular attention to the tensions and ambivalences that these discourses reveal. Central to this account is an interest with the relational processes that underpin and crucially link individual and state obligations. However, in distinguishing these two broad discourses it is important to highlight some differences between the six issues – and in particular the types

of 'responsible' actions people can meaningfully take in each situation. In relation to GM foods, mobile phone handsets and genetic testing we see individual agency for managing personal risks realised to varying degrees through consumer behaviour. Genetic testing is in some ways distinct, in that it can imply wider kinship obligations. In the cases of radioactive waste disposal, GM crops and mobile phone base stations, which are all collective problems, individual action is confined to citizenship roles of opposition and protest. Climate change is distinct in that it represents a collective action problem but at the same time we see the construction of a citizen-consumer identity. In other words the individual can act meaningfully on citizenship obligations through consumption choices. Given these differences in issue context, the first section of the paper, which is concerned with discourses of personal responsibility, draws most heavily on the genetic testing, mobile phone handsets, GM foods and climate change risk cases.

Personal responsibility and agency

There was some identification across the groups of a personal role in managing risks, particularly so where the technologies (and thus exposure to risk) were seen to be, to a greater degree, under personal control. This belief was principally related to controlling personal exposure to radiation from mobile phone handsets. In regulatory terms this is an arena where government advice emphasises personal duties to the self and to one's family. This guidance sets out precautionary measures relating to the length of calls and use by children. In most cases then we see expressions of personal agency – that is individual actions were considered meaningful.

> Martin: *It is, it's the individual at the end of the day. Mobile phones should be treated the same way as cigarettes it's your own personal risk if you wanna use it, it's as simple as that you know.*
> Linda: *Choice yeah.*
> Martin*: It's the individual's choice.* (Norwich 1, mobile phones)

Genetic testing offers to find our individual risk factors using personal genetic information, mediated by health practitioners, as guidelines for shaping lifestyles. Like mobile phone handsets this technology implies certain personal duties of responsibility for the self and for others (Beck- Gernsheim 2000). It is noticeable then that people often talked about both genetic testing and mobile phone handsets as enabling greater choice and control – in other words they were

technologies that on some level increased people's sense of their own agency.

In the case of GM foods, people expressed some feelings of personal agency – in that they could actively make consumer choices. However, these expressions were tempered by recognition that choices were effectively circumscribed by a range of external political and commercial actors. In the case of climate change, where the effects of responsible action were more dispersed through society, we see a general lack of faith that individual actions could or would make a meaningful difference. Finally, in relation to the issues of radioactive waste, mobile phone masts and to a lesser degree GM crops people were unable to identify with consumer-citizen roles. Rather personal responsibility could only be realised through political routes of citizenship – and few saw these as effective modes of citizen expression (more so the case with GM and radioactive waste siting decisions than with phone masts).

Moral discourses of personal duty were most apparent around climate change – perhaps reflecting moves by government to encourage individuals to reduce greenhouse gas emissions through behaviour change and personal responsibility. Arguably the moral obligations people articulated around this issue could be read as an internalisation of this political rhetoric of individual duties: "Can't just say it won't make any difference I won't bother." (Cromer, climate change)

In relation to genetic testing, participants commonly interpreted the issue through their moral obligations to others – that is through a duty of care to one's children and one's family more generally. This mode of reasoning tended to produce an interpretation of testing as a good thing: the parent was better positioned to exercise responsible choices.

> *If you are a carrier, then that's up to you to make that decision then isn't it, well I won't have any kids because I know I could pass that on and they'd get that disease, even though you're only the carrier. So it's good for that thing because you could make that decision then.* (Liverpool, genetic testing)

The feelings of safety and security associated with mobile phone handsets were particularly marked in terms of children's safety. In other words the mobile phone was constructed by many as liberating and empowering - offering an almost invisible safety line between the parent and child – and as many people made the point served to smooth the fraught passage for the child towards independence.

Whilst across these issue domains we can identify discourses of moral obligation we simultaneously see a number of tensions,

revealing a diminished sense of agency. In the case of genetic testing we saw an observable tension between access to personal genetic information and the ability to act upon this information. In the case of mobile phone handsets, whilst the technology was undoubtedly seen as enabling in terms of children's security and safety, people simultaneously recognised the potential health risks.

In terms of phone masts our participants were generally aware of a contradiction in the use of handsets but a simultaneous opposition to the siting of masts locally (and in this sense a rejection of social responsibilities). So whilst people were largely unwilling to live in proximity to a mast they saw no opportunities through which they could act to reduce the demand for masts. *"I live in this part of Norwich, and we've continually got campaigns going against mobile phone masts, you know, and you become very aware then - there's sort of an irony that such a high percentage of the population's got them but nobody actually wants a mast anywhere near them.* (Norwich 2, masts)

In the case of climate change we see a strong discourse of what people ought to be doing rather than necessarily are doing. There were a number of factors underpinning this tension of responsibility. Firstly, the technologies associated with individual energy use (heating, motor cars etc.) are deeply embedded within the cultural practices of society and as such people expressed a degree of social dependency; few felt practically capable of disentangling themselves from energy intensive lifestyles. In essence the day-to-day products (or consumables) that energy generation enabled were constructed as social needs or necessities and few people saw any realistic alternatives.

Added to this, the recognition that a solution to climate change would depend upon collective action was a characteristic of the risk context that simultaneously inhibited expressions of personal responsibility at a behavioural level. Harrison *et al*. (1996) noted a similar diminished sense of active involvement in or responsibility for policies connected with environmental issues in the UK (compared to the Netherlands) which they argue corresponded to a relative sense of alienation and disempowerment (cf. Macnaghten *et al.* 1995). Similarly, we found that the perceived inability of individuals to act in response to climate change was often related to broader patterns of social change. In particular values of self-interest and individualism were linked to a decline in a sense of collective or shared responsibility (see also Harrison *et al.* 1996) – a relational context which meant that individuals could not accept the personal duties many judged to be morally correct: *"I think we've all gone inwards and selfish and… and I think if we all stood together I think there is the way with all to change things"* (Liverpool, climate change).

The tension between a sense of moral duties but a perceived inability to take action led, all too often, to the expression of feelings guilt, embarrassment and shame. *"Some people are extreme and some people couldn't give a damn. With me, I'm sort of a bit like it but then I spend more time feeling guilty that I could be better at it."* (Cromer climate change)

One particular manifestation of these personal tensions around duty and agency was a reflexive articulation of a personal failure to act responsibly. In other words people confronted their own tendency to shift responsibility to others. Implicit here was a sense of powerlessness and dependency on other agents – there was nothing the individual could do to ameliorate the problem. *"I must admit - this attitude of "oh no it's not our fault" is a bit hiding or evading one's responsibility."* (Heysham, climate change)

Such expressions of a diminished sense of personal agency in taking action do raise the broader question of how far the individual can be held responsible for managing any particular risk problem when opportunities to realise moral obligations do not (or are perceived not to) exist. The key point we wish to make here is that central to the construction of these discourses of personal responsibility and the models of agency they embed are perceptions of the duties of other (institutional) actors. As Eden (1993) has argued the self-ascription of responsibility depends upon the role of the individual compared with the role of other responsible agents in a social context. In what follows we consider the nature of attributions of responsibility to political actors, and how these attributions relation to the expressions of personal responsibility and agency discussed above.

Institutional responsibility

The concept of recreancy advanced by Freudenburg (1993), in analysing public perceptions of risk management actors, centres on a retrogression or failure to follow through on a duty (or responsibility) of trust. Crucial to Freudenburg's argument is the recognition that for the interests of the society to be properly protected the relevant specialists and institutions need to be both competent and properly reflective of their responsibilities to the citizenry at large.

Competence

If we consider how people talked about the role of policy and expert actors, we find arguments that reflect a sense of reliance upon the competence of these actors to resolve the problems generated by the various risks. It was generally seen to be the duty of science and government to develop and implement solutions or technological fixes because it was felt that they and not individuals had the knowledge and power to take meaningful action:

Dave: *Where's the [ozone] hole? Nobody's seen the hole. Nobody knows there's a hole there. We're told there is, we're told there is, we don't know.*
Joyce: *Well yes, but you have to rely on being told a lot of things…* (Cromer, climate change)

Such comments may be read as expressing confidence in the competence of authorities. Yet if we look at the discussion of different issues we see little evidence of this unquestioning trust in the competence of experts. In the case of both radioactive waste management and climate change, whilst most people perceived there to be a high degree of technical competence in the short term, few had the same confidence in the abilities of experts to predict and thus control for longer term risks or their consequences.

We're talking about using computer models […] how accurate can we [be]? We all know how reliable computers are [laugh] (Heysham Climate Change)

All these eminent scientists […] they're saying "Well, a hundred years down the line x y z is going to happen". […] But that's all based on "If that goes on and that goes on and that goes on". But if you go in a different direction, on a different tack… (Liverpool, climate change)

On similar grounds, people were largely unconvinced by the science surrounding newer technologies such as mobile phones, GM crops and genetic testing, arguing that scientists simply hadn't had sufficient time to identify the risks posed by these technologies.

Well, I expect the industry to say there's no evidence [of harmful effects]. And I just don't think that [the masts] have been here long enough for anybody to prove anything. It is a new thing. In twenty years time we'll probably know a lot more. (Lancaster, masts)

Although participants expressed a general confidence in the expertise upon which they felt themselves to be dependent they also questioned the limits to the capacities of these actors to perform their responsibilities. Even where the competence of institutions responsible for risk management is not questioned, however, there remains the issue of whether they are seen to be fulfilling the duty of care with which they have been entrusted by society.

Societal duty of care

For many participants the role of institutional actors was to act in the best interests of society. Their comments reveal a sense of social dependency in that there was no alternative but to have faith in the motivations of the experts.

In the analysis which follows we firstly identify the institutional obligations and duties that people set out for different political and 'expert' actors and bodies. We then move on to consider how far institutions were seen to be failing to act upon these duties. For many participants the normative role of institutional actors was to secure the best interests of society – again, revealing a level of social dependency:

> *I'm basically a libertarian. But I do think there is a role for government to play as there was yesterday in the precautionary principle… because they are our stakeholder, the best we've got. They don't always do it, they don't always do it well but if we employ the government to do anything it's a few very strategic things and when it comes to things like public health it's got a duty of care generally on a range of things.* (Lancaster, masts)

We can clearly identify the articulation of a number of particular roles that effectively serve as a reminder to the state of particular obligations that need to be met (Szerszynski 1999). In the case of serious collective action problems such as climate change and radioactive waste management we see, as others have argued (Eden 1993, Harrison *et al.* 1996, Macnaghten *et al.* 1995), a view that government responsibility should be anchored in legislation to enforce personal duties. In these situations people had a low sense of agency and personal action was seen as futile in isolation – the individual could do nothing to arrest technological development or ameliorate risk production and exposure. Direct government was thus often talked about as the best system through which to ensure the collective interests of society were met. So here we see calls for a mode of (responsible) government that lays down policy and prescribes individual duties.

> Julie: *Well it's down to legislation at the end of the day*
> Amy: *It has to be a policy, doesn't it?*
> Julie: *Yeah, course, the government has to step in*
> Amy: *The government has to say this is what you have to do.* (Liverpool, climate change)

For radioactive waste, a small number of people talked of duties of social care that involved the state addressing the wider issue of

nuclear power. For these individuals maintenance of the nuclear energy sector, under any circumstances, conflicted with serving the collective interests of society. In relation to climate change, people also identified a series of government roles to enable and guide personal choices through education, persuasion and incentives. *"As long as they subsidise public transport. Whatever they expect from you, you must expect as much if not more from them."* (Cromer, climate change)

With genetic technologies a duty was identified for the state to police the commercial application and use of the technology: *"I think that GM foods and GM modifications in humans should be done at a level, on a Governmental level and not a commercial level, both of those things. Then you get accountability back."* (Lyng, genetic testing) A similar role was identified with regards to mobile phone handsets and base stations – though such duties were limited by the widespread nature of use.

> *I think the companies are just getting away with it. I really think, I think so many other industries have got to prove that what they're selling is safe, the services they're providing, and everybody's just been swept up in technology. It might not be a bad thing, it might cause, you know create huge economic and social benefits, but it does seem to me that the government's saying "well you know, haven't really done a lot about it and we really did ought to do a bit more but we're not going to" and the companies, the industry they're not going to put they're hands in their pockets and say have this money for research. I think they're getting away with it and the government should take a much firmer line.* (Norwich 2, masts).

Where risk exposure was perceived to be to a greater degree under personal control we can identify calls for institutional guides to personal behaviour. So whilst people talked of a social dependence on mobile phones, most saw that that they retained a high degree of personal control over risk exposure. Similarly with GM foods and to a lesser degree genetic testing, people identified the crucial role of the state as a provider of 'consumer' information to enable choice. What we see in these instances is a very different construction of institutional responsibility reflecting a judgement of consumer agency.

> *If people made enough noise about it and said bring me the information and when we go in that supermarket and see what is good and what is bad and that's up to the individual*

to make their choice what they are going to buy isn't it?
(Norwich 1, GM)

Whilst we see a range of expectations of social responsibility directed towards government (and others), we simultaneously see a lack of confidence that these duties will be met (see also Bickerstaff and Walker 2002, Hinchliffe 1997, Bulkeley 2000, Harrison *et al.* 1996). However, and in a number of ways, across the issues, people expressed critical views about the government's failure to act on its duties of care – by delegated these duties to the individual (also Bickerstaff and Walker 2002, Harrison *et al.* 1996). This state devolving of responsibilities over to the individual was identifiable in relation to two risk arenas –mobile phone technologies and genetic testing. So in the case of mobile phone handsets a number of participants saw the government as effectively delegating duties of risk assessment and management over to the individual: *"Well it all comes back to the individual making their own risk assessment isn't it and that's... it's a cop out because they still get there money"* (Norwich, mobile phones).

Similarly genetic testing was seen by a number of participants as shifting duties of responsibility away from the state to individuals – the inference drawn was that it was up to the individual to monitor and maintain personal health. Indeed for a relatively small group of people genetic testing represented a simplistic (institutional) approach to the causes of ill health and poverty, which took away from any kind of government (or for that matter societal) responsibility: *"Again, it's economic factors that produce…the occupational hazard of being poor is through malnutrition, lack of health education, and housing. Isn't it? It's not to do with whether you've got gene therapy or not."* (Norwich 2, genetic testing) Another related argument centred on the government's perceived failure to publicly communicate the nature (and uncertainties) of the risks associated with the various technologies.

To account for the seeming contradictions in how people talked about state role-responsibilities regarding duties of care we must turn to perceptions of institutional agency or capacity. It is noticeable that at a national scale people repeatedly talked of the powers of the nation state as fundamentally circumscribed by wider supra-national political and commercial networks. The state therefore lacked the political resources to meet expectations of responsibility. So, in the case of radioactive waste we see a mismatch between the agency of British political authorities to make decisions about the national management of wastes for the social good but a relative inability to reduce the global dangers associated with nuclear waste. In the case of climate change, effective risk management depended on the co-operation and actions of other countries. People repeatedly referred

to the failure of the United States to act with the wider international community – severely damaging the agency of all other nations: *"They're a country to their own aren't they, they make their own rules. I mean at the end of the day … they'll go on their own."* (Cromer, climate change)

Moving on to the issues of genetically modified crops and foods, these technologies were again interpreted as risks that were imposed on the nation-state by wider global institutions and networks - fundamentally circumscribing the agency of the UK political machinery. Decisions about the development and application of genetic testing were seen to be more under state control and less influenced by external (or global) policy structures – perhaps reflecting the relative newness of the technology. In the case of base stations, the powers of political institutions were hindered by perceived commercial pressures. By contrast, handsets were seen to be at the root of the state's diminished agency. The technology was already widely diffused through society and had become a part of everyday social practices and routines. So from this perspective the government lacked the powers (or will) to effectively control and manage risks.

The central rationale people gave for the failure of the state to meet duties of social care, related to the political and economic agendas of government that ran counter to serving the collective good. So here we see a discourse of government interests that runs counter to principles of social care. Many emphasised, across the risk domains, the short-termism of politics – oriented towards establishing and retaining positions of power (Harrison *et al.* 1996): *"We're going to have to be persuaded to do things […] as I said no Government is going to make itself so unpopular by bringing in unpopular laws. No Government are going to do it".* (Cromer, climate change)

> *I think no matter what, they won't listen to our views anyway, you're always going to have the half that are for and the half that are against and the government will always go with which ever they think is best for them not what's best for us.* (Lyng, GM)

People also referred to the significance of economic interests as grounds for scepticism of government. One of the key arguments here related to the apparent unwillingness of the state to effectively police and enforce the duties of industry. In other words, as previous research has demonstrated, people questioned the accountability and interests of central government (Harrison *et al.* 1996, Macnaghten *et al.* 1995, Hinchliffe 1997). Such concerns were most apparent in the cases of mobile phones/masts, GM crops/food and climate change – where the technologies in question were seen to provide the

government with substantial (economic) gains: *"With climate change […] the people that are opposed as we said yesterday are all flunkies for companies like ESSO so* (Norwich, radioactive waste).

In a related way people also referred to the vested interests of state institutions leading to a lack of precaution or consideration of long-term consequences in developing and introducing new (and potentially risky) technologies. In other words the state was seen to be effectively imposing the population's exposure to risk – a relationship between state and the individual which severely curtailed feelings of personal agency.

> *Well I don't think we should be asked anyway. I'm quite angry about that. To think that they went ahead with that [nuclear power] before they thought about what they were gonna do with the waste. That is really shocking. It's fairly, it's irresponsible of them and everything.* (Liverpool, radioactive waste)

In the case of genetic testing, many of our participants, often revising initial responses (and thus constructions of personal responsibility), did not consider the technology as under individual (consumer) control or as enabling individual choice. Under conditions where few believed government would meet its role responsibilities, testing was interpreted as an overt mechanism of state and commercial control over individuals that would further erode personal agency.

> *Would you (make your) decision to cut that point off, "I am not going to have this child", or would it come from above and the doctor would say "you can't have that child, you can't take that chance", because that's another small part of your life that's been taken away.* (Lyng, genetic testing)

Summary

In this chapter we have mapped out the public discourses of personal and state responsibility that were articulated around a series of, in many ways, quite distinct technological risks. Acceptance of personal duties for managing risk was focused on those issues where exposure was to some degree perceived to be under individual control - that is mobile phone handsets and to a lesser degree GM foods and genetic testing. In these instances people identified, to varying degrees, with a consumer identity. Indeed, in the cases of mobile phone handsets and some applications of genetic testing, the technologies were constructed as actually enabling people to accept greater responsibility for the self and family – increasing a sense of personal agency. However, with genetic testing and GM foods we do see considerable ambiguity regarding personal duties to manage risks. In

both cases choices and agency were heavily circumscribed by the actions of wider political and commercial actors (on a national and global stage). Climate change was distinct in that we see perhaps the clearest tension in talk around personal responsibilities. People talked of a strong moral sense of obligation to take action (often consumption behaviours) for the good of society. However, these discourses of consumer-citizenship generated serious tensions around notions of responsibility. So what we see is a normative sense of personal duty that is constrained by a high level of social dependency on the energy producing/consuming technologies that cause climate change and scepticism that other people would act likewise. These judgements were supported by wider social changes that were seen to be running counter to notions of collective responsibility. Finally, in the cases of GM crops, radioactive waste management, and mobile phone base stations we see very little discussion of individual obligations regarding risk management. Where people did express some sense of duty this related to a political concept of citizenship – in terms of protesting, opposing or accepting siting decisions (focused on radioactive waste facilities and base stations). However, these roles were undercut by a heavily constrained sense of agency.

In understanding these discourses of duty and obligation, it is important to situate such expressions within a wider political frame of analysis. As we have argued, individual roles and agency were crucially tied to judgements of institutional failure. In other words, as Irwin *et al.* (1999) argue, a lack of agency is often translated as a profound cynicism about institutions. In terms of expectations of institutional duties we see a clear expression of muted dependency on political institutions (and experts) to serve the best interests of society. For some, and focused on severe collective action problems these duties implied a direct government role – for the state to establish a strong legal framework or guide to individual choices. In the case of mobile phone handsets, and to a lesser degree GM foods and genetic testing, where people expressed stronger feelings of agency, the government's principal duty was to act as information provider – leaving decisions about risk exposure to individual choice. However, and importantly, there was a general lack of confidence that these state roles or obligations would be accepted or actioned. This crucial ambivalence in perceptions of institutions can be linked to two sets of issues – the agency of the state and a range of political and economic agendas.

Chapter 5: Summary and conclusions

Risk and proximity

1.1 In making sense of risk, in particular at an affective level, people used a series of 'local' framings. Those living in communities with an immediate spatial and temporal connection to the risk issue (particularly radioactive waste, mobile phone masts and GM crops) were more able to draw on a range of experiential resources to make sense of the problem.

1.2 People with some greater proximity to or familiarity with the relevant technologies and / or their impacts tended to adopt more pragmatic and often ambivalent positions – revealing both fears and anxieties about the risks as well as a recognition of the social and economic necessity of the technologies. They also held more consistent discursive positions than those dealing with the issue as new (or as geographically and temporally remote).

1.3 Where the spatial and temporal aspects of risks (and benefits) were more immediate, that is focused upon the individual or family level (issues of genetic testing, mobile phones), most people were able to engage with or localise the technology at hand. These technologies and their implications were, or could be connected with, everyday salient issues.

1.4 Proximity does engender a degree of familiarity with the relevant technology in a way that is consistent with 'social learning'. We have, however, argued such responses may also embed more complex psycho-social processes of fear, denial and economic dependence.

1.5 Whilst risks may share certain characteristics in terms of spatial and temporal proximity, the accessibility of cultural resources is critical to them becoming socially salient. In other words people use available symbols, ideas, images and metaphors to mediate their relationship with the technology and more broadly with risk.

Science, expertise and trust

2.1 For most people science in the abstract was constructed as a specialised knowledge system – with a unique ability to establish the reality of risk. Indeed, in making sense of the implications of the different risks, people often invoked the language of scientific argumentation.

2.2 Science was an exclusive epistemological system. People implicitly or explicitly referred to science in terms of its inaccessibility and their own sense of ignorance of the principles and activities of science. Here we have identified a dominant discourse of ignorance based on epistemological weakness or deficiency. Embedding a division of labour science and scientists also had a duty to inform and influence decision-making. Reflecting these discourses of ignorance, science was often accorded a privileged position in policy – serving as a powerful argument against widening public involvement in risk decision-making.

2.3 The uniqueness and exclusion of science also served to problematise the nature of scientific truths. In other words we see an argument about abstract science-in-general that draws upon a critique of its real-world application and the limits to scientific knowledge.

2.4 What is quite clear from our analysis is a relation of the individual, as holder of inferior and subjective skills and abilities, to science as an abstract entity based on a position of powerlessness and dependency. In these discourses science is black-boxed – largely (though not entirely) removed from social critique.

2.5 Discourses of science-in-particular were concerned with the detail of the competence (skills, abilities, methodological limits) of situated science. The techniques and principles of science were constructed as overly simplistic and imprecise when applied to particular questions or problems. In the different issue contexts the capacities of scientific knowledge could not be relied upon (alone) as a sound basis for policy decisions.

2.6 The questions raised about the competence of science-in-particular reveal a blurring of the (exclusive) science/ (excluded) layperson boundary so apparent in relation to science-in-general and supports arguments about widening stakeholder and citizen engagement in particular policy contexts.

2.7 More sceptical constructions situated science-in-particular within a broader problematized social and political frame. For many science-in-particular was aligned with specific political and economic agendas that militated against it serving the societal good.

2.8 In certain risk contexts, specifically relating to the new genetics, we can identify a strong discourse of *bad science* – that is science-in-particular treated in isolation, divorced from broader political and social problematics.

2.9 One feature of discourse around science-in-particular was the mobilisation of past experience to cast doubts over (another) example of science-in-particular. In other cases we something of a transference of the critique of science-in-particular to science in more abstract terms.

Risk and responsibility

3.1 Acceptance of personal duties for managing risk was focused on those issues where exposure was to some degree perceived to be under individual control or agency. Agency was principally constructed in terms of a consumer identity. In other situations we see a more constrained discourse of individual responsibility that is focused on political routes of citizenship.

3.2 In the cases of mobile phone handsets and some applications of genetic testing, the technologies were constructed as to a degree empowering – enabling people to accept greater responsibilities for managing personal risks.

3.3 With genetic testing and GM foods we see tensions regarding personal duties to manage risks. In both cases agency was heavily circumscribed by the practical and political limits to making responsible choices.

3.4 Climate change stands out in that, more than any other issue, people talked of a strong sense of moral obligation to take action (often quasi-consumption behaviours) for the collective good. Yet this normative sense of duty was invariably constrained by dependency on the energy producing/consuming technologies, and where people had little faith that others would act in a like manner. These judgements of low level personal and collective agency were supported by wider social changes and values which ran counter to notions of social responsibility.

3.5 Individual role responsibilities and a sense of personal agency are crucially tied to the expectations of competence and social care people ascribed to political institutions.

3.6 In situations of severe collective action problems like climate change the responsibilities attributed to the state centred on imposing legally binding duties on others.

3.7 In the case of mobile phone handsets, and to a lesser degree GM foods and genetic testing, where people expressed a much

stronger sense of agency to control exposure to risk, the government's principal duty was to enable informed consumer behaviour.

3.8 There was however a general lack of confidence that the roles people constructed for the state would be accepted or actioned. We suggest two explanations for this apparent contradiction

3.8.1 The limits to the agency of state political machinery. With few exceptions control of risk (particularly climate change, GM crops/food and radioactive waste) lay beyond state borders.

3.11 In many cases the political and economic agendas of government ran counter to notions of social care, effectively weakening the abilities (or willingness) of the government to manage risks for the collective good.

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