Participatory environmental risk policy-making in an age of uncertainty: UK actor-networks, social learning and effective practice

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Abstract

This thesis aims to explore aspects of the democratisation of science within the UK. It does this through focusing on the analytic-deliberative practice of participatory risk appraisal (PRA), which emphasises the active involvement of citizens and stakeholders in the framing, assessing, and evaluation stages of complex and uncertain environmental risk policy processes. This was achieved by following professional actors (comprising process-experts, scientific-experts, and decision-makers) through networks currently building around PRA practice across the UK more generally, and in the area of radioactive waste specifically.

Analysis shows that professional actors can be seen to belong to an epistemic community comprised of a core group of process experts (researchers and participatory practitioners). This community is in an early stage of development at present and characterised by significant fragmentation between specific actor groupings within it. This coupled with intensely competitive relations between actors means that the community is not learning as effectively as it might. Unless the community makes a more concerted effort to faithfully represent a learning community its potential to democratise science within the UK will remain limited.

Closer analysis within the area of radioactive waste provides evidence that community members are influencing the beliefs of decision-making institutions, and enhancing scientific reflexivity, in geographically localised and institutionally specific instances. They have played a central role in bringing about a shift away from a technocratic mode of decision-making prior to 1997, towards one that is more democratic. A key indication of this democratisation is the significant degree to which citizens are being involved in processes of extended peer review, and possibly contributing extended facts, in the framing stage of decision processes within the area.

A final insight of the thesis is that community members possess shared understandings about effective PRA. Fifteen shared principles of effective practice are identified in relation four themes: the overall shape of the analytic-deliberative process; the role of science/analysis; access to information and expertise; and the nature of deliberation. The key observation emerging from these principles is that many existing participatory methodologies have not sufficiency considered constructivist perspectives on environmental knowledge. It is argued that effective PRA in post-normal environmental risk contexts depends on a number of specific measures being in place that guard against the 'technocracy of participation'.

Key words: epistemic community, democratisation of science, environmental risk decision-making, participatory risk appraisal, analytic-deliberative approach, competence, effective practice, social learning.

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Table of Contents

Page

Abstract 2
Acknowledgements 4
Table of Contents 5
List of Figures 9
List of Tables 10

Chapter 1 Introduction 12

1.1 Research themes and questions 18

1.2 Thesis structure and content 21

Chapter 2 Participatory environmental risk appraisal: theoretical perspectives and current understandings 24

2.1 Scientisation of the policy process and the need for democratisation 25

2.1.1 Citizens and experts in the Risk Society 25

2.1.2 Science, environmental knowledge(s) and the citizen-expert relationship 27

2.1.3 Conceptualising the relations between scientific and non-scientific expertise 34

2.1.3.1 Post-normal science: a new political epistemology for the democratisation of science? 35

2.1.3.2 An alternative framework? 40

2.1.4 Towards a discursive theory of environmental knowledge? 43

2.2 The technocratic mode of environmental risk policy-making 45

2.3 The democratic mode of environmental risk policy-making 53

2.3.1 Rationales for participatory environmental risk appraisal 53

2.3.1.1 Normative rationales 54

2.3.1.2 Instrumental rationales 54

2.3.1.3 Substantive rationales 55

2.3.1.4 Epistemological rationales 56

2.3.2 Conceptualising the democratic mode of environmental risk policy-making 57

2.3.2.1 Participatory environmental risk appraisal: an analytic-deliberative process 62

2.3.2.2 Fitness for purpose and the importance of context 67

2.3.2.3 Defining the actors within the process 68

2.3.2.4 Techniques for integrating deliberation and analysis 71
2.4 Evaluating the effectiveness of participatory environmental risk appraisal processes 77
2.4.1 Effective deliberation and inclusion in participatory risk appraisal 80
2.4.2 An integrative framework for effective participatory risk appraisal 86

Chapter 3 Studying professional networks in participatory risk appraisal 89
3.1 Conceptualising a network approach 92
3.1.1 Understanding participatory environmental risk appraisal networks 92
3.1.2 Social learning in environmental risk policy networks 102
3.2 Research methodology 105
3.2.1 Stage 1: Entering the UK participatory risk appraisal network 109
3.2.1.1 Selection and recruitment of key gatekeepers 109
3.2.1.2 In-depth interviews 112
3.2.1.3 Analysis 115
3.2.2 Stage 2: Focusing on waste 119
3.2.2.1 Selection and recruitment of respondents 120
3.2.2.2 In-depth interviews 121
3.2.2.3 Analysis 124
3.2.3 Stage 3: Drawing actors together in a workshop process 124

Chapter 4 Professional networks and social learning in participatory environmental risk appraisal 127
4.1 Mapping the UK participatory environmental risk appraisal network 128
4.1.1 An overview of the UK PRA network 128
4.1.2 The UK PRA network as seen from the area of waste management 142
4.2 Social learning within the UK participatory risk appraisal network 149
4.3 Conclusions 157

Chapter 5 Current participatory risk appraisal practice in the area of radioactive waste management 160
5.1 Epistemic community evolution in the radioactive waste area 160
5.1.1 The Nirex network 164
5.1.2 The BNFL network 168
5.1.3 The Defra network 170
5.2 Current PRA practice in radioactive waste management 173
5.3 Conclusions 191

Chapter 6 Epistemic community perspectives on effective participatory risk appraisal practice 195

6.1 Interview respondents' perspectives on effective practice 196

6.1.1 The analytic-deliberative process 198

6.1.2 Science/analysis 205

6.1.3 Access to information and specialist expertise 209

6.1.4 Deliberation 218

6.2 MRWS Workshop participants' perspectives on effective practice 228

6.3 Conclusions 234

Chapter 7 Participatory environmental risk policy-making in an age of uncertainty: concluding thoughts 237

7.1 On studying epistemic communities in the making 237

7.2 The PRA epistemic community in the UK: present and future 242

7.3 The democratisation of science in the UK: reflections on participatory risk appraisal practice 246

Appendices

Appendix 1 Competing conceptualisations of the environmental risk policy process 257

Appendix 2 Approaches for involving citizens and stakeholders in environmental risk 260

Appendix 3 Webler's (1995) fairness and competence evaluation framework 270

Appendix 4 Interview material 271

Appendix 4.1 Stage 1 interview material 271

Appendix 4.1.1 Stage 1 recruitment letter 272

Appendix 4.1.2 Stage 1 research outline 273

Appendix 4.2 Stage 2 interview material 275

Appendix 4.2.1 Stage 2 Recruitment letter 276

Appendix 4.2.2 Stage 2 Research outline 277

Appendix 4.2.3 Model of the environmental risk decision process used in Stage 2 interviews 279

Appendix 5 MRWS Participatory Methods Workshop participants 280

Appendix 6 Network Analysis 282

Appendix 6.1 Stage 1 Analysis 282

Appendix 6.1.1 Stage 1: Issue-areas 282

Appendix 6.1.2 Stage 1: Cases 283
Appendix 6.1.3 Stage 1: Actors 284
Appendix 6.2 Stage 2 Analysis 288
Appendix 6.2.1 Stage 2: Cases 288
Appendix 6.2.2 Stage 2: Actors 289
Appendix 7 Description of cases nominated by Stage 2 Respondents 292

Bibliography 296

List of Figures

		Page
Figure 2.1.	Three types of problem-solving strategies (redrawn from Funtowicz & Ravetz, 1991: 145).	37
Figure 2.2.	Different kinds of uncertainty (after Wynne, 1992a: 114-119).	41
Figure 2.3.	A linear model of the environmental risk policy process where 'science speaks truth to power' (adapted from Jasanoff & Wynne, 1998: 8).	47
Figure 2.4.	A democratic/contextual model of the environmental risk decision-making process.	59
Figure 2.5.	A systematic model for understanding and evaluating participatory risk appraisal processes.	78
Figure 3.1.	A diagrammatic representation of a hypothetical epistemic community and actor-networks within it; defining how it relates to environmental risk issue-areas (around which issue networks exist), individual policy processes (around which policy networks exist), and specific analytic-deliberative processes (cases).	100
Figure 3.2.	An overview of the research approach.	106
Figure 3.3.	The Stage 1 interview guide.	113
Figure 3.4.	The Stage 1 analysis process.	116
Figure 3.5.	The Stage 2 interview guide.	123

List of Tables

Page

Table 2.1. Key characteristics relating to the technical and cultural rationality of risk (adapted from Plough & Krimsky, 1987). 44

Table 2.2. The main types of technical assessment used in environmental risk. 49

Table 2.3. General dimensions of environmental risk assessment summarising traditional practice and emerging best practice in relation to current challenges. 52

Table 2.4. A summary of different techniques and practices for integrating deliberation (participation) and analysis (science). 76

Table 3.1. The Stage 1 interview panel: summarising each respondent's identifying code, actor type, sector, gender, age, and the date and duration of interview. 112

Table 3.2. The issue-areas in which citizens and stakeholders are being engaged in environmental risk decision processes in the UK, as identified by the Stage 1 interview panel. 118

Table 3.3. The Stage 2 interview panel: summarising each respondent's identifying code, actor type, sector, gender, age, and the date and duration of interview. 121

Table 4.1. Actors identified by Stage 1 respondents as having the knowledge, skills and capabilities in relation to participatory risk appraisal in the UK. 131

Table 4.2. Actors identified by Stage 1 respondents as being important and influential in relation to participatory risk appraisal in the UK. 136

Table 4.3. Actors identified by Stage 2 respondents situated in the area of radioactive waste management as having the knowledge, skills and capabilities and/or being important and influential in relation to participatory risk appraisal in the UK. 145

Table 4.4. Actors identified by Stage 2 respondents situated in the area of municipal waste management as having the knowledge, skills and capabilities and/or being important and influential in relation to participatory risk appraisal in the UK. 148

Table 5.1. A comparative analysis of current PRA practice in the area of radioactive waste against the ideal type model of participatory risk appraisal outlined in Chapter 2. 176

1 Introduction

The need to democratise the dominant role of scientific expertise and instrumental forms of rationality in modern society has remained a central concern of key social and critical theorists over the past half a century (e.g. Foucault, 1973, 1980; Habermas, 1971, 1984, 1987; Beck, 1992). This need is particularly acute in areas of environmental technology and risk where a technocratic mode of decision-making remains the dominant institutional response to such issues across western democracies. The technocratic worldview, rooted in ideas of reductionism and positivism, sees science as a higher knowledge form. When played out in institutional settings it can be seen to serve a legitimatory or justificationalist role (Collingridge, 1982; Stirling, 1997) that shields scientific institutions from political pressure from below (Laird, 1990), thus upholding an elitist knowledge hierarchy and reinforcing the existing social order (Fischer, 1990). This science-centred view constructs citizens as ignorant, irrational, and lacking legitimate expertise in the face of environmental risks, thus posing a fundamental barrier to citizen participation (Irwin, 1995; Fischer, 2000).

This dominant institutional response to environmental risk issues is becoming increasingly problematised in late modern society. For Beck (1992) and Giddens (1990, 1991) this is a period where the scientific truths of modernity have given way to radical doubt, uncertainty, reflexivity and anxiety. The dominance of science in environmental risk policy debates under the technocratic mode leads to its contestation in the public sphere, thus exposing its limitations and bringing about a wider erosion of trust in scientific institutions (Beck, 1992). This rise of counter scientific debate, where different groups dispute the judgements and assumptions embedded within the environmental scientific research of others, exposes the subjective and conditional nature of science (Jasanoff, 1990; Ozawa, 1991; Yearley, 1992). In 'post-normal' environmental risk contexts, where facts are uncertain, values in dispute, stakes high and decision urgent, 'normal' science associated with the technocratic mode can be seen to break down in the face of natural systems complexities and social/ethical uncertainties that it can't understand (Funtowicz & Ravetz, 1992a; 1993a).

Within this context the very core of the technocratic approach is undermined creating possibilities for the wider democratisation of science. The case for democratisation has been considerably strengthened by work in the risk field and constructivist perspectives in the sociology of scientific knowledge (SSK) and public understanding of science (PUS). Early work in SSK showed science to be an inherently social practice where scientific 'facts' are loaded with social values that are framed by ideological and institutional influences (e.g. Latour & Woolgar, 1979). Under conditions of uncertainty non-scientists have just as much right to make such social judgements. Researchers in PUS have shown the technocratic view of the 'deficit model', which assumes the public to be 'ignorant' in matters of environmental risk, to be inherently flawed (Irwin, 1995; Irwin & Wynne, 1996). Responding to public discontent and distrust with 'more science' only serves to intensify conflicts surrounding environmental risks. Far from being ignorant or irrational, the unwillingness of publics to accept science is more accurately seen as a response to the irrelevance of its unstated social assumptions (Wynne, 1995). Public reactions to science are intimately tied to issues of trust, agency, and their view of institutions, rather than an ability to understand the facts (Wynne, 1996a). Furthermore, the public can be seen to actively construct their own environmental knowledge (Michael, 1992). In specific localities it is often lay knowledge that has a better understanding than the external scientific knowledge of experts (Wynne, 1991, 1992b; Fischer, 2000). As studies of lay/popular epidemiology have shown, where they feel the need, citizens are more than capable of producing their own systematised knowledge based on their own experience (Brown, 1987, 1990; Brown & Mikkelsen, 1990).

This work in the fields of risk, SSK and PUS has developed powerful arguments, at the epistemological level, for the need to democratise science. The argument is that effective environmental risk decision-making under uncertainty ultimately depends on allowing citizens a legitimate and critical voice in opening up and (re)negotiating uncertainties/indeterminacies embedded within scientific practice (Wynne, 1992a). Importantly, this demands a fundamental restructuring the relationship between citizens and experts to one that is more symmetrical, interactive and constructive (Irwin, 1995; Fischer, 2000). Funtowicz & Ravetz (1992a; 1993a) have been particularly clear in describing possibilities for the democratisation of science. In post-normal situations they see a need for citizen and stakeholder involvement in scientific assessment through processes of 'extended-peer review' and the active contribution of 'extended facts'. However, although providing powerful rationales for democratising science these literatures don't offer any concrete perspective on what it should look like or how it should be done.

Despite an increasing number of exceptions (e.g. Burns & Ueberhorst, 1988; Ozawa, 1991; Irwin,1995; Stern & Fineberg, 1996; Petts, 1997; Fischer, 2000) there remains a gap running through the academic literature when it comes to understanding the relations between science and participation at a more detailed level. From the perspective of science, despite the significant attention given to understanding the relations between science and the policy process in the social science literature (see for example: Jasanoff, 1987, 1990; Renn, 1995; Shackley & Wynne, 1995),

> "the almost exclusive focus of these studies on the modalities according to which governments, their agencies, as well as courts of law, have used expertise for decision-making, has resulted in a lack of attention to the display of expert knowledge in controversist space *per se*, that is participant groups in a public forum" (Limoges, 1993: 419).

Whereas if we look from the perspective of the burgeoning participatory literature it is evident that,

> "[almost] all research that has sought to identify the determinants of successful public participation in environmental decision-making has focused on process-oriented social goals... not the role of science" (Charney, 2000: 4).

There are number of reasons that account for this gap in the literature, not least disciplinary biases. Probably the most significant reason, however, is simply that citizen and stakeholder participation in scientific assessment and appraisal processes has become seen as important only very recently. Most effort to date has been concerned with involving people in value and interest debates, typically around decisions at the 'end' of policy processes (*i.e.* participatory decision-making), meaning that the role of participation in *understanding* environmental risks and *informing* decisions (*i.e.* participation *within* assessment and decision-making) has been relatively neglected (Lynn, 1990; Shrader-Frechette, 1995; Stern & Fineberg, 1996; Perhac, 1998; Petts & Leach, 2000; Fischer, 2000). In this sense, even innovative forms of participation in environmental risk have tended to operate after the policy process has been framed and constrained by experts. Wynne shares this perspective in noting extend-peer review, and the (re)opening of cognitive commitments in science, as an area where the fields of SSK, PUS and participation could usefully converge,

> "Very little of the voluminous work down the years on participation in science and technology has addressed these dimensions, remaining instead at the cruder level of competing interests and rights, where scientific knowledge remains substantially unproblematised except in notions of deliberate political manipulation" (Wynne, 1995: 387).

This situation does appear to be changing however. Over the past decade or so we have begun to see what could be termed a 'participatory turn' in relation to formal assessment approaches to environmental risk. At a more practical level, citizens and stakeholders are being engaged much more interactively with aspects of science. This 'turn' appears to be cutting across most formal assessment approaches including: constructive or participatory technology assessment (e.g. Joss & Durrant, 1995; Joss, 1999; Hennen, 1999; Hörning, 1999, Europta, 2000); participatory approaches to cost-benefit analysis (e.g. Niemeyer & Spash, 2001); deliberative multi-criteria analysis (e.g. Stirling, 1997, 1998); participatory integrated assessment (e.g. Bailey *et al.* 1996; Dürrenberger *et al.*, 1997; Darier *et al.* 1999a,b; Darier & Schule, 1999; Kasemir *et al.* 2000); and participatory risk assessment (e.g. Fischer, 1995; 2000; Stern & Fineberg, 1996; Perhec, 1998).

Participatory assessment approaches are particularly developed in the area of environmental risk generally, and risk assessment in particular. A key area of development has been the analytic-deliberative approach to environmental risk decision-making as proposed by US National Research Council (NRC) in their report on *Understanding Risk* (Stern & Fineberg, 1996). A key feature of this framework is the emphasis on the involvement of citizens and stakeholders early on, and through out, the framing, assessing and evaluation stages of the environmental risk decision-making process. These are stages that have traditionally been the exclusive preserve of experts. The other key feature is the emphasis on an integrative and interactive relationship between analysis (science) and deliberation (participation) at all stages in the process. It is this analytic-deliberative practice that forms a key focus of this thesis. For reasons explained later in Chapter 2, I define this practice as participatory risk appraisal.

Questions on the integration of participation and assessment, or the need to combine technical expertise with public values (Stern, 1991), are not new. Such questions have underpinned some of the earliest initiatives of citizen participation in science and environmental risk, stretching back over three decades (Dienel, 1978; OECD, 1979; Nelkin & Pollak, 1980; Crosby, 1986; Burns & Ueberhorst, 1988; for comprehensive review see Irwin, 1995). The significant point in the context of this thesis is the fact that much of the innovation in this field has occurred outside of the UK, in other parts of Europe and the US (e.g. Renn *et al.* 1991, 1993, 1995; Joss & Durrant, 1995; Stern & Fineberg, 1996). For example, participatory risk assessment practice in the UK is considered to lag at least 10 years behind that of the United States (Stirling, 1998; ILGRA, 1998). The signs are that this is beginning to change however.

One indication of a move towards the more active engagement of citizens in science-intensive policy processes is emerging policy guidance from bodies such as the Royal Commission on Environmental Pollution (RCEP, 1998), The House of Lords Select Committee on Science and Technology (House of Lords, 2000), and the Economic and Social Research Council / Green Alliance (ESRC/Green Alliance, 2000). These reports have all called for more direct involvement and inclusion of public values alongside technical considerations in environmental decision-making. The Royal

Commission on Environmental Pollution in their 21st Report on Setting Environmental Standards has stated,

> "governments should use more direct methods to ensure that people's values, along with lay knowledge and understanding, are articulated and taken into account alongside technical and scientific considerations" (RCEP, 1998: 104, para 7.17).

Two years later the House of Lords Select Committee on Science and Technology in their report on *Science and Society* added,

> "direct dialogue with the public should move from being an optional add-on to science-based policy making... and should become a normal and integral part of the process" (House of Lords, 2000: para 5.48).

There are indications that decision-making institutions are beginning to develop initiatives along these lines. One instance of particular relevance in the area of environmental risk is the Environment Agency's Participatory Risk Assessment project (Homan *et al.* 2001; Petts *et al.* 2003). This project has attempted to trial methods that involve citizens and stakeholders in the framing and assessing stages of the regulatory risk assessment process.

The main aim of this thesis is to offer perspectives on the democratisation of science in the UK. It does this through focusing on the analytic-deliberative practice of participatory risk appraisal, the nature of which has been briefly outlined above. Two key aspects of this are to explore how practice is currently developing in the UK and what effective practice means in this context. In order to achieve this the thesis relies on a third key aspect of a network approach, which is important as an area of inquiry in its own right. The conceptual framework that underpins this network approach draws significantly on the concept of 'epistemic communities' (Haas, 1989, 1990, 1992; Adler, 1992; Adler & Haas, 1992; Sebenius, 1992). Haas (1992: 3) defines an epistemic community as "a network of professionals with recognised expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue area". In this sense those associated with a democratic mode of environmental risk decision-making in the UK, or more specifically the networks of professional actors currently pushing forward participatory risk appraisal practice, could possibly collectively belong to an epistemic community.

One reason for adopting a network approach in the thesis is so that I can enter, gain an overview of, and navigate through, the emerging area of participatory risk appraisal in the UK. The main reason, however, is the means by which existing understandings of citizen and stakeholder engagement in environmental risk policy process have been captured in the academic and practitioner literature. The first, and most popular, means is through single case examples, be they participatory experiments (e.g. Dürrenberger *et al.*, 1997; Darier *et al.* 1999b; Bailey *et al.* 1999; Yearley, 1999, 2000) or case studies of 'policy for real' processes (e.g. Ozawa, 1991; Limoges, 1993; Renn *et al.* 1993, 1999; Webler *et al.* 1995, 2001; Petts, 1997; Guston, 1999; Kinney & Leschine, 2002). A second means by which understandings have been captured involve accounts at the organisational level (Stern & Fineberg, 1996; Twigger-Ross & Smith, 2000). This thesis builds on, and makes a concerted attempt to capture, such experimental, case-based, and organisational learning experiences in relation to participatory risk appraisal through working at the broader level of professional networks developing in the UK. Through involving professional actors in in-depth reflection it is possible to gain an overview of developments in participatory risk appraisal practice, wider social learning, and the democratisation of science. Adler *et al.* (2000) and Yosie and Herbst (1998) engaged professional actors in the US in a similar way through interviews and focus groups to capture their views on effective analytic-deliberative practice. Such a study, where professional actors reflect on analytic-deliberative practice, is without precedent in the UK context.

1.1 Research Themes and Questions

As outlined above, the main aim of this thesis is to offer perspectives on the democratisation of science in the UK. Related to this overall aim are three main research themes, each with key research questions within them. The first research theme focuses on the actor-network or the possible epistemic community that is currently building up around participatory risk appraisal in the UK and the nature and extent of social learning that is occurring between actors within it. The second research theme focuses on current participatory risk appraisal practice in a specific environmental risk issue area in the UK, through assessing the nature and extent of practice and the impact of the epistemic community on decision-making institutions. The third research theme focuses on the beliefs of community members in relation to effective participatory risk appraisal practice. Each of these themes will now be discussed in greater depth.

Research Theme 1: Networks and social learning

This first Research Theme focuses on the actor-network (or possible epistemic community) that is building up around participatory risk appraisal in the UK. It considers the extent, nature and character of the community that is currently forming, the members who make up the community, and how they relate to each other. It also focuses on the nature and extent of social learning that is currently occurring within the community through analysing processes by which ideas circulate and shared understandings are developed between professional actors within it. This ultimately provides a partial indication of the degree to which actors and institutions faced with making difficult environmental risk decisions under uncertainty are actually learning to engage publics and stakeholders more effectively. Through going beyond case based and organisational accounts this theme potentially offers novel perspectives on the potentials for democratising science within the UK environment-risk domain.

Three key research questions relate to this theme:

- Is it possible to identify an actor-network currently developing around participatory risk appraisal in the UK and to what degree does this network represent an epistemic community?

- What is the extent, nature and character of this epistemic community and what kinds of relationships exist between actors within it?

- What is the nature of social learning occurring between actors within this community and to what extent are they learning to engage citizens and stakeholders more effectively in response to environmental risk issues?

Research Theme 2: Current participatory risk appraisal practice

This second research theme focuses on current participatory risk appraisal practice in a specific environmental risk issue-area in the UK. The theme partly centres on tracing the evolution of the epistemic community in a specific UK environmental risk issue-area through analysing how community members are building relationships with key decision-making institutions and potentially influencing their beliefs and behaviour. The theme also assesses the nature and extent of current participatory risk appraisal practice within the issue-area. This analysis offers a possible means of gauging the extent to which an epistemic shift from a technocratic to a democratic mode of decision-making has occurred, and the extent to which science has been democratised. Or in other words, the degree to which key actors within the area are learning how to make decisions on complex and uncertain environmental risk issues.

Three key research questions relate to this research theme. In relation to a specific environmental risk issue-area in the UK:

- How, and to what degree, has the epistemic community evolved?

- To what extent are members of the epistemic community influencing the beliefs and behaviours of decision-making institutions, and influencing the shape of policy processes?

- What is the nature and extent of current participatory risk appraisal practice?

Research Theme 3: Effective participatory risk appraisal practice

This third research theme focuses on the beliefs of community members in relation to effective participatory risk appraisal practice. The theme makes two important contributions to the thesis. First, it provides further insights into the degree to which shared understandings and beliefs about participatory risk appraisal are developing between actors within the community (in comparison to Research Theme 1). Second, the analysis contributes to current understanding of what constitutes effective participatory risk appraisal practice. It represents an attempt to develop principles of effectiveness from the grounded perspectives of practitioners involved in the study, based on their own experiences. The analysis centres on competence, the specific focus of which emphasises questions of knowledge, expertise and science in relation to deliberative and inclusionary processes. It therefore provides an insight into how ideas of competence are being negotiated between members of the epistemic community.

Two key research questions relate to this theme:

- To what degree are shared understandings and beliefs about effective participatory risk appraisal developing between actors within the epistemic community?

- Can principles of effective participatory risk appraisal practice be identified from the grounded perspectives of community actors?

1.2 Thesis structure and content

The following Chapter develops the theoretical basis for the active involvement of citizens and stakeholders in highly complex and uncertain environmental risk policy processes. It begins by considering powerful critiques of expert-scientific knowledge developed over the past three decades, that provide epistemological rationales for the democratisation of science. Key characteristic features of the technocratic mode of decision-making are then considered, before outlining an alternative democratic model of environmental risk decision-making through drawing on and further developing emerging literatures that underpin it. Current understanding of effective participatory risk appraisal practice is then reviewed and existing evaluative frameworks considered.

In Chapter 3 the methodological approach employed in the thesis is introduced. First the conceptual framework than underpins the network approach adopted is presented, drawing in particular on the concept of epistemic communities (Haas, 1992; Adler & Haas, 1992), before considering what social learning means in this context. An overview of the three stage research methodology adopted is then given before describing in-turn how each stage was conducted, detailing the research approach, along with methods of data collection and analysis.

Chapter 4 presents an analysis of the network that is currently building up around participatory risk appraisal in the UK and the degree to which social learning is occurring between professional actors within it. First, an analysis of the extent, nature and character of this possible epistemic community is presented, describing the actors within it and how they relate to each other, both across the UK and in the area of waste management specifically. The processes of social learning currently occurring between professional actors within the epistemic community are then considered through analysing the circulation of ideas through the network and assessing whether shared understandings are developing between professional actors. This ultimately provides an partial indication of the degree to which actors are actually learning to engage publics and stakeholders more effectively.

Chapter 5 focuses down on the area of radioactive waste management to analyse how the epistemic community is influencing decision-making institutions and shaping environmental risk policy processes within the area. First, the evolution of the epistemic community in the area of radioactive waste is traced through presenting an analysis of how members of the epistemic community are building relationships with key decision-making institutions potentially influencing their beliefs and behaviour. The second part of the Chapter attempts to better understand how the epistemic community has influenced the shape of radioactive waste decision-making processes through presenting an analysis of the nature and extent of current participatory risk appraisal practice in the area. This analysis considers the extent to which an epistemic shift from a technocratic to a democratic mode of decision-making has occurred.

In Chapter 6 we take a step back to look at the actual content of learning that has taken place within the epistemic community and consider the degree to which shared understandings about participatory risk appraisal are developing between community actors. The analysis centres on competence, the specific focus of which emphasises questions of knowledge, expertise and science in relation to deliberative and inclusive processes. The first part of the Chapter considers interview respondents' perspectives on effective practice based on four themes of effective participatory risk appraisal:

- the overall shape of the analytic-deliberative process;
- the nature and role of science/analysis within the process;
- access to information and specialist expertise; and
- the nature of deliberation.

The second part of the Chapter offers further insight into the epistemic community's beliefs about effective PRA through briefly reflecting on the deliberations of community members in a workshop process.

Chapter 7 aims to synthesise emerging findings from across the thesis to reflect on the three research themes and questions and offer concluding perspectives. The first part reflects on methodological themes emerging from the thesis, in particular the specific challenges that have arisen through closely studying a network that is currently emerging and some of the possible benefits of this. We then turn to the epistemic community itself drawing together final conclusions on its nature and character from across the three empirical chapters and considering how it might develop in the future. Finally, perspectives on the democratisation of science in the UK are considered through reflecting on participatory risk appraisal practice. This reflection considers the extent to which science has been democratised in terms of current practice in the area of radioactive waste, before considering community beliefs on effective participatory risk appraisal and prospects for future practice.

2 Participatory environmental risk appraisal: theoretical perspectives and current understandings

This chapter maps out the theoretical basis for the active involvement of citizens and stakeholders in highly complex and uncertain environmental risk policy processes, with particular emphasis on various forms of risk assessment and appraisal embedded within them.

Section 2.1 considers powerful critiques of expert-scientific knowledge and its role in environmental risk decision-making, developed over the past three decades or so, that stress the need to democratise risk science. Drawing on contemporary social theory and constructivist accounts of science in society, two conceptual schema are presented to analyse the expert/non-expert relationship and explore possibilities for citizen involvement in scientific assessment processes. The theoretical perspectives presented in Section 2.1 provide significant rationales, at the substantive and epistemological level, for citizen and stakeholder participation in technical environmental risk decision processes, and point toward a discursive theory of knowledge.

The technocratic mode of decision-making, which remains the dominant institutional response to environmental risk issues throughout western democracies, is summarised in Section 2.2. Key features of technocratic practice are outlined before summarising the main formal assessment approaches employed in environmental risk contexts, the deficiencies associated with these technical-analytic approaches, and emerging best practice in relation to them.

Section 2.3 then draws on and further develops emerging literatures that are beginning to establish what a democratic mode of environmental risk decision-making might look like. First, the various arguments for active citizen and stakeholder involvement in technical environmental risk decisions are outlined by situating the rationales developed in Section 2.1 within the wider participatory literature. A contextual model of the environmental risk policy process is then presented to describe the analytic-deliberative practice of participatory environmental risk appraisal, defining the potential roles of different actors within it, before reviewing existing approaches to citizen and stakeholder participation in environmental risk. Current understanding of effective participatory risk appraisal practice is then reviewed in Section 2.4.

2.1 Scientisation of the policy process and the need for democratisation

2.1.1 Citizens and experts in the Risk Society

The claims of Beck (1992) and Giddens (1990, 1991), that late modern society is undergoing a period of change where the 'truths' of modernity have given way to radical doubt, uncertainty, reflexivity and anxiety, provide an important context in which to view current developments within the environmental risk field. Although Beck's thesis is in many ways the more relevant here, focusing on expert-science and its use, both can be taken together. Beck identifies (environmental) risk as the dominant organising principle in contemporary industrial societies, which increasingly preoccupies social and political discourse. Characteristic of this 'risk society' is the imperceptibility of modern risks (such as radioactivity), the only form of detection being expert-scientific assessment. As science becomes elevated to a 'higher form of rationality' experts become central to environmental risk debates, thus environmental policy becomes 'scientised'. The politics of risk emerges as a politics of knowledge, creating tensions between experts and non-experts.

Related to this tension is the credibility of expertise. The profile and politicisation of science brings about its contestation in public spheres through the rise of 'counter-science' creating an emergent awareness of the limitations of scientific expertise throughout society. Traditional claims of science no longer hold, as Giddens (1990: 21) states,

> "the reflexivity of modernity actually undermines the certainty of knowledge, even in the core domains of natural science".

One symptom of this is a wider erosion of trust in the dominant institutions whose legitimisation has traditionally relied on this (increasingly) discredited expert knowledge. Thus, it could be said that "*sciences' monopoly on rationality is broken*" (Beck, 1992: 29, authors emphasis) - modernist dichotomies, such as nature/society, no longer hold. As Beck (1992: 9-10) puts it,

> "scientific rationality without social rationality remains *empty*, but social rationality without scientific rationality remains *blind*".

Central to the work of Beck and Giddens is the notion of reflexivity. This holds important potentialities and opportunities for the democratisation of science. Of relevance is the argument for an alternative science in which science changes itself through 'reflexive scientisation' (Beck, 1992). However, although Beck recognises a need for broader societal involvement the fundamental driver of reflexive scientific reform is through internal expert critique or 'counter-expertise'. This highlights an aspect of the Beck/Giddens argument that has been so comprehensively criticised for being too rationalist and too cognitivist. For instance Wynne (1996a), in a powerful constructivist critique, has taken Beck and Giddens to task for asymmetrically privileging scientific knowledge, while ignoring the cultural/hermeneutic truths of lay actors, and the possibilities they bring to the reform of dominant scientific institutions and decision-making practices.

Wider social theories of Beck/Giddens provide high level critiques of scientific expertise, stress the importance of credibility and trust issues, and identify the need to find new ways of carrying out environmental risk assessments that embrace reflexivity and democratise the process. However, their insights severely lack any real resolution on knowledges, both scientific and non-scientific.

2.1.2 Science, environmental knowledge(s) and the citizen-expert relationship

A body of work has emerged over the past three decades or so that focuses on questions of knowledge and provides valuable empirical material to further substantiate the rather generalised insights of Beck/Giddens. The core of this work involves situated studies using constructivist research approaches in science studies, the sociology of scientific knowledge (SSK), and more recently the public understanding of science (PUS). This work is supported by social scientific studies in the risk field that have at times overlapped with and complemented developments in PUS. Taken together, these alternate literatures provide critical insights into: the social, conditional and heterogeneous nature of science; fundamental differences between scientific and lay knowledges; processes by which citizens respond to scientific expertise; and the experiential nature of lay/local knowledge held by citizens. In sum they present powerful arguments for the need to draw on citizens' understandings and knowledges in understanding environmental risks.

According to the conventional view, science is an objective, rational, value-free enterprise that explains reality by empirical falsification through experimentation, observation and hypothesis testing of causal generalisations (e.g. Popper, 1959). Representing a positivist epistemology, science is seen as a superior knowledge form, one that can draw universal generalisations across social and historical contexts. This is the view generally held by scientists and those sympathetic to its ideals, which included, until recently, most social scientists. For Beck (1992) this view is modernist in character.

This dominant view of science was turned on its head through the 1970s when a group of sociologists, developing an area of work in the sociology of scientific knowledge (SSK), began producing situated ethnographic accounts of scientific practice. Through entering laboratories and observing scientists at work these researchers have successfully exposed science as an inherently social practice where scientific 'facts' are constructed by people, and thus framed by values/subjectivities that relate to wider historical, ideological and institutional influences (e.g. Latour & Woolgar, 1979; Knorr-Cretina, 1981). Science emerges as a complex and heterogeneous form of human action. Scientific knowledge is thus socially constructed through an emergent *process*, the product of which attempts to hide the judgements, subjectivities and uncertainties embedded within it.

Rather than representing a dispassionate pursuit of truth, science and scientific methods can be seen to use social judgement to ensure that the constraints of laboratory conditions are recreated the external world – reality is actively shaped and organised to fit the scientific method (Latour, 1987). Science is also seen as situated in, and shaped by, its local contexts (e.g. laboratories, field study sites). Thus, the challenge confronting scientists is not how to gain access to universal phenomena but rather "how to standardise and generalise the achievement (of science) so that it is replicable in different local contexts" (Rouse, 1987: 22; cited in Clark & Murdoch, 1997). The power of science, and the basis of its universal claims, lies in the extent of its networks and ability to organise human/non-human actors within them, thus reshaping the world in its own image (Callon 1986; Latour, 1987). The significant realisation from SSK research is the need to explore more constructive relationships between scientific and other (experiential/lay) knowledges in specific localities. In effect this develops a case for citizen participation.

The interpretative nature of science, as seen from this constructivist perspective, underpins the politics of expertise and rise of counter-science surrounding environmental risk conflicts (documented, for example, by Jasanoff, 1990; Fischer, 1990, 2000; Ozawa, 1991; Yearley, 1992). It means that different groups can easily dispute technical and social assumptions embedded within the environmental scientific research of others, construct counter scientific evidence based on their own interests, or come to alternative interpretations of the data (Hannigan, 1995). Judgements and assumptions underlying technical assessments become publicly exposed.

Despite these transformations in how science is viewed, both in theory and in real life, the way that science constructs the public (*i.e.* 'sciences understanding of the public') throughout western democracies remains rooted in the conventional/positivist view of science. This science-centred view of society has been embedded in scientific discourses since their conception and continually reappear in contemporary accounts that promote the value of science, typified for instance by the Royal Society (1985). The response of scientific institutions to the key characteristics of late modernity (outlined in Section 2.1.1) - such as decreasing societal trust, acceptance and legitimacy of science - tends to centre on 'more communication' to better inform and educate the public in the ways of science in order to engender greater understanding and acceptance. Science is held as a higher form of rationality, whereas the public are assumed to be cognitively ignorant, their non-acceptance or criticism of science being a clear sign that they lack any real (technical) understanding. The blame for recent failures in communicating, and making decisions on, environmental risks lies with the public.

This dominant political paradigm[1] has been termed the '*deficit model*' of public understanding of science (Wynne, 1992b, 1995; 1996b; Irwin, 1995; Irwin & Wynne, 1996). A number of assumptions about the relationship between science and citizens underpin the model (Irwin, 1995: 14-28), including the notion that:

1. publics are ignorant in matters of science and environmental risk;
2. better understanding of science leads to better 'public and personal decisions';
3. science is value-free, the 'public face of science' filters out uncertainties, subjectivities and interpretations inherent within it in order to present a message that is clear and simple;
4. wider exposure to scientific ideas leads to greater public acceptance and support for science.

This deficit model has been continually mobilised in institutional responses to conflicts and protests around environmental risk and technological development. Countless examples exist of scientists' anxiety and frustration at the 'irrational' and 'emotional' publics' unwillingness to accept technical risk assessments (e.g. Fischer, 1990; 1993; 2000). We now turn to work in the risk field and constructivist PUS studies which suggests that simply reacting to such situations with more science serves to intensify the problems and conflicts surrounding environmental risks rather than resolve them.

[1] This is not to say that all scientists hold this worldview but as Irwin (1995: 14) states "it does provide a powerful and frequently reiterated case for the centrality of scientific reasoning and development".

Although not entirely removed from the science-centred view outlined above, risk perception research conducted throughout 1970s and 1980s has raised doubts about the deficit view of public understanding and provides explanations (other than mere ignorance or irrationality) for public reactions to environmental risks. The main body of work in this area has involved cognitive psychological investigations of an individual's risk perception, typically using questionnaires to elicit peoples' judgements of risk (expressed preferences) associated with different hazards or risk-related options (Fischhoff *et al.* 1978; Slovic *et al.* 1980; Slovic, 1987, 1992). Such research has shown expert risk perceptions to be more closely related with 'objective' risk estimates of quantitative risk assessments that calculate probability of a hazard occurring and magnitude of that occurrence in statistical form (e.g. expected number of fatalities per year). Non-expert risk judgements on the other hand were shown to be influenced by a range of contextual factors including the degree to which any given hazard is perceived to be: voluntary; controllable; familiar; visible; uncertain; potentially catastrophic; dreaded; fatal; man-made; equitable; risky to future generations; and so on.

These research findings clearly illustrate that lay risk perceptions (and to a lesser degree the perceptions of experts) factor in a large number of qualitative considerations and thus represent a departure from the view that risk can be reduced to any single metric or objective risk estimate. This view converges to a degree with findings from constructivist SSK studies outlined above in that risk is seen to be socially constructed. Public understandings of environmental risks are shown to be inherently complex and multidimensional in nature.

This work carried out under the so called psychometric paradigm has prompted initial interest in, and development of, the area of risk communication, the subject of which will be returned to later in this chapter. Psychometric work is not without its deficiencies however. In addition to methodological problems, psychometric studies have been criticised for their lack of integration into the social and cultural context (Löfstedt & Frewer, 1998) and their limited explanation of the cultural processes underlying public understandings of risk (Royal Society, 1992; Krimsky & Golding, 1992). As Plough and Krimsky (1987: 8) note,

> "psychometricians [have] isolated the cultural factors and treated them as another variable in an experimentally derived technical framework... [rather than] explore the cultural underpinnings of risk perception".

Constructivist PUS studies developed through the late 1980s and early 1990s have gone much further in explaining these cultural underpinnings. Through developing critical SSK approaches this work has produced accounts of science in society both in terms of science's (mis)understanding of the public, and how citizens view, understand, and relate to science in the context of environmental risk controversies and everyday life. A key feature of this work has been the realisation that:

> '[S]cience... offers a framework which is unavoidably *social* as well as technical since in public domains scientific knowledge embodies implicit models or assumptions about the social world. Thus, whilst claiming to stand apart from the rest of society, science will reflect social interests and social assumptions' (Irwin & Wynne, 1996a: 2-3, authors' emphasis).

When people come into contact with science, such social assumptions are revealed, particularly in contentious situations. In this sense science is seen above all else as serving social interests no matter what the actual motives of those producing or communicating it (Irwin, 1995). Importantly, given that science's (unstated) view of society is often at odds with the individual social interests, values and identities of those that encounter it, it is not surprising to find public alienation and resistance. Research has shown that scientific institutions routinely fail to reflexively identify these social dimensions of science even in the face of negative public reactions (e.g. Wynne, 1992b,c, 1996b). It is clear then that "public readiness to understand science is fundamentally affected by whether the public feels able to identify with science's unstated prior framing" (Wynne, 1995: 377). Publics may also ignore, even ridicule, science because they regard it as irrelevant (Wynne, 1989; Irwin 1995). This is particularly the case where social assumptions held by science are seen to be naive or unrealistic compared to people's lived experience.

Public reactions to science also depend crucially on models of human agency and dependency. Contrary to the view of most experts, citizens often do not have the freedom or power to use scientific information and where they do have a choice they may be unwilling to risk the consequences of testing their power (Wynne, 1995). Michael (1992) has shown that rather than representing public ignorance, people's variable interest in and ambivalence towards science partly relates to the fact that their social agency is chronically uncertain. Related to this is the observation that publics sometimes construct their own 'ignorance' through actively avoiding scientific information. This may happen for a number of reasons. The adoption of scientific knowledge could be socially dangerous for certain individuals if it leads to conflict within a community (Michael, 1996); scientific information may be seen to promote the interests of those providing it (e.g. information on radiation from the nuclear industry, see Michael, 1992), whereas in a collaborative division of labour between volunteers and scientists people might be happy to leave science to the experts (e.g. when monitoring radon levels within their homes, see Wynne *et al.* 1990). When viewed this way ignorance is not a cognitive vacuum, as assumed by the deficit model, but an active construct that depends on one's (varying) social position, division of labour and dependency, in relation to science.

A significant insight of constructivist PUS studies is the critical importance of trust in shaping in public understanding of, and reaction to, science. Public responses to science depend on experiences and perceptions of relevant institutions or social actors, rather than simply upon their understanding of technical information (Wynne, 1992b; 1995). Uptake of information thus depends on the credibility or trustworthiness of the source of that information, and this judgement is dependent on contemporary and historical performance and reputation of the institution. However, Wynne (1992b; 1996a,b) has argued that were the public have a lack of agency in relation to, or feel dependent on, particular institutions their perceived trust can be seen as virtual or 'as if trust'.

A number of these themes are demonstrated in Wynne's now famous study of the interactions and conflicts between sheep farmers and government scientists in Cumbria UK following radioactive contamination from the Chernobyl nuclear accident in May 1986 (Wynne, 1991, 1992a, 1996a,b). A key theme relates to the nature of lay or local knowledge and its relation to scientific expertise. Wynne's study illustrates the inherent differences between expert and lay knowledges and conflicts between their respective epistemologies. The farmers' 'specialist' local knowledge understood the multidimensional complexity of the situation and adapted to it, in stark contrast to the scientists dependence on prediction and control. Wynne powerfully illustrates the possible role of lay publics in judging the validity of scientific commitments that are universal and insensitive to local conditions. He shows that this possible role of lay knowledge was ignored by the scientists, leading to their continuing failure to manage the controversy.

Citizens can be seen, then, to actively construct their own understanding and knowledge of environmental risk situations. More broadly lay knowledge has been variously termed 'common sense' (Lindblom & Cohen, 1979), 'experiential' (Heron, 1992), and 'informal' or 'contextual' knowledge (cited in Fischer 2000: 179). In contrast with reductionist scientific knowledge of experts, local/lay knowledge is:

- organised in narrative form and expressed through everyday language, storytelling, and imagery, thus remaining situated and interpreted within the specific culture within which it is produced (Fischer, 2000).
- contextual, constructed by bricolage (learning through doing), open to regular rethinking and alteration, and based on people's own experiences and observations that offer well tested models of complex (local) realities (Irwin, 1995).

Studies in the field of risk and PUS have also shown that where they feel the need, citizens are more than capable of constructing and systematising their own active local knowledge. This has been shown for instance through studies in lay or popular epidemiology (Brown, 1987, 1990; Brown & Mikkelsen, 1990) and the case of the 2,4,5-T as discussed by Irwin (1995). In addition, significant evidence of the active ability of citizens to understand, assess and develop science in complex and uncertain environmental risk contexts has been illustrated through a series of 'participatory experiments' that have emerged in recent years (some of which are considered in Section 2.3).

Constructivist PUS research argues, and lays the theoretical foundations for, what might be alternatively termed an *interactive* (Layton *et al.* 1993), *democratic* (Durrant, 1999), or *contextual* model of PUS. It is clear then that any attempt to democratise science that isn't reflexive in the face of inherent limitations in science, or doesn't understand and act upon the complex multifaceted knowledges held by citizens, is likely to fail. The need is for an (appropriately) symmetrical relationship between expert and lay knowledge, as Wynne states,

> 'The romantic seductions of local knowledges and identities do not come as an *alternative* to modernity's ahuman and alienating universals, but as an inspiration to find the collective self-conceptions which can sustain universals that do not bury the traces of their own human commitment and responsibility' (Wynne, 1996a: 78).

Which knowledges may be more applicable in specific situations cannot be determined in advance, but to begin from a position of symmetry is a matter of principle. The main point is to neither reify scientific or lay expertise, but embrace the plurality of knowledges and perspectives that relate to environmental risk issues within specific contexts (Irwin, 1995).

2.1.3 Conceptualising the relations between scientific and non-scientific expertise

The above situated accounts provide a powerful critique of expert-scientific knowledge, illustrating the conditional nature of scientific knowledge, tensions and differences between experts/non-experts and the importance of local/lay knowledge in understanding environmental risks. The majority of these findings, however, are drawn from specific case studies. The aim of this section, then, is to describe two conceptual schema that pull together the above findings to provide analytical frameworks for clarifying the possibilities and opportunities for the expert/non-expert relationship in participatory appraisal processes. The first attempt at such a framework is Funtowicz & Ravetz's 'post-normal science' which in fact proceeded, or was developed in parallel to, many accounts in Section 2.1.2. We then turn to Wynne who has offered a framework that builds more directly on constructivist accounts. The notion of uncertainty emerges as a fundamental organising principle in both frameworks.

2.1.3.1 Post-normal science: a new political epistemology for the democratisation science?

The concept of post-normal science (PNS), as developed by Silvio Funtowicz and Jerome Ravetz, could be regarded as a new political epistemology for science. PNS was first outlined in the mid-1980s (Funtowicz & Ravetz,1985) before being written through in the book *Uncertainty and Quality in Science for Policy* (Funtowicz & Ravetz, 1990), and has since been presented to various disciplinary audiences (Funtowicz & Ravetz, 1991; 1992a; 1994a,b) including the field of risk assessment (e.g. Funtowicz & Ravetz, 1992b; 1993b).

Funtowicz and Ravetz have proposed that in response to policy issues of risk and the environment a new form of 'post-normal' science is emerging. The term, 'post-normal' has more than a passing reference to the classic work of Kuhn (1962) who defined 'normal science' as a state in which uncertainties are automatically managed (or constrained), values are unspoken, foundational assumptions hidden, and where fuzzy socio-political problems tend to be converted into neat tractable analytical puzzles. However, the insight of post-normal science, is that in the present environmental risk policy climate where 'facts are uncertain, values in dispute, stakes high and decision urgent', conditions are far from 'normal'. Thus normal science can break down in the face of environmental risks, owing to factors such as data inadequacies and poor understanding of complex phenomena (Funtowicz & Ravetz, 1992a; 1993a). Distinctions between 'hard' objective facts and 'soft' value-judgements characteristic of traditional forms of environmental risk decision-making become inverted. Today it is environmental risk decisions that are hard, being based on soft (highly uncertain) scientific evidence.

Funtowicz and Ravetz believe that we can now invert Latour's well known metaphor and think of 'Nature as reinvading the lab' (Funtowicz & Ravetz, 1992a). This can be seen to be occurring in more ways than one. Firstly, a science-based technology that once appeared dominant over Nature, is now seen to be dependant on (and embedded in) a larger ecosystem, in which perturbations can risk catastrophic destruction. Secondly, is the increasing realisation of a social nature, a nature which traditional science cannot comprehend. Thirdly, the inherent complexities and dynamicity of nature 'reinvade' traditional (laboratory) science and expose it as an incomplete knowledge form.

Funtowicz and Ravetz locate PNS, in relation to traditional forms of problem solving strategy, on what is now a classic diagram[2] (Figure 2.1). The two axes are represented by systems uncertainty (*i.e.* comprehension of an inherently complex reality) and decision-stakes (*i.e.* costs, benefits and value commitments of various stakeholders in the issue)[3]. Where both are low we are in the realm of *applied science*, where systems uncertainties are dealt with at the *technical* level using standard ('normal') techniques. Where decision stakes or uncertainties are 'higher', uncertainties exist at the *methodological* level involving more complex aspects of information such as reliability or values. Here "personal judgements depending on higher-level skills are required, and the practice in question is a *professional consultancy*, a 'learned art' like medicine or engineering" (Funtowicz & Ravetz, 1992a: 259).

The realm of post-normal science exists when either stakes, uncertainties, or both are high (see Figure 2.1). Uncertainties are of the epistemological kind and decision stakes reflect conflicting purposes among stakeholders. As explained above, 'normal' methods are inadequate here. Irremediable uncertainty is at the core of any problem

[2] The authors stress that this schema is no more than a heuristic tool, where dimensions do not represent any quantifiable reality. They also note that Figure 2.1 should be seen dynamically, with different aspects of the problem, located in different zones, interacting with each other to create solutions – a case in point is the evolution of policy issues (Funtowicz & Ravetz, 1993a).

[3] Here the innovation is the acknowledgement of an interteraction between the epistemic (knowledge) and the axiological (values). Traditionally uncertainty and decision stakes have represented the very opposite what characterised science - *i.e.* science as truth and science as objective knowledge (Funtowicz & Ravetz, 1993a: 740).

and ignorance (or ignorance of ignorance) impacts on possible solutions. Uncertainties can be seen as going beyond those of closed systems to incorporate morals and ethics. Thus, the traditional distinction of facts/values is not simply inverted, the two are inherently intertwined and inseparable.

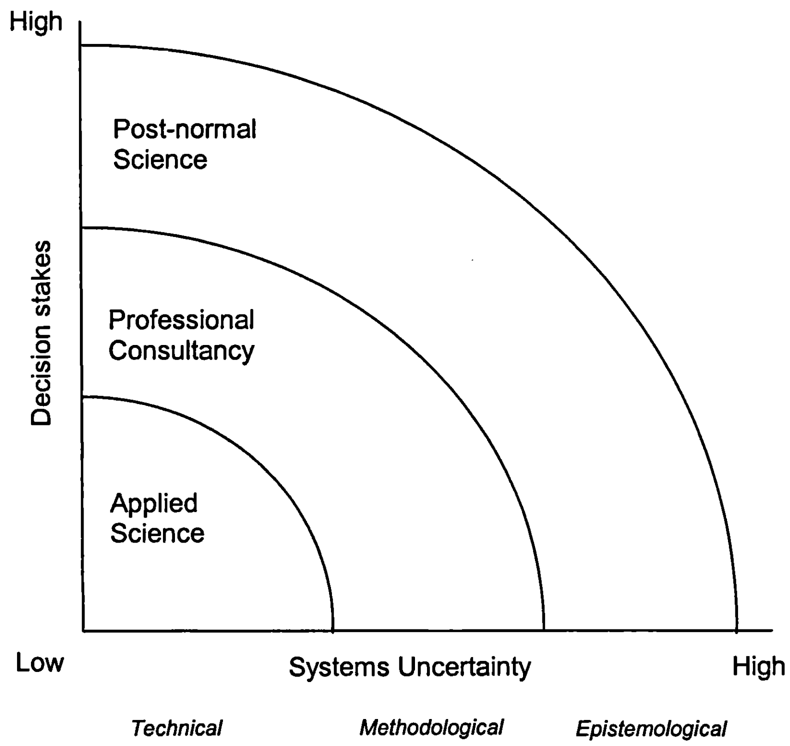

Figure 2.1. Three types of problem-solving strategies (redrawn from Funtowicz & Ravetz, 1991: 145).

Here we turn to the theoretical core of PNS - holding significant implications for participatory appraisal - that of *quality* assurance. Under post-normal conditions traditional forms of quality assurance, restricted to products of research (notably expert peer review), become insufficient. Quality can only be maintained through an ever growing set of legitimate participants, this means forming *'extended peer communities'*, and incorporating *'extended facts'*. Under this new conceptualisation quality refers as much to processes, persons and purposes (*i.e.* how, who and why) as it does to products (*i.e.* what).

Extended peer communities are defined broadly as all those with a stake in an issue and/or a desire to participate in its resolution. Their primary role involves the *quality assessment* of scientific information and *debate* in terms of policy proposals. Funtowicz and Ravetz's convergence with the arguments presented in Section 2.1.2 is altogether apparent,

> "Knowledge of local conditions may determine which data are strong and relevant, and can also help to define the policy problems. Such local, personal knowledge does not come naturally to the subject-specialism experts whose training and employment predispose them to adopt abstract, generalized conceptions of genuineness of problems and relevance of information. Those whose lives and livelihood depend on solution of the problems will have a keen awareness of how the general principles are realised in their 'back yards'" (Funtowicz & Ravetz, 1993a: 749).

In addition (and related) to these 'reactive' tasks of evaluation, is the possible enrichment of the cognitive basis of PNS through extended facts, where other knowledges 'actively' contribute to scientific assessment and decision-making processes. Clearly, this incorporates the possibilities and types of lay/experiential knowledges outlined in Section 2.1.2. Examples of extended facts put forward over the years range from verbal and written anecdotes, informal (e.g. local resident or pupil) surveys, and investigative journalism, through to cases of popular/lay epidemiology. As Funtowicz & Ravetz (1992a: 271-272) state,

> "These will not usually be in traditional scientific form, but they may be essential for establishing a prima facie for the existence of a problem. When such testimonies are introduced into scientific debate and subject to some degree of peer review... they approach the status of scientific facts".

It is clear from this that Funtowicz and Ravetz see public discontent with expert knowledge, and the conflicting rationalities of experts/non-experts, not as a problem that paralyses environmental risk decision-making but an opportunity to improve decision-making under uncertainty. The concept of PNS offers a framework for exploring the possibilities for citizen and stakeholder involvement in technical environmental risk assessment and decision-making processes. It provides a rationale for such involvement on the basis that it will enhance the quality of knowledge and understanding, and as a result of this improve the quality of environmental risk decisions[4].

It is debateable whether PNS can be regarded as a new epistemology *per se*, as it does not reject or challenge any of the established epistemologies of science. "[I]t is not a challenge to the traditional practice of science, nor does it contest the claims to reliable knowledge or exclusive expertise that are made on behalf of science in its legitimate contexts" (Funtowicz & Ravetz, 1992a: 263). PNS is therefore a new way of 'doing' than a new way of 'seeing'. It develops other ways of seeing through integrating alternative knowledges and rationalities under conditions of high uncertainty, complexity and value-conflict. It is under these conditions that any epistemological transformation must occur.

Although attractive and convincing the conceptualisation proposed by Funtowicz and Ravetz lacks empirical support. It is not clear whether these claims are at all accurate. Similarly, although Funtowicz and Ravetz outline a general programme for action, there remains a distinct vagueness. As with Beck/Giddens in Section 2.1.1, they fail to address what the practical dimensions of such action might be - *i.e.* who, what, where, when, how. How are extended facts to be qualified, in what specific fora, and who is included in such fora?

The authors are the first to stress that PNS is more an insight than a theory – with there being much room for future refinement. Some authors have adopted the PNS concept unchallenged (e.g. O'Riordan & Raynor, 1991), whereas others have expressed concerns with regard to certain elements (see for example Jasanoff &

[4] The NUSAP (Numerical, Unit, Spread, Assessment and Pedigree) notational system developed in parallel to PNS (see Funtowicz & Ravetz, 1990) is of relevance here. It provides a means of managing uncertainty in post-normal situations and a potential framework for assessing the uncertainty and quality of scientific information within assessment processes. The scheme relates to technical (*i.e.* Numerical, Unit, Spread), methodological (*i.e.* Assessment), and epistemological uncertainties (*i.e.* Pedigree). The particularly innovative aspect relates to Pedigree which can provide an evaluative account of the production processes of the knowledge form in question (including data sources, methods used, peer consensus, underlying assumptions, institutional culture). This serves to clarify more social, contextual and institutional uncertainties.

Wynne, 1998; Yearley, 2000). Yearley (2000) questions the applicability of PNS to issues other than those of a large and global nature that have unquestionably high decision stakes and systems uncertainties (e.g. climate change). He points to the examples of disasters (e.g. Bhopal or oil spills) that Funtowicz and Ravetz propose as situations of low-uncertainty/high-stakes, arguing publics have little opportunity to explore the level of uncertainty until after the event in such situations. Thus a drawback of PNS identified by Yearley is that it assumes the variables of uncertainty/decision-stakes can be agreed upon in an objective and non-partisan way. These hints at problems underlying the PNS approach are elaborated in the next section by considering an alternative conceptual framework.

2.1.3.2 An alternative framework?

Drawing on his own work in the SSK and PUS literature, Wynne has presented a framework, in a series of papers (most notably Wynne, 1992a; but also 1992b, 1996a,b), that could be regarded as an alternative to Funtowicz and Ravetz's. Convergence and divergence between the two perspectives can be identified through their respective characterisations of uncertainty. Wynne's classification is shown in Figure 2.2. Broadly speaking Wynne's first three types of uncertainty - *i.e.* risk ('we know the odds' and can quantify them probabilistically), uncertainty ('we don't know the odds' but they can be estimated and included in the analysis), and ignorance (we don't know what we don't know) - correspond respectively (in general terms) to Funtowicz & Ravetz's technical, methodological, and epistemological types of uncertainty.

For Wynne ignorance is a far more difficult concept, one that escapes recognition. Rather than being a characteristic of knowledge itself it is more to do with linkages between knowledge and commitments based upon it. Ignorance is endemic to science. Science proceeds by 'exogenizing' significant uncertainties, thus reducing what could be 'known' to fit specific methods and models. Such uncertainties therefore become invisible to it. As Wynne (1992a: 115) argues, this only becomes a problem when this intrinsic limitation is not acknowledged, "[I]nstitutionalised exaggeration of the scope and power of science knowledge creates a vacuum in which should exist a vital social discourse about the conditions and boundaries of scientific knowledge in relation to moral and social knowledge".

- **RISK** – 'We know the odds'.
- **UNCERTAINTY** – 'We don't know the odds though may know the main parameters'. May reduce uncertainty but increase ignorance.
- **IGNORANCE** – 'We don't know what we don't know'. Ignorance increases with increased commitments based on given knowledge.
- **INDETERMINACY** - Causal chains or networks open. 'We don't know how the system will work' because it depends in part in unchecked social behaviour. Contingent social behaviour has to be explicitly included in analytical and prescriptive frameworks.

Figure 2.2 Different kinds of uncertainty (*after* Wynne, 1992a: 114-119).

Wynne, however, offers a further important dimension – that of indeterminacy (see Figure 2.2) – resulting from "real open-endedness in the sense that outcomes depend on how intermediate actors will behave" (Wynne, 1992a: 117). Indeterminacy is not explicitly included in Funtowicz and Ravetz's analysis, being only referred to in passing. The important point is that they see indeterminacy merely as a larger scale of uncertainty (in a *linear* sense) – hence the progression through technical, methodological, and epistemological uncertainties (Figure 2.1). This is where Wynne departs. He sees indeterminacy as underlying all forms of scientific knowledge – even when uncertainties are 'small'. He states,

"Ravetz *et al.* imply that uncertainty exists on an objective scale from small (risk) to large (ignorance), whereas I would see risk, uncertainty, ignorance, and indeterminacy as overlaid one on the other, being expressed depending on the scale of the social commitments ('decision stakes') which are bet on knowledge being correct" (Wynne, 1992a: 116).

Implications for Figure 2.1 are first that risk, uncertainty and indeterminacy cannot be on the same dimension. Secondly, both 'decision stakes' and 'systems uncertainties' are also indeterminate and conditional (*i.e.* subject to individual interpretation), and thus cannot be independent of one-another (as depicted in Figure 2.1).

Wynne argues first, that technical environmental risk assessment methods treat all forms of uncertainties (including ignorance and indeterminacy) as if they were due to incomplete definition of a determinate cause-effect system (*i.e.* as mere statistically treatable risk). In other words to better understand and control environmental risks all we need is more intense/precise scientific knowledge which narrows down uncertainty, but increases ignorance and misses (or misrepresents) genuine indeterminacies that environmental systems embody. Second, he reiterates points raised in Section 2.1.2 – *i.e.* that conventional environmental risk assessments are pervaded by tacit social judgements which cover indeterminacies in scientific knowledge itself. Wynne (1992a: 123) adds,

> "My main argument seems to imply that we cannot ever expect to find criteria for reasonable decision-making of this kind. However, this misses the main point, which is to treat ignorance and indeterminacy more seriously as potential sources of risk in themselves, and to embrace them in the a broader debate about the implications of societal commitment to such production processes."

Such debate requires new regulatory (or policy) cultures, which encourage effective public participation that addresses the inherent social assumptions and framings of scientific knowledge. This involves new discourses, different epistemological commitments, and different definitions of the boundaries between nature (objective determinism) and culture (human responsibility). Importantly this demands a certain openness.

> "To confront fully the issues of values and policies will therefore require a willingness to wrest open the scientific black boxes and consider their internal reconstruction" (Wynne, 1992a: 127).

Despite such statements Wynne's argument, as with those presented in Sections 2.1.1 and 2.1.3.1, is void of any practical dimension as to who should do this, and where, when and how, it should be done.

2.1.4 Towards a discursive theory of environmental knowledge?

> "The challenge ahead is not just more science but how to better understand the interactions between science and ideology – facts and values – and most importantly how to integrate them systematically in a more comprehensive analysis" (Fischer, 2000: 142).

The three previous Sections have developed powerful arguments for the need to democratise science and showed such democratisation to be particularly crucial in post-normal situations characterised by intractable levels of scientific uncertainty and value conflict. It has been shown that effective environmental risk decision-making under uncertainty ultimately depends on allowing citizens a legitimate and critical voice in (re)negotiating and resolving uncertainties/indeterminacies embedded within scientific practice. Importantly, this demands a fundamental restructuring of the relationship between citizens and experts - to one that is more symmetrical, interactive and constructive - in order to facilitate mutual learning between them and an epistemological integration of their respective knowledges.

In order to clarify the theoretical basis of such an epistemological integration Fischer (2000) has outlined a 'discursive theory of knowledge' that draws on constructivist and contextual perspectives on knowledge developed throughout Section 2.1 and offers a postpositive alternative to conventional scientific view of knowledge defined at the beginning of Section 2.1.2. It provides a framework for practical deliberation that emphasises a contextually oriented discursive understanding of social inquiry where knowledge is discursively situated in the context of time and local circumstances. Knowledge can be better understood as, "something that emerges ... from a discursive interaction - or dialectical clash - between competing interpretations", and consensus as "a discursive construction of competing views" rather than the reproduction of empirical tests and statistical confirmation (Fischer, 2000: 76).

Empirical data produced under the philosophy and methodology of normal science is only turned into knowledge through interpretative interaction with other perspectives or standpoints thus exposing the hidden suppositions that give it meaning and leading to the production of new understandings in a deliberative process of learning. This substitutes the formal logic of science with the informal deliberative framework of practical reason which exposes uncertainties and indeterminacies in existing knowledge through probing the argument-as-given within the particular context of the problem in hand and legitimising a wider range of perspectives and evidence (Fischer, 2000).

Technical Rationality	Cultural rationality
• Trust in scientific methods, explanations, evidence	• Trust in political culture and democratic process
• Appeal to authority of expertise	• Appeal to folk wisdom, peer groups and traditions
• Boundaries of analysis are narrow and reductionist	• Boundaries of analysis are broad; include the use of analogy and historical precedent
• Risks are depersonalised	• Risks are personalised
• Emphasis on statistical variation and probability	• Emphasis on impacts of risks on citizens and communities
• Appeal to consistency and universality	• Particularity (less concerned about consistency of approach)
• Unknown risks are irrelevant	• Unknown risks are relevant

Table 2.1. Key characteristics relating to the technical and cultural rationality of risk (adapted from Plough & Krimsky, 1987).

Drawing on Habermas' theory of communicative rationality Fischer argues that a discursive theory of knowledge serves to establish interconnections between empirical evidence, normative assumptions that structure our understandings of the social world, and circumstances of the situational context. It provides the foundation for a dialectical exchange where citizens and experts learn together through contestation and debate in relation to their alternate rationalities. So far this Chapter has only implied or touched upon the different 'rationalities' of experts and citizens. It is useful to clarify this point at this stage. To this end Plough & Krimsky (1987) have differentiated between technical rationality and cultural rationality, the key characteristics of which are summarised Table 2.1.

This Section has developed comprehensive rationales at the epistemological level for the need to democratise science and facilitate and epistemological integration of alternate knowledge and rationalities. It has remained at a high level of abstraction however and offers limited practical guidance. In Section 2.3 we take these ideas and see how they might be practically realised. Before this however we will briefly summarise key characteristics and approaches of the technocratic mode of environmental risk decision-making.

2.2 The technocratic mode of environmental risk policy-making

The technocratic worldview represents the dominant means by which environmental risk decisions continue to be made throughout western democracies. This section outlines the key characteristic features of technocratic practice before briefly summarising the main formal assessment approaches employed in environmental risk contexts, the deficiencies associated with these technical-analytic approaches, and emerging best practice in relation to them.

The technocratic mode of decision-making is rationalist, instrumental and reductionist in nature, being grounded in the modernist tradition of positivism and the conventional view of science outlined at the beginning of Section 2.1.2. The basic positivist principles of upholding a fact-value dichotomy and viewing science as a higher knowledge form underlie the technocratic worldview and the way it shapes environmental risk policy processes. In this sense the technocratic view privileges technical rationality, and thus excludes various forms of cultural rationality within society, when defining procedures for, or seeking solutions to, environmental risk problems. Another characteristic feature of the technocratic view is that of the 'deficit model' of public understanding (see Section 2.1.2). Citizens, their knowledges, and understandings are socially constructed in the technocratic mode as technically ignorant and irrational. Their role is essentially a passive one in environmental risk policy processes where the challenge is to get them to accept assessments and recommendations made by experts. It is not surprising, therefore, that the technocratic approach has been identified as playing a legitimatory or justificationalist role (Collingridge, 1982; Stirling, 1997), where science is seen to be a servant of power in upholding an elitist knowledge hierarchy and thus reinforcing the existing social order (Fischer, 1990; Irwin, 1995). This is reflected in the vacuous calls of those in power for 'sound science' or 'best science' in making decisions under uncertainty, a trend that seems to continually pervade contemporary environmental policy formulation in the UK (Wynne & Mayer, 1993; Munton, 1997).

In seeing science as the only legitimate knowledge form, and citizens as lacking legitimate expertise, the technocratic mode represents a fundamental barrier to public participation (Irwin, 1995). The dominance of scientific discourses, and the higher legitimacy and power of technical language, disadvantages citizen participation both directly and indirectly. It underplays experiential knowledges and everyday moral vocabularies through creating an unequal communicative relationship, while the lack of access to policy relevant technical knowledge hinders the possibility of active and meaningful involvement (Fischer, 2000). In addition those publics with technical understanding might feel intimidated or not be in a position to test their power due to issues of social agency, dependency and trust (as outlined in Section 2.1.2). In this sense technocratic politics has been seen to shield scientific institutions from political pressure from 'below' (Laird, 1990).

The *actors* involved in this 'closed' technocratic mode of environmental risk decision-making therefore tend to be limited to institutional *decision-makers* and the *technical* *experts* that they depend on for scientific evidence and advice. This science-policy linkage has long been the object of social scientific study. Additional actors might include organised interest groups or non-governmental organisational (NGOs) if they have the resources, capacity and influence to develop and present counter-expertise conforming to the framework of technical discourse within which debates take place under the technocratic mode.

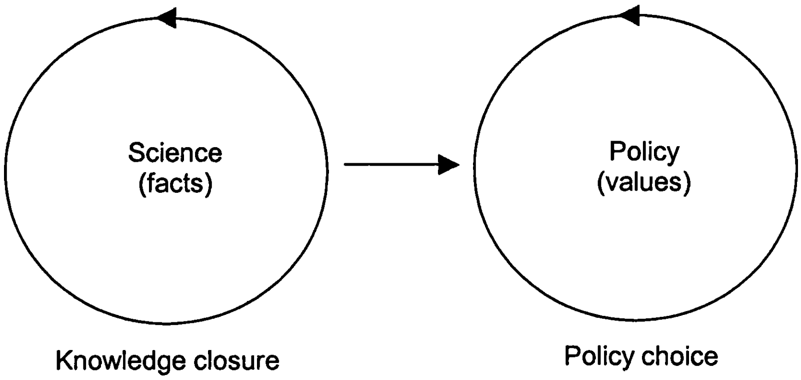

Figure 2.3. A linear model of the environmental risk policy process where 'science speaks truth to power' (adapted from Jasanoff & Wynne, 1998: 8).

The technocratic mode is characterised by a linear conception of the environmental risk policy process, a highly simplified illustration of which is presented in Figure 2.3. This linear conceptualisation sees environmental risk policy-making as being initiated, informed and framed by science (facts), that is uncontaminated by social interests, in a one way flow of information to policy and wider society (values) where the decision is then made on the basis of this information. Arguments developed in Section 2.1.2 have shown such a linear conception of the environmental risk policy process to be inherently flawed. It is a model that has long been criticised, for instance by Weinberg's (1972) 'trans-science' and more recently by those who see the science-policy domain as a process of mutual construction (e.g. Shackley & Wynne, 1995). The linear model does however represent the dominant technocratic worldview and continues to underlie procedural frameworks of technical approaches to assessing environmental risks (outlined below). It represents the continual attempts of scientists and technocrats to maintain boundaries between science and society (Jasanoff, 1987; Gieryn, 1995), and purify hybrids into modernist dichotomies of fact-value, nature-culture, and so on.

The technocratic mode is associated with a range of formal approaches to assessing environmental risks. The environmental problematique created the need for assessing, characterising and appraising different types and sources of environmental risk, impact and cost. This has fuelled the professionalisation of environmental assessment into a large and lucrative field, with a wide variety of approaches, methods and techniques competing for a niche in the market place. The major assessment types employed in the context of environmental risk are summarised in Table 2.2, along with their specific definitions and function or purpose. What these represent, essentially, is a range of environmental decision-support tools - as Collingridge (1982; cited in Stirling, 1997) puts it 'justificationalist' techniques - that are embedded within wider decision-making frameworks.

Formal assessment approaches, such as those described in Table 2.2, have been born out of an inherent reductionism, determinism, and notions of a single objective rationality. Although a number of factors account for this, such as specific disciplinary orientations at particular times, a significant driver has been the specific requirements of decision makers – *i.e.* assumptions that allow them to know in advance 'all' relevant details and their respective degrees of importance, in order to justify (often difficult) decisions (Stirling, 1997). This has laid down a legacy, culminating in a series of dominant assumptions and characteristics that occupy the very core of technical assessment approaches today. Stirling (1997: 189-190) has summarised these as:

- the assumption that there exists a single definitive set of considerations that have a bearing on any individual decision and that only one rational chain of inference exists from any single set of propositions;
- a deterministic conception of nature-society, in that the consequences of any action can be predicted given 'sufficient' understanding of initial conditions;
- assessments treat environmental impacts and risks as objectively determinate and seek to identify the 'single' optimum solution;

- the implication that it is possible to integrate and reconcile diverse perspectives into a single definitive structure of 'social' preferences;
- the fact that assessments tend to be conceived or presented as individually bounded projects leading to intensive, sporadic and definitive characteristics that contrast with the on-going nature of policy processes;
- the fact that assessments are characterised as closed processes, dominated by highly technical discourses and practices, that are inaccessible to external validation.

Type	Definition and purpose
Risk assessment (RA)	"Environmental risk assessment focuses on risks to human health (including ecosystem health) that arise in, or are transmitted by, the natural environment". RA is typically used in setting standards, predicting environmental impacts and for risk comparison in strategic planning situations (Hardin, 1998).
Technology assessment (TA)	TA is "a procedure of science-policy consulting... [in order to] broaden the knowledge base of policy decisions by comprehensively analysing the socio-economic preconditions for, as well as the social, economic, and environmental impacts of, implementing new technologies" (Hennen, 1999: 304)
Cost-benefit analysis (CBA)	"[A] tool to help determine whether a project should proceed or not, by weighing up the advantages and disadvantages of a project in monetary terms" (Beder, 1996). Refers to real or hypothetical markets (e.g. through contingent valuation) in order to identify the 'best' option for projects, policies and plans in the state and private sectors.
Integrated assessment (IA)	"[A] structured process of dealing with complex issues, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers" (Rotmans,1998: 155). IA involves 'general' assessments for cross-sectoral policy-making at the national/international (but increasingly regional) level.
Environmental impact assessment (EIA)	A "systematic process that examines the environmental consequences of development actions in advance" (Glasson *et al.* 1994: 3). The purpose of EIA is to inform decisions relating to policies, plans and programmes.
Strategic environmental assessment (SEA)	A "systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives ... at the earliest stage of decision-making on par with social and economic considerations" (Sadler & Verheem, 1996).

Table 2.2. The main types of technical assessment used in environmental risk.

Increasingly these traditional assumptions and characteristics of formal approaches to assessing environmental risk are seen as being inherently flawed. This is not just in the case of external critiques such as constructivist accounts of science (Section 2.1.2, above) or the changing 'post-normal' needs of decision-making (the emphasis being on upstream prevention, principles of precaution, and 'wider' sustainability agendas), but increasingly from environmental risk assessment practitioners on the 'inside'. This need to *rethink* the traditional view of environmental risk assessment as '*analytical fix*' presents a number of difficult challenges, as Stirling (1998: 102) puts it,

> "This newly emerging consensus on risk policy has very deep and robust theoretical roots which reach right to the core of established methodologies. Indeed, it represents in many respects a coming to terms with... fundamental constraints that have been established, but unduly neglected for many years" (Stirling, 1998: 102).

For Stirling a major challenge presented by this, which provides a significant argument for wider participation in assessment processes, is incommensurability. Technocratic approaches believe that it is possible to integrate and reconcile these perspectives into a single coherent structure of social preferences. Kenneth Arrow (1963; cited in Stirling, 1998) has shown that it is impossible democratically and consistently to aggregate individual preferences in a plural society, such practice violates at least one of a minimal set of conditions held to be axiomatic in the characterisation of individual choice. The implications of this for environmental risk appraisal are clear.

> "No matter how much information is available, and no matter how much consultation and consideration are involved, no purely analytical procedure can fulfil the role of a democratic political process. In other words, even in terms of the theoretical framework underlying the assessment methodologies themselves, there can be *no uniquely* 'rational' way to resolve contradictory perspectives or conflicts of interest" (Stirling, 1998: 103, *emphasis added*).

The dominant environmental assessment practice of reconciling perspectives analytically, in an objective manner, needs to be rethought.

Table 2.3 contrasts emerging consensus on good practice in environmental assessment with traditional practice that effectively dominates the field today, in relation to six key themes. It is clear that emerging good practice in the assessment of environmental risks and impacts is emphasising a participatory approach. The past decade or so has seen the initiation of what could be termed a 'participatory turn' in formal assessment approaches to environmental risk including: technology assessment (e.g. Joss & Durrant, 1995; Joss, 1999; Hennen, 1999; Hörning, 1999; Europta, 2000); cost-benefit analysis (e.g. Niemeyer & Spash, 2001); multi-criteria analysis (e.g. Stirling, 1997, 1998); integrated assessment (e.g. Dürrenberger *et al.*, 1997; Shackley *et al.* 1998; Darier *et al.* 1999a,b; Darier & Schule, 1999; Kasemir *et al.* 2000); environmental impact assessment (e.g. Praxis, 1998); and risk assessment (e.g. Fischer, 1995, 2000; Stern & Fineberg, 1996; Perhec, 1998). This represents a culmination of generic themes and trends that cut across *all* formal assessment types, born out of inherent deficiencies, problems and associated challenges outlined in this Section and Section 2.1.

Although informed by developments across these various forms of assessment/appraisal, the next section will focus down on the participatory turn currently occurring in the field of risk assessment. It seeks to understand how participatory assessment might be undertaken and establish what a democratic mode of environmental risk decision-making might look like.

Theme	Traditional/technocratic practice	Emerging best-practice
1. Path-dependency & complexity	• *Determinism* – identification of single (or series of) optimum solution(s).	• *Pluralism* – procedures should be pluralistic. • *Employ a diversity* methods and perspectives, to facilitate the simultaneous consideration of alternatives.
2. *Incommensurability & multi-dimentionality*	• *Reductionism* – simplistic reduction of complex multi-dimensional reality, often to single unidimensional index.	• *Display increased realism* in relation to multi-dimensional nature of reality.
3. Issues of *subjectivity & framing*	• *Objectivity* – notion of a single (and privileged) objective rationality. Hidden subjective assumptions and framings.	• *Openly acknowledge subjectivity* of output/results (esp. in communication & at user interfaces) and make *implications* of individual framings/assumptions explicit.
4. Uncertainty, ignorance & indeterminacy	• *Statistic/probabilistic* – all uncertain*ies* (including ignorance and indeterminacies) treated as mere statistically treatable 'risk' or 'uncertainty'.	• *Recognise all types of uncertainty* – through the appropriate identification, representation and treatment of uncertainty, ignorance, and indeterminancies.
5. Assessment as *on-going processes*	• *Intensive, sporadic & definitive* – assessments conceived/presented as individually bounded projects.	• *Open-ended/reflexive* – assessments as iterative, on-going and reflexive social processes, embedded in the wider policy cycle.
6. Assessment as inclusive *& social processes*	• *Closed technical process* – dominated by highly technical discourse/practice. Inherent assumptions, values, and biases rarely contested. • *Inaccessible* to wider participation and opaque to critical scrutiny.	• *Transparency* - should be as transparent as possible (esp. assumptions, biases, values). • *Participation* - should be as accessible to wider stakeholder participation as possible.

Table 2.3. General dimensions of environmental risk assessment summarising traditional practice and emerging best practice in relation to current challenges. This summary draws heavily on work by Stirling (1997; 1998; 1999), but also perspectives from within the fields of risk assessment (e.g. Fischoff, 1995; Stern & Fineburg, 1996), technology assessment (e.g. Rip *et al.* 1995), and integrated assessment (e.g. Rotmans, 1998).

2.3 The democratic mode of environmental risk policy-making

Although developing important arguments and theoretical bases for citizen and stakeholder participation in technical environmental risk appraisal processes, theoretical perspectives presented in Sections 2.1 and 2.2 say very little about how this should or could be realised in practice. This Section attempts to address this apparent operational gap by drawing together emerging literature from the (until recently distinct) fields of risk and participation. The main purpose is to develop an alternative to the technocratic approach outlined in the previous Section by establishing what a democratic mode of environmental risk decision-making might look like. The various arguments for active citizen and stakeholder involvement in technical environmental risk decisions are outlined through situating rationales developed in Section 2.1 within the wider participatory literature. A contextual model of the environmental risk policy process is then presented which describes the analytic-deliberative practice of participatory environmental risk appraisal, defines the potential roles of different actors within it, before reviewing existing approaches to citizen and stakeholder participation in environmental risk.

2.3.1 Rationales for participatory environmental risk appraisal

Rationales and arguments for participation are well established in wider theoretical debates of participatory democracy. Work stretching back before the late 1960s has laid down 'popular' rationales focusing on areas such political efficacy, equity or legitimacy. Over the past decade these arguments have been continually recycled, refined and developed in the fields of environment (e.g. Mathews, 1996; Mason, 1999) and planning (e.g. Forester, 1993; Healey, 1997). In this subsection, Fiorino's (1990) classification - that differentiates between *normative*, *instrumental* and *substantive* rationales for participation - is taken to organise perspectives from the diverse participatory literature with rationales developed in Section 2.1. It is argued that the latter develops epistemological arguments for citizen and stakeholder participation in environmental risk decisions that complement and further enhance substantive rationales.

2.3.1.1 *Normative rationales*

Normative[5] rationales begin with a normative belief or theory and argue for its appropriateness. The justification for engaging the public is derived from a theory of participatory democracy[6]. Public involvement is integral to the emergence and sustenance of two central democratic values: popular sovereignty and political equity (Webler & Renn, 1995). Arguments for *popular sovereignty* beginning with the deliberations of J.S. Mill (1873) and Rousseau (1968 [1762]), state that participation is necessary to determine the 'general will' and for citizens to 'learn democracy' through engagement thus contributing to their (moral, intellectual and social) development (cited in Renn *et al.* 1995a), to more recent arguments that stress the normative assumption that participation is better when citizens have a greater influence on decision-making (e.g. Arnstein, 1969; Fiorino, 1989; Lynn, 1990). Popular arguments of *political equality* relate to notions of creating a level playing field so that citizens have the ability to influence decisions.

One important observation at this stage however is that normative rationales, rooted in political and democratic theory, may be relevant to participatory appraisal, but not necessarily appropriate. Normative rationales tend to argue for increased or equal participation *per se*, such that realities of the 'appropriateness' of participation, to particular problems and in particular situations, may be neglected. Normative rationales thus miss the specific practical difficulties that surround participation in scientifically framed assessment and appraisal processes.

2.3.1.2 *Instrumental rationales*

Focusing on more pragmatic dimensions, instrumental rationales are related to empirical outcomes of decision-making process (means) and subsequent results (ends). There is widespread support for arguments that citizen and stakeholder participation in decisions:

[5] Also termed 'ethical' or 'moral' rationales (Renn *et al.* 1995).
[6] Alternatively termed 'direct' (Renn *et al.* 1995) or 'discursive' democracy (Dryzek, 1990).

- resolves or *reduces conflict* in the short term, and increases the *acceptance* of policy decisions in the longer term (e.g. Fiorino, 1990; Webler & Renn, 1995);
- enhances the *responsiveness* and legitimacy of institutions (e.g. Rosener, 1982; Thomas, 1990);
- enhances the *implementation* of policy decisions (e.g. Fiorino, 1990; Webler & Renn, 1995; Forester, 1999; Rowe & Frewer, 2000), fostering 'action' at all levels down to the individual (Eden, 1996);
- through being more efficacious, leads to more *efficient* or economically viable decision processes (Forrester, 1999);
- brings about wider *learning* and enhanced *social capital* (Barnes, 1999);
- enhances the public's *trust* in decision-making institutions, their scientific assessments and policies (see arguments in Section 2.1).

Although instrumental rationales could be deemed more relevant than normative ones they too are mostly related to decision-making outcomes in general, rather than scientific and technological assessments specifically. As with normative arguments, the diffuse and indirect nature of assessments means the need for citizen and stakeholder involvement is less clear. Assessments and appraisals usually influence policy indirectly, making it difficult to establish whether participation, as a component of this assessment, is necessary for policy acceptance, implementation, and so on (cf. Perhac, 1998).

2.3.1.3 Substantive rationales

Substantive rationales stress that "lay *judgments* about [environmental] risks are as sound or more so than those of experts" (Fiorino, 1990: 227). The inclusion of other local/non-expert knowledge is an essential element of any decision-making process. Clearly substantive rationales incorporate the many arguments already put forward in this Chapter including: critiques of expert-scientific knowledge; the ability of non-scientific expertise to characterise environmental risks; utilising contextual/experiential wisdom to identify aspects 'missed' by experts; and the ability of non-experts to frame issues; understand technical information and make decisions in the face of uncertainty. There is room for further clarity here, however. Fiorino (and others) tend to present substantive rationales in the context of decision-making in general, thus dimming the 'resolution' of certain arguments presented in Section 2.1. A further epistemological rationale is proposed in my thesis.

Substantive rationales can be seen as 'evaluative', where participants exercise value judgments about: the quality of scientific assessments; the strength of scientific evidence; or the nature of environmental risks or impacts (essentially the function of Funtowicz & Ravetz's extended peer review). Public involvement here can be envisaged as taking two forms: (i) assessors provide estimates of environmental risks and impacts which participants than verify; or (ii) participants are involved form the outset in providing 'judgments' in relation to estimates of environmental risks (Perhac, 1998).

2.3.1.4 Epistemological rationales

Epistemological rationales go further in embracing arguments in Section 2.1, expert-science being exposed as value laden, subjective, and contingent. Non-expert knowledges can be equal to, and just as valid as, those of experts (similar to Funtowicz & Ravetz's extended facts). This radically challenges scientific understandings, characterisations and framings of the environment. Participants' knowledges should be actively utilised and incorporated into assessments. Assumptions and framings embedded within assessment processes have to be opened up to participatory contestation.

The rationale for participation becomes a fundamental matter of *analytical rigour* (Stirling, 1998), focusing on the *quality of knowledge* (Funtowicz & Ravetz, 1992a, 1993a), and the *quality of assessment processes.* The relation to decision quality is once removed – *i.e.* decision-making can be improved via better decision support in the form of better assessments.

In summary, epistemological (and substantive) rationales can be seen as the basis of informing what participatory assessment might look like and how we can begin to measure its effectiveness. Participatory rationales provide the basis for why and how a participatory process might be undertaken, as well as providing a basis for evaluation. Different participatory rationales for involvement can imply distinct participatory forms, including different conceptions of who is to be included, what form of process or approach should be used, and where and when this should occur.

2.3.2 Conceptualising the democratic mode of environmental risk policy-making

Despite the rapid expansion of available participatory approaches over the past three decades, citizen and stakeholder participation in risk assessment and appraisal processes has become seen as important only very recently. Most effort to date has been concerned with involving people in value and interest debates, typically around decisions at the 'end' of policy processes (*i.e.* participatory decision-making), meaning that the role of participation in *understanding* environmental risks and *informing* decisions (*i.e.* participation *within* decision-making) has been relatively neglected (Lynn, 1990; Shrader-Frechette, 1995; Stern & Fineberg, 1996; Perhac, 1998; Petts & Leach, 2000; Fischer, 2000). As Rowe & Frewer (2000: 7) note:

> "most [participatory] procedures have been used for gaining input with regard to more value laden and policy-oriented aspects of risk management, rather than for acquiring public input regarding the more technical aspects of risk assessment per se".

In this sense, even innovative forms of participation in environmental risk have tended to operate after policy processes have been framed and constrained by experts (or, as some might argue, the decision has already been made). This, at least partly, reflects and upholds the technocratic separation of assessment (facts) and management (values) in policy processes, a formulation shown to be deficient (Royal Society, 1992; Jasanoff, 1987; Horlick-Jones, 1998). Arguments developed in Section 2.1 have shown such dichotomies to be the root cause of conflicts around environmental risks, non-experts don't necessarily see this distinction. As Perhec (1998: 222-223) observes:

> "[P]ublic involvement in the ostensibly more technical matter of estimating risks is finding advocates both within and outside the realm of [risk assessment]. In large part, this is a result of the challenges to the possibility of keeping distinct the activities of risk assessment and risk management".

The need to 'involve the public early and often' has long been a tenet within the public participation field (e.g. Kasperson, 1986), although one not always upheld. Substantive and epistemological rationales - perhaps more obvious or apparent in science-intensive areas of decision-making - effectively embrace the same tenet, that non-scientists can, and should, play an active role in most, if not all, stages of the policy process, including technical assessments. The theoretical arguments are clear: why then is current practice lagging behind? The overriding reason is that it is difficult to see how participation fits to scientifically framed assessments. As Darier *et al.* (1999b: 105) state,

> "The ambiguities in [assessment] and 'participation' in general are multiplied many-fold when it is suggested that the public should participate in [assessments]. In fact it is not clear where the public does fit in to scientifically-framed issues".

Two highly influential attempts at conceptualising how citizens and stakeholders might fit into science-intensive policy processes have been made. In 1996, the US National Research Council (NRC) published a report by the Committee on Risk Characterisation entitled '*Understanding Risk: Informing Decisions in a Democratic Society*' (Stern & Fineberg, 1996). The Committee drew together academic and practitioner experience to propose an approach to improve risk characterisation. Essentially the report outlines an ideal type model for participatory risk assessment, including the conception of the risk decision process shown in Figure A1.2 (Appendix 1). Two years later, the UK's Royal Commission on Environmental Pollution (RCEP) published their Twenty-First Report entitled '*Setting Environmental Standards*' (RCEP, 1998). Despite being set in a different geographic context (the UK and European as opposed to the North American) and having a distinct focus (environmental standards as opposed to risk characterisation) the RCEP report converges significantly with its American counterpart, particularly in how it conceptualises the policy process (see Figure A1.3, Appendix 1).

Both reports emphasise the cyclical, iterative and recursive nature of the environmental risk policy process. Both argue the fundamental need to incorporate values through deliberation and inclusion in the initial *framing* stages, in *assessing* environmental risks/impacts, and ultimately in *decision-making* to finalise policy choices. In this respect the NRC and RCEP reports closely resemble earlier work by Burns and Ueberhorst (1988), and to a lesser extent Ozawa (1991), who have developed similar conceptions.

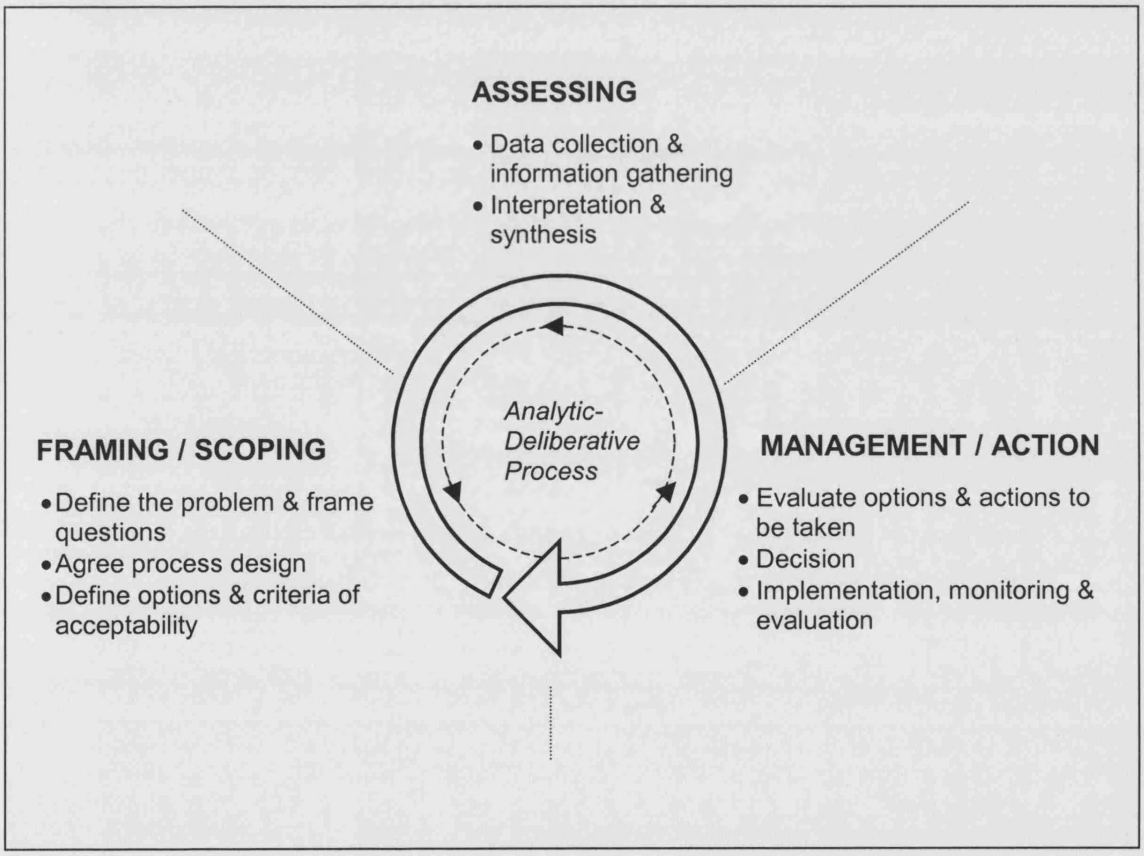

Figure 2.4. A democratic/contextual model of the environmental risk decision-making process.

These conceptions of the environmental risk decision process inform the democratic/contextual model illustrated in Figure 2.4. The model comprises the three main stages of framing/scoping, assessing, and management/action, each of which has a number of steps associated with them. These steps broadly equate with those outlined in UK risk assessment frameworks (Department of the Environment, 1995; DETR, 2000; also described in Royal Society, 1992; POST, 1996; RCEP, 1998).

Key characteristic features of the democratic mode of environmental risk decision-making shown in Figure 2.4 are that it is:

1. *Participatory and inclusive:* emphasising the active involvement of citizens and stakeholders, the incorporation of lay/experiential knowledges, and the representation of cultural rationality, at all stages in the process. The model stresses the particular importance of broad participation in 'front-end' framing/scoping steps where wider involvement has traditionally been excluded. Participation is also important in the highly technical and expert dominated stage of assessing risks and impacts, as well as tasks relating to management/action where participation has traditionally been sought.

2. *Analytic-deliberative:* through integrating formal analysis with deliberation and inclusion at each stage in the process. Deliberation/participation frames analysis and analysis/science informs deliberation in an interactive and recursive process that facilitates mutual influence and social learning (Stern & Fineberg, 1996).

3. *Iterative and recursive:* being non-linear and cyclical in nature. Rather than proceeding chronologically or sequentially the stages in the processes may overlap and be subject to feedbacks and iterations between them, as depicted in Figure 2.4 by the inner feedback loop (dashed line) (Burns & Ueberhorst, 1988; Stern & Fineberg, 1996; RCEP, 1998). For example, the assessing stage may produce new information and understanding that leads to a reframing of the problem, or attempts to reach a decision may identify the need for further information and assessment. The decision process is therefore reflexive and adaptive to changing circumstances and needs as it evolves; including, for instance, changes in process design.

4. *Contextual:* in the sense that it is both *fit for purpose, i.e.* the level, nature and timing of deliberation/participation and analysis is appropriate to the needs of the specific decision situation and its wider context; and *decision relevant,* meaning that analysis and assessment is solution oriented being directed to issues most pertinent to the decision in hand and the needs of participants within the process (Stern & Fineberg, 1996; RCEP, 1998).

The emphasis on maintaining a reciprocal and constructive relationship between scientific and non-scientific expertise throughout the democratic mode of environmental risk decision-making stands to make good the principal theoretical findings presented in Section 2.1. To this end it emphasises a symmetrical relationship between expert and lay/local knowledges and the facilitation of their epistemological transformation. It potentially operationalises a discursive theory of knowledge that upholds cultural rationality within the process and integrates it with technical forms of rationality. It therefore builds on constructivist perspectives on knowledge, breaking down modernist dichotomies such as fact-value, and emphasising an interactive model of public understanding of science.

A further characteristic feature in addition to the four listed above is the meaning of '*expertise*' in the democratic/contextual model. Two aspects are of particular significance. First, as already noted, the notion of expertise is extended to include lay/local experts (Irwin, 1995; Fischer, 2000) and 'extended facts' (Funtowicz & Ravetz, 1992a; 1993a). Second, is the transformed and extended role of 'specialists' under the democratic model. Specialists continue to act as scientific-experts undertaking technical risk analyses to support decisions (their role under the technocratic mode), but also adopt extended responsibilities as 'facilitators of learning' both in terms of shaping and facilitating/mediating deliberative processes, and providing analysis or communicating technical information that is relevant to, and meets the needs of, participants within the process (Burns & Ueberhorst, 1988; Fischer, 1993, 1999, 2000; Renn *et al.* 1993, 1995; Webler *et al.* 1995; Stern & Fineberg, 1996).

2.3.2.1 Participatory environmental risk appraisal: an analytic-deliberative process

The practice of participatory environmental risk appraisal[7] forms the focus of this thesis. Participatory risk appraisal (PRA) is an analytic-deliberative process, possessing the key characteristic features of the democratic model outlined above, and is defined here as encompassing all stages/steps in the environmental risk policy process leading up to a decision (*i.e.* defining the problem through to evaluating options, as shown in Figure 2.4). This Section describes this model of PRA in more detail and outlines the possible roles of deliberation/participation and analysis/science at each stage in the process. It draws significantly on the analytic-deliberative approach proposed by (Stern & Fineberg, 1996) which has proved to be highly influential, being widely adopted and developed within the risk field (e.g. Renn, 1998; 1999, 2001; Apostolakis & Pickett, 1998; Slovic, 1998; Tuler & Webler, 1999b; McDaniels *et al.* 1999; Petts, 2001). This sub-section will describe the stages of the PRA process in turn, after clarifying what is meant by analysis and deliberation in PRA.

Under this conception of PRA deliberation is defined as "any formal or informal process for communication and for raising and collectively considering issues ... [where] people confer, ponder, exchange views, consider evidence, reflect on matters of mutual interest, negotiate and attempt to persuade each other" (Stern & Fineberg, 1996: 73). Analysis on the other hand is defined as "the use of rigorous, replicable methods, evaluated under agreed protocols of an expert community - such as those of disciplines in the natural, social, or decision sciences, as well as mathematics, logic, and law - in order to arrive at answers to factual questions" (Stern & Fineberg, 1996: 3-4).

Deliberation as defined under PRA is extended to include a wide range of citizens and stakeholders. It emphasises communicative rationality (Habermas, 1984, 1987) and

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[7] A number of authors use the term participatory risk assessment (e.g. Fischer, 1995, 2000; Homan *et al.* 2001). Here the term participatory risk appraisal is preferred mainly due to the technocratic connotations associated with the term 'assessment' (as outlined in Section 2.2). Risk appraisal tends to be associated with aspects of risk management such as evaluating policy options. As outlined above I define participatory risk appraisal as encompassing all stages environmental risk policy process leading up to a decision, including stages traditionally conceived as 'risk assessment'.

attempts to operationalise the discursive theory of knowledge introduced in section 2.1.4. Deliberation is a joint social activity where participants weigh the reasons for and against a course of action, deepen their understandings and learn together, and progress towards the goal of solving a problem together with others who have distinct perspectives and interests (Burns & Ueberhorst, 1988; Stern & Fineberg, 1996; Bohman, 2000). The purpose of deliberation is often seen as building consensus to reach agreement between participants, however deliberation equally includes adversarial communication processes and should acknowledge divergence especially in post-normal situations where epistemic and value claims differ greatly.

Deliberation plays a fundamentally important role throughout the PRA process (Stern & Fineberg, 1996) in:

- negotiating the decision problem, policy options and possible outcomes (risks and benefits) of a decision;
- framing, guiding and ensuring the relevance of (scientific) analysis, including defining the questions to be addressed and the appropriate uses for potentially controversial approaches;
- improving understandings through incorporating local/experiential knowledges and cultural forms of rationality;
- negotiating the meaning of scientific findings, including the various (social) assumptions, uncertainties and indeterminacies inherent within them;
- agreeing procedures for the interpretation and synthesis of data;
- clarifying the nature and extent of consensus and disagreement among all participants and identifying whether further analysis is needed;
- promoting mutual understanding and learning among all actors within the process.

"If judgements made at each stage of the risk decision process are found to be unacceptable to stakeholders and publics, they can become lightning rods for conflict" (Stern & Fineberg, 1996: 37). Deliberation and inclusion allows these judgements to be called into question, negotiated and revised. However, this does not negate the role of science and analysis in the PRA process. Analysis is a source of reliable, replicable information about environmental risks and impacts. Technical experts bring indispensable substantive knowledge, experience, analytical skills and judgement. Analysis is essential in making effective environmental risk decisions, but it is never adequate on its own. The possible roles of analysis and deliberation at different stages of the PRA process are considered presently.

Framing/scoping

There is widespread agreement that one of the most important factors leading to the effective resolution of contentious and uncertain environmental risk decisions is broad involvement of all interested and affected citizens/stakeholders in early 'front-end' tasks that frame and scope the decision process (Burns and Ueberhorst, 1988; Ozawa, 1991; Webler & Renn, 1995; Stern & Fineberg, 1996; RCEP, 1998). The PRA model (see Figure 2.4) emphasises widespread involvement in the three steps of (i) problem formulation; (ii) agreeing the process; and (iii) defining policy options and possible outcomes.

Problem formulation, where the decision problem is defined and questions framed, is perhaps the most crucial step because it shapes and bounds the whole decision process and to a large extent determines the eventual outcome. Section 2.1 has shown that people have divergent perspectives on the nature of the problem in highly uncertain post-normal situations. Those whose perspectives are left out or not incorporated at this stage will therefore deem the whole risk appraisal process to be inadequate and irrelevant, as it will not address the questions and issues of fundamental concern to them. Considerations that have traditionally been missing from technocratic formulations of environmental risk problems, and often omitted by institutions charged with managing environmental risks, include issues of fairness and equity, the prevention of risk/impacts, and the rights of groups and individuals to control their own lives (Stern & Fineberg, 1996). Deliberation and inclusion is therefore especially important in problem formulation through questioning initial problem definitions and allowing (usually broader) perspectives, values and concerns of all those interested and affected to be taken into account (Stern & Fineberg, 1996; RECP, 1998). On this basis the problem can be (re)defined to adopt framings that are more widely accepted.

Analysis contributes to problem formulation through detecting the existence of a hazard, providing initial information about the risks it presents.

The importance of framing, scoping and *agreeing process design* (see Figure 2.4) is highlighted by the fact that many environmental risk conflicts are born out of discontent with procedures just as much as they are about substantive issues. The PRA process should therefore seek agreement from participants on acceptable procedures from the outset, defining issues such as who participates and how, how analysis will be undertaken and used, and procedural rules to enable closure at points in the process (Webler, 1995; Stern & Fineberg, 1996). Deliberation plays a key role in seeking such agreement from participants on procedural rules at the framing stage. Analysis can contribute, for instance, in the identification of participants, along with understanding commitments and boundaries of the process (e.g. legal) (Stern & Fineberg, 1996).

The tasks of *defining options* (the range of policy options or actions that could possibly be used to address the decision problem) and scoping *possible outcomes* (criteria, values or measures that define/assess the extent to which policy actions are desirable or acceptable) are predominantly determined by problem formulation (see Figure 2.4). Again, if either the range of options or possible outcomes considered are deemed to be truncated in the eyes of citizens and stakeholders the risk appraisal process is likely to be seen as biased and could be doomed to controversy long before it has started. Risk appraisal tends to routinely focus on a limited range of physical environmental and health related criteria, whereas outcomes of concern to citizens and stakeholders are more holistic spanning for example social, cultural, ethical, economic, political, institutional criteria and possible effects on future generations, governance, democracy (Stern & Fineberg, 1996). At this stage deliberation plays an important role in scoping and agreeing on a range of policy options and decision outcomes/criteria that are considered viable by experts and interested and affected parties. Analysis can provide a preliminary indication of outcomes and assist in narrowing down the range of viable options.

Through integrating deliberation with analysis the front-end of the PRA process involves citizens and stakeholders in questioning the assumptions underlying existing definitions and scientific understandings of a policy problem, and framing the issues to be subjected to more detailed scientific assessment of environmental risks and impacts.

Assessing

The role of participation and deliberation may appear less obvious (and particularly challenging) in *assessing* environmental risks and impacts (Stern & Fineberg, 1996; Perhac, 1998; Fischer, 2000; Rowe & Frewer, 2000), a stage typically envisaged as the exclusive domain of scientific experts and specialists and based on formal scientific/technical analytical approaches (including those outlined in Table 2.2., Section 2.2). Constructivist perspectives presented in Section 2.1, however, provide powerful arguments for the active involvement of citizens and stakeholders at the assessment stage. Advocates of the PRA model vary between those that suggest limited participation in assessment, technical analysis having been shaped by wider participation in the framing/scoping stage (e.g. RCEP, 1998), through to those that see an active substantive role for citizens and stakeholders in the steps of *data collection and information gathering,* and *interpretation and synthesis* (e.g. Stern & Fineberg, 1996). It is clear that the potential extent, nature and influence of participation in the assessing stage depends on the character of the specific decision situation and its context. More generally experts/non-experts, and questions of fact/value, play a part in both analysis and deliberation.

In *data collection and information gathering* (see Figure 2.4) citizens and stakeholders can frame questions to be addressed and approaches used in analysis; contribute 'extended facts' and lay/experiential expertise on local conditions and social realities; and actively develop systematic knowledge through conducting analysis (through, for example, participatory research). Processes of 'extended peer review' can allow participants to influence the *interpretation and synthesis* of data/information produced by analysis through negotiating various (social) assumptions, uncertainties and indeterminacies embedded within it, suggesting meanings in the data and how it should be presented.

Evaluation

Before deciding on the action(s) to be taken *evaluation* (see Figure 2.4) draws together information produced in the assessing stage, and value judgments relating to possible outcomes, to evaluate the degree to which various policy options can resolve the decision problem. Evaluation is often performed analytically at this stage utilising expert judgment and formal approaches such as multi-criteria analysis or economic analysis of the costs and benefits of different options. Deliberation contributes to evaluation through offering understandings of people's values elicited in earlier stages, or through bringing citizens, stakeholders and experts together in informed dialogue that identifies areas of consensus and difference between participants on the performance of policy options and recommended policy action(s) (RCEP, 1998).

Under the definition adopted, decision-making and monitoring/evaluation are considered to be outside of the PRA process, the role of PRA being to inform decision-making. This distinction partly reflects the fact that rather than representing participatory decision-making the majority of deliberative and inclusive processes (particularly those involving citizens) provide recommendations which are then considered by a responsible authority in making the final decision.

2.3.2.2 Fitness for purpose and the importance of context

> "[T]he appropriate role of public involvement in making environmental decisions is contingent on the type of decision to be made and the type of conflict associated with the decisions" (Renn *et al.* 1995b: 354).

A key principle underlying participatory risk appraisal is that the extent, nature, and timing of deliberation/participation and analysis at each stage of the process should be appropriate to the needs of the specific decision situation and its wider context. This idea of 'fitness for purpose' has been widely argued and adopted in the participatory literature (e.g. Renn *et al.* 1995; Petts & Leach, 2000; Rowe & Frewer, 2000; Clark *et al.* 2001). For example, Clark *et al.* (2001) suggest a framework where the nature and extent of participation depends on the decision situation and its context, which frames the interrelated questions of: (a) *who* should be involved; (b) *how* they should be involved; and (c) available *resources* (time, money, expertise) (see also Chilvers *et al.* 2003b who have translated this framework into the context of environmental risk). Stern & Fineberg (1996) offer a similar framework that emphasises the need for science, as well as participation, to be fit for purpose through diagnosing the decision situation. They assert that for many environmental risk decisions there is little or no need for participation, nor to change existing analytic risk assessment practice in such contexts (cf. RCEP, 1998). High levels of participation and considerable effort in both analysis and deliberation are needed however to effectively address some of society's most significant risk issues where,

> "participants are likely to come into conflict about the adequacy of scientific knowledge; about issues of fairness, access, and consent in decision process; or about basic goals and values. Such decisions are relatively few in number, but usually great in importance" (Stern & Fineberg, 1996:12).

This mirrors Funtowicz and Ravetz's framework described in Section 2.1.3 (see Figure 2.1) where post-normal situations characterised by high levels of uncertainty and value conflict (decision stakes) demand broadly based participation and intensive analysis, whereas science proceeds as 'normal', with limited need for participation, in less contentious/uncertain decision contexts (cf. Renn & Levine, 1991; Renn *et al.* 1995).

2.3.2.3 Defining the actors within the process

The democratic mode (see Figure 2.4) is based on an extended notion of expertise, involving a greater plurality of actors who adopt a wider range of roles. This spans across *policy-makers*, *'specialists'* ranging from scientific experts (who represent decision makers, interested parties, or are 'independent') through to facilitators/mediators of deliberative processes, and *participants* comprising citizens and stakeholders who are interested in, and affected by, a decision (Burns & Ueberhorst, 1988; Renn *et al.* 1995; Stern & Fineberg, 1996).

Under the democratic mode, the role of *policy makers* is extended to the initiation or sponsoring/commissioning of deliberative and inclusive processes, in addition to undertaking technical risk analyses to inform decisions. Policy makers also interact and communicate more closely with all those involved in the process which, depending on the specific situation, may involve direct interaction with participants in deliberative processes. The remainder of this Section defines and further explains the 'types' of specialist and participant involved in participatory risk appraisal and their potential roles in the process.

The type and roles of *specialists* are extended and transformed under PRA. Three types of specialist can be identified in the PRA process:

- *Process experts* who play a central role in shaping and managing the PRA process, designing and facilitating/mediating deliberative processes, and facilitating interactions between participation and science. In this sense the role of the expert moves "beyond merely providing analytical research and empirical data, the expert becomes a facilitator of public learning and empowerment ... [an] expert in how people learn, clarify and decide for themselves" (Fischer, 2000: 40).

- *Independent specialists* are individuals with particular expertise who act as expert witnesses, expert representatives or translators to help process participants.

- *Scientific experts* continue to act as natural and social scientific experts undertaking technical risk analyses to support decisions.

Significant confusion surrounds the terminology and definitions of those that participate in deliberative processes. Stern & Fineberg (1996) define participants in PRA as those who are interested in and affected by a decision but offer little explanation as to who this might be. This broadly equates with the popular notion of 'stakeholders', with some preferring to define all possible participants within a process as different types of stakeholder. Others emphasise that the role of participants as citizens or 'members of the public' means something different (e.g. RCEP, 1998; Fischer, 2000). Given arguments presented in Section 2.1.2 on the differences between citizen and expert knowledge this distinction needs to be taken seriously. Furthermore, there is a need for clarity in relation to the epistemic (knowledge) and ethical (value) claims which allow participation (O'Neill, 2001; Bohman, 2000).

With regards to epistemic claims, it is possible to distinguish between three different kinds of knowledge of significance in determining who participates: (a) *specialist knowledge*, including scientific, technical, socio-economic, ethical, and social/cultural expertise; (b) *procedural knowledge*: knowledge of how institutions work; knowing 'the rules of the game'; and (c) *local/lay knowledge*: experiential or common sense knowledge, gained especially from experience of a particular locality or situation (as described and defined in Section 2.1.2). When considered alongside questions of what or whom they 'represent', and the context or scale at which they usually act, it is possible to identify three ideal types of *participant* in the participatory risk appraisal process – professional stakeholders; local stakeholder groups; and publics/citizens (after Clark *et al.* 2001).

- *Professional stakeholders* possess specialist (expert) scientific knowledge and procedural knowledge, but often lack specific local or experiential knowledge relevant to the problem. They encompass public, private and academic/research sector organisations, and professional voluntary groups that operate at the national level, as well as local and regional levels. Professional stakeholders will normally represent their organisational perspectives and strategic/tactical interests when engaged in participatory processes.

- *Local stakeholders* tend to lack specialist (expert) and procedural knowledges, but posses rich understandings of local or experiential knowledge through their active engagement with others in their collective interest. Local stakeholder groups are non-professional, organised groups that operate within specific localities, including: (i) people who come together around a common interest (e.g.

autonomous local environmental groups); (ii) people who have an attachment to a particular place (e.g. residents' associations); and (iii) people who are united by feelings of a common identity (e.g. Women's Institutes). Individual members of local stakeholder groups are usually enrolled in participatory processes to represent the views of their group and, often, to act as surrogates for 'the general public'.

- *Publics*[8] *or citizens* is the largest category of potential participants in the PRA process, covering individuals who represent no-one else other than themselves but who are potentially representative of the diverse elements which constitute civil society as a whole. No prior assumptions can be made about their specialist, procedural or local knowledges, although individual publics/citizens are often recruited into specific deliberative processes based on one or more demographic features (e.g. age, gender, socio-economic status). More commonly, surveys test 'public opinion' through statistically representative samples of citizens who are then aggregated by demographic characteristics.

Although the above typology of actors within the PRA process aids analysis, it is important to note that it simplifies what is a highly complex reality. It is possible that at different times and places one individual could adopt multiple identities in relation to the above categories. For example a local authority officer (who could at different times be a policy maker, an independent specialist, or a professional stakeholder), might belong to a local environmental group (and participate in a planning process as a local stakeholder) or be recruited in a representative local health survey (in the capacity as a citizen).

2.3.2.4 Techniques for integrating deliberation and analysis

Renn *et al.* (1995a: 2) define public participation as "forums for exchange that are organised for the purpose of facilitating communication between government, citizens, stakeholders and interest groups, and businesses regarding a specific decision

[8] The term publics is preferred, in acknowledgement of the fact that, in reality, 'the general public' is highly heterogeneous and individual perspectives and understandings vary widely.

or problem". A considerable literature on participatory approaches in environmental decision-making has developed over the past three decades providing a seemingly endless range of models and techniques for citizen and stakeholder involvement (reviews have been provided by Renn *et al.* 1995; Warburton, 1998; Democracy Network, 1998; Lowndes *et al.* 1998; NEF, 1998; Audit Commission, 1999; Petts & Leach, 2000; IEMA, 2000). A comprehensive review of the main established approaches, along with those directly applicable to the area of environmental risk, is provided in Appendix 2.

The focus of this sub-section is on techniques for integrating analysis and deliberation in the PRA process. Before doing this it is important to highlight the typology of different engagement approaches shown in Table A2.1 (Appendix 2) as it contributes to the analysis presented later in Chapter 5. The typology integrates three levels of citizen/stakeholder engagement with the typology of participant types defined earlier. It groups methods into six engagement strategies based on the key distinguishing features of power and representation (of knowledge). Appendix 2 provides a further description of each engagement strategy, how the typology was derived and the engagement approaches that relate to it. The typology of engagement strategies is as follows:

- 6. Deliberation / Dialogue (groups of citizens and specialists)
- 5. Deliberation / Dialogue (groups of predominantly local stakeholders)
- 4. Deliberation / Dialogue (groups of predominantly professional stakeholders)
- 3. Consultation (targeting the public / citizens)
- 2. Consultation (predominantly open to all)
- 1. Education and information provision

The most important engagement strategies in relation to PRA are deliberation/dialogue, which are a central part of the analytic-deliberative approach. The integrative approaches described in this section can be seen to work within these deliberative approaches (*i.e.* engagement strategies 4 to 6).

A characteristic feature of participatory risk appraisal that distinguishes it from other participatory forms is its focus on the integration of analysis/science and deliberation/participation along with its emphasis on involving participants throughout technical policy processes, including areas that have until recently been the preserve of scientists. PRA therefore problematises relationships that have (as argued in Chapter 1) remained largely unquestioned in the areas of science, participation and decision-making - *i.e.* how science relates to deliberative and inclusive processes (DIPs) and how participants within such processes relate to and influence science. Such questions and possible solutions have been addressed where participation has coincided with science-intensive areas of risk and technological controversy, although the participation field has generally not considered analytic-deliberative relationships in a systematic and sustained way. This section draws together existing understandings from the participatory literature, along with emerging work on analytic-deliberative processes and participatory assessment more generally, to review the specific techniques, approaches and practices that exist for integrating deliberation/participation with analysis/science. The summary of different techniques and practices for integrating deliberation and analysis are shown in Table 2.4.

	Integration technique	Description	Examples
5	Participatory research / participatory inquiry	Participants are actively involved in the collection, understanding and/or interpretation of data/information (Fischer, 1993; 1999). Participants might work jointly with technical experts or independently. Resources made available for participants to undertake own research (Fischer, 2000).	Cases of participatory research and lay/popular epidemiology such as Woburn, US (Brown, 1987; Brown & Mikkelsen, 1990). Also initiated as part of participatory processes - e.g. consensus building process to develop a waste management strategy in Hampshire UK (Petts, 1995; 1997).
6,5	Joint fact-finding or Collaborative analysis	Resources are made available for participants to work with technical experts, agree on analytical work to be conducted by the experts, and produce a shared (and accepted) body of information/knowledge on environmental risks/impacts to be used in the deliberative process. Participants mutually agree on the conditions of acceptability of the knowledge produced and frame/agree the questions to be answered in analysis, the methodology used, how findings should be reported and interpreted (Baughman, 1995; Busenburg, 1999; Ehrmann & Stinson, 1999; Adler, 2000).	McCreary (1999) presents the example of the New York Blight Initiative, carried out from 1986-1988, which involved stakeholders in a joint fact-finding process to collaboratively analyse PCB concentrations near New York Harbour and explore management and restoration options. Busenburg (1999) provides a further example where collaborative analysis was used to help resolve a technically intensive policy dispute over the environmental management of the marine oil trade in Alaska.
6,5, 4	Expert representation and translation	Resources are made available for participants within the deliberative process to have access to an independent technical expert (or experts) who either: (a) acts as a 'translator' to inform participants of, and help and support them in understanding, pertinent technical information relating to a decision; and/or (b) seeks out information and conducts analysis with, or on behalf of, participants (Adler, 2000).	
6,5, 4	Deliberative multi-criteria techniques	Multi-criteria analysis techniques can be used within analytic-deliberative processes as a means of defining policy options, scoping appraisal criteria, and then assessing the performance of different options/issues relating to the process. Can be employed in a more quantitative (e.g. Renn *et al.* 1993, co-operative discourse / planning cells) or qualitative sense (e.g. Clarke *et al.* 1998, stakeholder decision analysis).	Good examples of the use of deliberative multi-criteria techniques include the cooperative discourse model (Renn *et al.* 1993; Webler *et al.* 1995); stakeholder decision analysis (e.g. Clarke *et al.* 1998); and multi-criteria mapping (Stirling & Mayer, 1999, 2001)

6,5, 4	Value tree analysis	A formal means of structuring and prioritising values/criteria elicited from participants with a deliberative process on a group or individual basis. Criteria can be used to frame analysis conducted in the assessment stage of the PRA process, or to evaluate of policy options. (Deliberative multi-criteria techniques include less formal ways of agreeing acceptability criteria with participants)	Has been used in defining stakeholder criteria/values to frame expert analysis of environmental risks/impacts and are considered in the evaluation of policy options by citizens panels - in the case of agricultural application of sewage sludge in New Jersey, USA (Renn *et al.* 1989; Renn *et al.* 1993), and a landfill siting process in Switzerland (Webler *et al.* 1995; Renn *et al.* 1998).
3 (6,5, 4)	Information Communication Technology (ICT)	Includes a wide spectrum of computer visualisation and simulation techniques, including environmental modelling approaches, geographical information systems (GIS) and environmental information systems that are used to present analytical outcomes within deliberative processes or allow participants to contribute to analysis with varying degrees of interactivity. Can be operated / facilitated by technical experts, an independent facilitator or the participants themselves. (Predominantly relates to the assessing stage of the PRA process, and possibly evaluation.)	A number of examples of participatory experiments in the area of integrated assessment where participants have interacted with, and commented on, ICT integrated into focus/in-depth groups, including: GCM models in the context of climate change (e.g. Dürrenberger *et al.,* 1997; 1999; Schlumpf *et al.* 1999; Pereira *et al.* 1999); local air quality modelling in Sheffield, UK (e.g. Bailey *et al.* 1999; Yearley, 1999, 2000); and regional sustainability (Ravetz, 1999; 2000). A substantial body of work has also been developed in participatory GIS (e.g. Cinderby, 1999; Harrison & Haklay, 2002).
4 (6,5)	Expert Panel – Interactive (interacting group of expert witnesses)	An independent panel of specialist expert witnesses interact with the deliberative process as a group presenting testimonies based on their expertise and responding to questioning from each other as well as from process participants (Adler, 2000). (Relates to the evaluation stage of the PRA process, but can also contribute to framing.)	
4	Expert panel – Individual (individual expert witnesses)	An independent panel of specialist expert witnesses interact with the deliberative process on an individual basis through presenting testimonies based on their expertise and responding to questioning from participants (Relates to the evaluation stage of the PRA process, but can also contribute to framing.)	Employed in a wide variety of deliberative approaches including consensus conferences, citizens' juries, citizen panels, planning cells panels and community advisory committees.

4 (6,5)	Delphi process	Draws together consensus and differences in scientific-expert opinion on the degree of uncertainty and confidence in technical knowledge/data to inform participants within a deliberative process. Can elicit the view of experts individually through repeat questionnaires (postal, internet, telephone) (Rowe *et al.* 1991) or a group process (e.g. Webler *et al.* 1991). Outputs are usually communicated using the three techniques outlined below. (Usually relates to the assessing stage of the PRA process, and informs evaluation.)	The Group Delphi process has been used in the analytic-deliberative approach of cooperative discourse to communicate consensus and difference in expert assessments of risk/impacts to citizens in the case of agricultural application of sewage sludge in New Jersey, USA (Renn, 1989; Renn *et al.* 1993), and a landfill siting process in Switzerland (Webler *et al.* 1995; Renn *et al.* 1998).
2	Face-face presentation	Oral presentation by specialist experts in the form of lectures or seminars. The intention is to inform, not receive feedback or interact with, participants. Might also be a mechanism for process facilitators to communicate outcomes to experts/decision makers (Potentially relates to all stages of the PRA process, where analysis/expertise and deliberation are separate entities.)	Potential use in any deliberative process. A consensus building processes to develop a waste management strategy for the County of Hampshire (UK) used expert presentations provided in seminars to inform participants of the health impacts of dioxin (Petts, 1995, 1997).
1	Remote presentation	Specialist expert presentation to inform participants, often in the form of a pre-recorded video or film. (Relates to all stages of the PRA process, where analysis/expertise and deliberation are separate entities.)	Used to communicate expert judgements to participants in an analytic-deliberative landfill siting process in Switzerland (Webler *et al.* 1995; Renn *et al.* 1998).
1	Written material	Used to inform participants of technical (or other) information relating to the process through information packs, papers, essays, flyers, technical documents, etc. Conversely, used to inform experts/decision makers of outcomes of the deliberative process (including prior framing of, and feedback in relation, to analysis) in the form of reports written by participants and/or process facilitator(s). (Relates to all stages of the PRA process, where analysis/expertise and deliberation are separate entities.)	All forms of deliberation and inclusion involve some sort of written information provision before and during the process. Particularly important in citizen processes where participants have little or no prior knowledge of the issues (e.g. consensus conferences and planning cells provide substantial information packs). Outcomes of deliberative processes are communicated by participants (e.g. panel reports in citizen juries and consensus conferences) and process facilitators (e.g. analysis and reporting of focus / in-depth groups).

Table 2.4. A summary of different techniques and practices for integrating deliberation (participation) and analysis (science).

2.4 Evaluating the effectiveness of participatory environmental risk appraisal processes

> "There should be no doubt that whoever is doing the perceiving is crucial to any understanding of the effectiveness of citizen participation" (Rosener, 1978: 458).

Evaluations that determine the effectiveness of citizen participation in environmental risk policy-making are urgently needed (Renn *et al.* 1995a; RCEP, 1998). Evaluation is a means to improve the quality and effectiveness of the emerging practice of participatory risk appraisal in a number of ways that encompass: deepening our understanding of participation; facilitating knowledge transfer; allowing processes to be repeated; and fostering decision transparency to participants and those outside the process (e.g. Renn *et al.* 1995a). As Rosener's classic quote suggests, inherent difficulties underlie the evaluation of participatory processes, namely the very subjective and multi-dimensional nature of evaluation – *i.e.* everyone has different views on what is 'effective'.

The date of Rosener's quote indicates that these are not new questions, yet evaluation of participatory processes is still in its infancy. The literature has until recently suffered from a paucity of empirical evidence and a lack of appropriate evaluative criteria (Chess & Purcell, 1999; Rowe & Frewer, 2000). On a practical level,

> "There is little systematic knowledge about what works in public participation, deliberation, and the coordination of deliberation and analysis. When government agencies and other organisations have promoted or created specific deliberative processes, they have rarely reported the results of their efforts" (Stern & Fineberg, 1996:76).

Although this gap largely remains in the specific context of analytic-deliberative processes, in terms of participation more generally the past decade or so has seen an explosion of evaluative frameworks and principles of effectiveness. A means of mapping out this burgeoning literature, and understanding ways that people evaluate participatory risk appraisal processes, is shown in Figure 2.5. It elaborates on the generic input, process, output/outcome model that has it origins in the policy analysis literature (Weiss, 1977; Majone, 1989). The approach has been widely applied in the practitioner literature (e.g. Oakley, 1991; Warburton, 1998; InterAct, 2001), in the evaluation of participatory processes in general (e.g. Smith, 1983; Innes, 1999), and those in the context of environmental risk in particular (e.g. Guston, 1999).

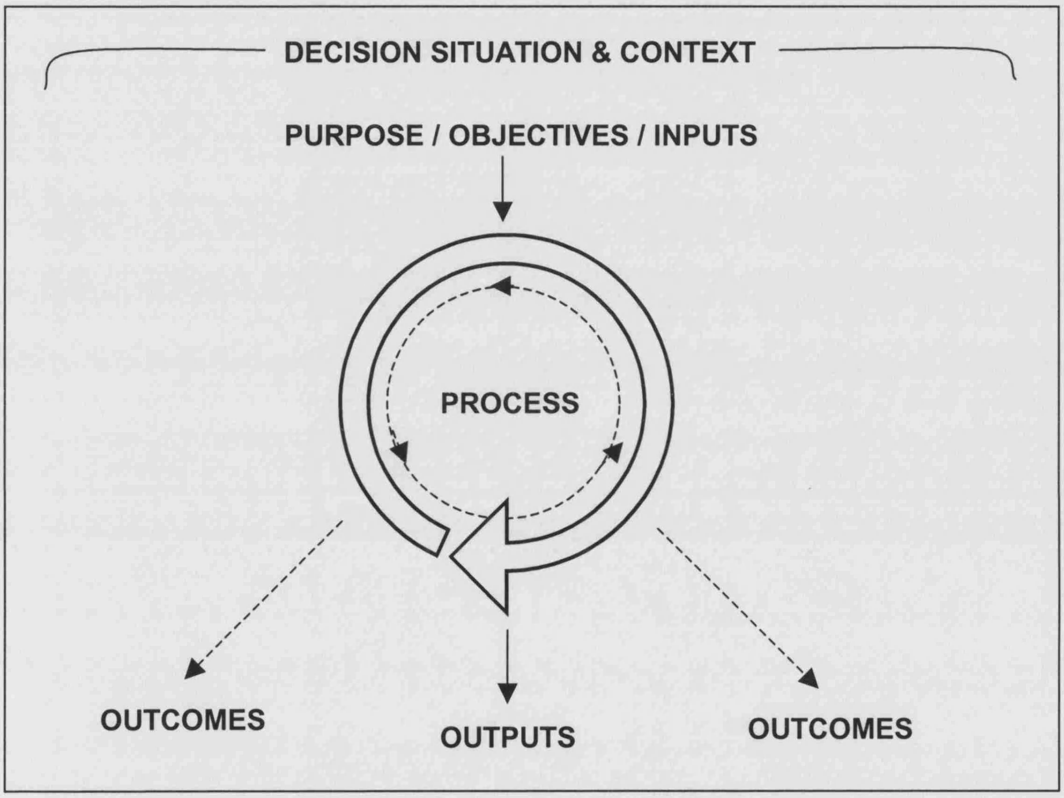

Figure 2.5. A systematic model for understanding and evaluating participatory risk appraisal processes.

Within this model the *process* refers to processes of deliberation/participation and analysis/science - the actual approaches employed, participants involved, the nature of interaction between them (as described in Section 2.3) being largely determined by decision context, process objectives, and process experts. *Outputs* relate to the immediate, substantive products of the decision process - including, for example, formal outputs of deliberative / analytic processes (reports, stated recommendations and agreements), elements of final decision (policy actions, management plan). *Outcomes* are indirect effects/impacts of the analytic-deliberative process. Outcomes tend to be less tangible and emergent (*i.e.* they change through the course the process and after) and include for example, learning (social learning of participants, experts and decision makers involved in an analytic-deliberative process and institutions relating to it), or trust, acceptability and legitimacy of the process and its outputs.

Participation has mainly been evaluated either in terms of its process effectiveness *or* the effectiveness of its outcomes/outputs. Although inherently interdependent these two aspects have rarely been considered together. Outcome evaluation has tended to focus on the views of different actors (participants, experts and/or decision-makers) involved in individual participatory processes. These approaches are dependent on 'who is doing the perceiving', and suffer from problems of 'knowing the generalised will' or aggregating individual preferences (Renn *et al.* 1995a; Webler, 1995), but remain important and will be considered further in Chapter 3.

In an attempt to overcome such subject-centredness most work on the effectiveness of participation has focused on the development and application of process based evaluative frameworks. Based on theoretical and practical perspectives these frameworks define the essential characteristics of an effective participatory process in a normative sense, usually in the form of generic principles or criteria. Such approaches are seen to be essential for ensuring the effectiveness of newly emerging or recently established forms of public participation (Webler, 1995), as is the case with PRA. Although the evaluation of outcomes/outputs will be touched upon in this research, the focus of this thesis is on *process* effectiveness.

PRA emphasises the integration of, and interaction between, science and participation. A key focus then is processes of expertise, or expert/non-expert relationships, within deliberative and inclusive processes. Although there is a paucity of evaluative literature directly addressing this analytic-deliberative focus, a considerable theoretical literature exists that contributes to our understanding of effective participatory risk appraisal in a less direct manner. In simple terms this diverse and diffuse body of work can be separated in to two groups:

- the *risk communication literature*, which has focused on understanding how to most effectively communicate scientific/technical information to various audiences. Much of this work has considered mass communication using individualist approaches which are only of partial relevance in deliberative contexts (Renn & Levine, 1991; Renn, 1992; Fischoff, 1995; Bier, 2001).
- the *participatory literature* which focuses on understanding effective deliberation and participation (e.g. Coenen et al. 1998). However this literature tends to be deficient in its treatment of knowledge, processes of expertise, and how science/analysis interacts with participatory processes.

2.4.1 Effective deliberation and inclusion in participatory risk appraisal

The most systematic and sustained attempt to develop a process based understanding of effective deliberation and inclusion, of relevance to the focus of this thesis, is that of Webler (1995)[9]. Webler builds on the work of Jürgen Habermas, notably his theories of universal pragmatics (communicative competence) and the ideal speech situation (Habermas, 1984, 1987), to develop a procedural normative framework for evaluating public participation in environmental decision-making. Webler's framework represents a vision (ideal) of what deliberation and inclusion should look like if it is to uphold communicative rationality and put into practice the discursive theory of knowledge (as introduced in Section 2.1). Webler's framework is based on two meta-criteria, namely that to be effective public participation must manifest the general goals of *fairness* and *competence.*

The idea of *fairness* is closely related to ethical-normative arguments for participation (introduced in Section 2.3.1) emphasising that everyone who wishes to should be able to participate on an equal footing thus ensuring equality in people's right to: be represented in the participatory process; agree rules of engagement; contribute to

[9] Webler's work builds on others who have developed procedural normative evaluative criteria based on theories of participatory democracy (e.g. Fiorino, 1989) and pluralist democracy (e.g. Laird, 1993); and those that have used Habermasian theories of ideal speech and communicative action (e.g. Kemp, 1985; Forester, 1993) to normatively evaluate policy and planning processes. In the context of this study Webler's framework is considered the most relevant to the focus of environmental risk and deemed to be the most comprehensive.

discussions; and influence outcomes. *Competence*, on the other hand, relates to functional-analytic arguments for participation. This emphasises the need for 'decision quality' through accessing the best available knowledge, supporting the ability of individuals to participate competently (through providing information and other resources), and developing competent mutual understandings and shared social constructions of reality between all participants. The competence (or quality) of a decision can only be evaluated after the event (in terms of outputs/outcomes such as systems sustainability) but must be assured during the process, and Webler suggests criteria for ensuring this. Ideas of competence are central to effective participatory risk appraisal given its focus on knowledges/expertise, and the epistemological integration of citizen and expert knowledge.

A synthesis of Webler's framework is provided in Appendix 3, which summarises the 34 sub-criteria, and associated sub-questions, that relate to the two meta-criteria. Fairness criteria (top half of diagram, Appendix 3) refer to "the distribution among participants of opportunities to act meaningfully" (Webler, 1995: 62). Here there are four fundamental actions that each participant must be free to assume: *attend* (be a participant in the discourse); *initiate* discourse/discussion; *discuss* (the ability to challenge and defend claims in discussion); and *decide* (participate in group resolution of disputed claims in order to influence collective consensus). These four specific actions or needs of fair discourse are relevant to each of three activities that make up a participatory process, namely *agenda & rule making*, *moderation & rule enforcement*, and *discussion*. In summary, three key principles of fairness can be identified:

- All those potentially affected by the decision (publics and stakeholders) should have an equal chance to be present or represented (at all stages) in the discourse;
- All participants should have an equal chance to suggest, debate and influence the agenda/rules of the discourse; and the means by with it will be moderated and enforced (such as who facilitates and what style of facilitation should be adopted);

- All participants should have an equal chance within the discourse to suggest and debate claims about language, facts, norms, and expressions[10].

Competence criteria (bottom half of diagram, Appendix 3) refer to "the construction of the best possible understandings and agreements given what is reasonably knowable to the participants" at the time of the decision (Webler, 1995: 65). Competence relates to the ability of the deliberative process to provide participants with the procedures and knowledge necessary to make the best possible decision. There are two basic needs to this regard: (a) *access to information (knowledge) and its interpretations*; and (b) *the use of the best available procedures for knowledge selection*, in resolving disputes about knowledge and interpretations. In this sense,

> "Information and its interpretation (knowledge) are the raw material that a discourse processes into collective understandings and agreements. Access is a matter of time, effort, and cost. Although it is impossible to make final determinations about how accessible information and knowledge should be, unreasonable inaccessibility are grounds for criticising the discourse" (Webler, 1995: 65).

These two basic needs of competence relate to the four main types of discourse[11] associated with deliberative processes (Webler, 1995), namely: *explicative discourse* (about the comprehensibility/clarity of communications); *theoretical discourse* (about knowledge and 'facts'), *practical discourse* (about values and norms), and *therapeutic discourse* (about authenticity/sincerity of claims). In each type of discourse competent mutual and shared constructions of reality depend on different rules and procedures for which Webler has developed a series of criteria (see Box 2.1).

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[10] This is tempered by the reality of social organisation, division of labour, and the fact that different people have different specialities - which is particularly acute in complex and uncertain environmental risk contexts where large divergences in the knowledges and competencies of participants often exist. As Webler (1995: 64) notes, "some balance needs to be struck between equal rights and assigning higher credibility to certain speakers on the basis of their experience or specialisation".

[11] These four types of discourse (*i.e.* explicative, theoretical, practical, and therapeutic) are taken from Habermas' theory of pragmatics and relate, in turn, to four types of *speech act* (*i.e.* communicative, constantive, regulative and representative) and four types of *validity claim* (*i.e.* comprehensibility, true/correct, normative, and authentic) (Webler, 1995).

Box 2.1 Webler's (1995: 82-86) criteria for competent participation.

(1) *Explicative discourse:* discussion/claims about the comprehensibility/clarity of language and other forms of communication (e.g. over definitions, terms, pronunciation). Key competence criteria:

- all participants should have equal access to the sources of definitions, terms, and concepts relating to the decision;
- the deliberative process should allow enough time to resolve issues of comprehensibility and confirm that participants understand the definitions, terms, and concepts of others.

(2) *Theoretical discourse:* discussion/claims about facts and truths about the objectified world (nature or society) and factual validity claims. Key competence criteria:

- all participants should have equal access to available and relevant systematic (scientific) knowledge:
    - all participants should agree (or have a say) on the expert advice that is brought into the process;
    - if there is disagreement on how to bring specialist expertise into the process resources should be made available to individual (or groups of) participants to seek expert assistance;
    - the process should allow enough time for participants to consult with experts and have experts collect data where appropriate;
    - scientific/technical information provided in the process should be reviewed by independent experts and/or professional stakeholders;
- all participants should have equal access to available and relevant local/experiential knowledge:
    - the deliberative process should promote consideration of local/experiential knowledge and expose participants to experiences that enhance local/experiential knowledge;
- the deliberative process should provide means for the uncertainties in factual information to be considered;
- the deliberative process should include a mechanism to check if factual claims are consistent with prevailing opinion in expert/lay community (peer review):
    - is sufficient time allowed for factual claims to be adequately verified.
- the deliberative process should provide participants with the option to delegate determinations of factual evidence to an outside expert panel:
    - is the panel consensually agreed on by participants;
    - is information provided about the range of expert opinions and positions.

(3) *Practical discourse:* involves disputes over claims about the appropriateness of social relations, *i.e.* norms – references are made to social needs and the appropriate forms of social interaction. The deliberative process should:

- ensure that an unbiased distribution of interests (and knowledges) in the affected population are represented;
- develop mutual understandings of values between all participants, through the

discovery of values and discourse procedures that build compromises;
- ensure that anticipated factual (physical and social) implications of normative choices are scoped and considered;
- ensure that normative/value choices are consistent with themselves, (e.g. through systematic structuring of values).

(4) *Therapeutic discourse:* explores the authenticity and sincerity of expressive claims – references are made to the subjectivity of the speaker. The deliberative process should:
- promote discussion about the authenticity of participants' expressive claims and the sincerity of those claims;
- provide enough time to allow participants to accurately state and defend their expressive claims.

Webler *et al.* (1995) have supplemented fairness and competence with another criterion to define effective participation, that of *social learning*, which is defined as the "process by which changes in the social condition occur – particularly changes in popular awareness and changes in how individuals see their private interests linked with the shared interests of their fellow citizens". They propose that these three meta-criteria offer a firm and comprehensive basis for evaluating participatory processes. Their focus is on participant and expert/specialist learning within participatory processes, although it is important to recognise learning effects on decision-makers and institutions relating to the process. Webler *et al.* (1995) identify two components of social learning; cognitive enhancement (cognitive dimension) and moral development (normative dimension).

Cognitive enhancement means more than gaining technical competence. It involves learning about the state of the problem (information, knowledge); learning about possible solutions and consequences (cause-effect relations, predictions); learning about other people's interests and values (information, explanation); learning about one's own personal interests (reflection); and learning about methods, tools and strategies to communicate well. *Moral development* represents the ability of people to set aside their egoistic demands and act for the good of all. It includes developing self-respect and responsibility for oneself and others; being able to take on the perspectives of others; and learning how to integrate new cognitive knowledge into one's opinion or preferred choice

Theoretical perspectives, notably Habermasian ideals of communicative action and their interpretation in particular contexts by authors such as Webler, have done much to shape our understanding of what effective participation in environmental decision-making actually means. Such perspectives have been supplemented with practical experiences in recent years, leading to the emergence of theoretical principles and criteria of effective participation that are more pragmatic in nature (e.g. Petts, 1997, 2001; IEMA, 2000; Barnes, 1999; Rowe & Frewer, 2000; Petts & Leach, 2000; InterAct, 2001; POST, 2001). Drawing on this work it is possible to identify ten key principles and criteria of effective participation around which considerable consensus exists (see Box 2.2).

Box 2.2 Principles and criteria of effective participation identified in the UK literature.

- *Clarity.* The objectives of the participatory process, how its outputs will be used, and the boundaries and constraints placed on the process (e.g. legal, institutional) should be clear and understandable to all participants.

- *Representativeness & inclusivity.* Participants should be representative of all those interested in and potentially affected by the decision; the process should remove barriers that could bias participation and include minority groups who are normally excluded.

- *Deliberation* The process should involve highly interactive deliberation that develops mutual understandings between participants and experts; allows all those involved to enter the discourse and put forward their views; foster critical debate that ensures experts and their knowledges are challenged.

- *Consensus & difference.* While recognising the importance of achieving consensus, the participatory process should also ensure that dissent and differences are engaged, understood and acknowledged.

- *Access to resources.* The process should meet the needs of participants and provide sufficient resources to allow their effective participation, including the provision of relevant information resources, human resources (such as access to specialist expertise), and time resources (sufficient enough for participants to develop understandings of the issues and make decisions).

- *Transparency:* The participatory process should be transparent and open so that everyone within and outside of it can see what is going on and how decisions are being made.

- *Learning.* The participatory process should enhance social learning of participants (and experts and decision makers) through changing their understanding and knowledge of the issue, and enhancing their understanding different viewpoints.

- *Decision influence.* The output of the participatory process should have a genuine impact on decision-making and should be seen to do so.

- *Independence.* The participatory process should be conducted (managed and facilitated) in an independent and unbiased way, and be seen to be independent.

- *Efficiency:* The participatory process should in some sense be cost-effective, and timely.

2.4.2 An integrative framework for effective participatory risk appraisal

The considerable volume of literature on risk communication and on participation contributes much to our understandings of effective participatory risk appraisal but, as argued above, does not exclusively address the specific focus of PRA – *i.e.* the integration of, and interaction between, analysis and deliberation. In terms of risk communication this focus emphasises 'deliberative risk communication' that is reciprocal, multi-way and non-hierarchical. Risk communication from participants to experts is just as much the focus of inquiry as the inverse which has dominated existing work in the field. In terms of participation, the specific focus of PRA is on competence, emphasising questions of knowledge, expertise, and science in relation to the participatory process, how technical expertise is brought into the process, and how deliberation influences science/analysis. This is not to downgrade fairness, which has, arguably, been the overwhelming concern of the participatory literature. Competence and fairness are inherently interdependent. For example, building the competence and capabilities of participants is essential if they are to interact with experts on a fair basis. Likewise fair representation ensures a range of knowledges and understandings enter the process thus contributing to the 'quality' of an appraisal or decision. The specific nature of PRA and the post-normal contexts within which it operates demands a focus on questions of competence.

One of the few evaluative frameworks that directly relates to the specific character of participatory risk appraisal has been proposed in the National Research Council's 1996 report. Stern & Fineberg (1996) define five key principles which state that an effective PRA process must: (i) *Get the science right*; (ii) *Get the right science*; (iii) *Get the right participation*; (iv) *Get the participation right*; and (v) *Integrate analysis and deliberation*. These five criteria and the principles that relate to them are summarised in Box 2.3. They emphasise the symmetrical treatment of science and participation, and the valid role of citizens/experts, in both analysis and deliberation.

Box 2.3. The five criteria proposed by the National Research Council that define the effectiveness of an analytic-deliberative process (Stern & Fineberg, 1996: 6-7; 131-132).

(i) Get the science right: analysis conducted and drawn upon in the process should use best available approaches, adhere to recognised scientific standards, and be clear about the plausibility of its assumptions, the magnitude and character of uncertainty, and its limitations.

- A degree of humility and scepticism is required in communicating scientific findings, and value judgements and subjectivities within analysis should be made explicit.
- Analysis should make clear the extent and nature of scientific agreement or disagreement on an issue, what is known and what is not known, with particular attention to sources of uncertainty often unrecognised in analysis (*i.e.* ignorance and indeterminacies).
- Analysis should focus on treating and resolving uncertainties that matter most to the ongoing deliberation and are most pertinent to the overall decision process.

(ii) Get the right science: analysis conducted and drawn upon in the process should be relevant, responsive to, and be framed by, the needs and concerns of participants and decision-makers.

- Analysis should be directed and shaped by participants in deliberation in order to: address the breadth of their significant concerns, address their framings of the decision problem, management options, and possible outcomes (criteria); ensure that analysis answers the right questions; and ensure that participants agree with underlying scientific assumptions and methods of analysis.
- Analysis should incorporate local knowledges and actively involve participants in conducting analysis, interpreting findings, and seeking the right ways to summarise and synthesise information.

- Analysis should provide all participants with the information they need to make informed choices, in the form that they need it. Analysis should be transparent, understandable, accessible, and relevant to each participant's own situation.

(iii) Get the right participation: the analytic-deliberative process should be inclusive and representative of interested and affected parties and ensure that the full range of knowledges, perspectives, and information of relevance to the decision enters the process.

- Participation should have sufficient representativeness, inclusiveness and clarity from the outset.
- The deliberative process should be informed with the best available knowledge and the full range of perspectives (values and knowledges) that exist from the spectrum of decision participants, including specialists/experts and decision-makers.
- Participants should have sufficient access to resources, including specialist/technical information or human assistance from sources that they trust, that is responsive to their needs, and that is subject to their mutual agreement.

(iv) Get the participation right: the analytic-deliberative process should satisfy participants that it has been responsive to their needs; adequately represented and incorporated their knowledges, views and concerns; and allowed them to influence how risk issues are understood and acted upon.

- The deliberative process should involve participants and incorporate their perspectives from the earliest stages of problem formulation, and throughout the process.
- The deliberative process should allow participants to influence the formulation of the decision problem, analysis, and recommendations
- The deliberative process should be flexible both in terms of procedural rules and iterations/feedbacks where the process identifies the need for framings to be reconsidered or further analysis to be conducted.

(v) Integrate analysis and deliberation: the process should represent a synthesis of the knowledges and understandings relating to a decision through treating/negotiating the respective limitations, uncertainties, assumptions and boundaries in expert and lay knowledges through the appropriate integration of deliberation and analysis.

- The process should ensure a reciprocal relationship and mutual influence between participation and science.

3 Studying professional networks in participatory risk appraisal

This chapter maps out the overall methodological approach and explains the methods employed and empirical work undertaken in addressing the three main research themes of this thesis (outlined in Chapter 1). This has involved following professional actors through networks building up around participatory risk appraisal practice in the UK, engaging them in-depth interviews and drawing them together in group discussion. The first Section of this Chapter presents the conceptual framework(s) than underpin the network approach adopted in this study, drawing significantly on the concept of 'epistemic communities'. Section 3.2 then provides an overview of the three stage research methodology adopted, before describing in-turn how each stage was conducted - detailing the research approach, and methods of data collection and analysis for each.

Before describing the methodology in detail, however, and by way of introduction, it is important to situate the rationales underpinning the network approach adopted in the methodological context of existing studies that have contributed to understanding analytic-deliberative practice and institutional responses to environmental risk issues. Two aspects are particularly important. The first is that our understandings of citizen and stakeholder participation in science-intensive policy processes are derived from single case examples (be they participatory experiments or case studies of 'policy for real' processes) or individual accounts at the organisational level. The methodology described in this Chapter goes beyond this level of analysis to explore developments in PRA practice, wider social learning, and the 'democratisation of science' at a broader network-based (inter-organisational / inter-sectoral) level. Second, is the observation that although policy professionals in general, and 'process experts' (participatory researchers and practitioners) in particular, play a very influential role in shaping 'democratic' environmental risk policy processes, the wealth of experience they hold has not been captured, nor their powerful position sufficiently problematised, in the literature. The methodology adopted here makes participatory process experts and related policy professionals the focus of study.

In terms of case-based understandings participatory experiments have been conducted to develop and trial analytic-deliberative processes, some of which have been reviewed in the previous chapter. Such studies play a vital role in contributing to our understanding of effective participatory risk appraisal, although their artificial nature and manipulation of contextual factors, barriers, and constraints, somewhat limits and distorts their practical insights. By contrast a large number of authors have conducted in-depth empirical research to analyse 'real life' cases of citizen participation. This work has employed methods such as participant observation, case study research, and documentary analysis to evaluate participatory processes against procedural criteria (e.g. Renn *et al.* 1995; Coenen *et al.* 1998; Petts, 2001) and sought to capture views on effectiveness (of the process and/or its outcomes) from those involved through questionnaires and in-depth interviews (e.g. Renn *et al.* 1993, 1998; Webler *et al.* 1995, 2001; Petts, 1997; Coenen *et al.* 1998; Guston, 1999; Tuler & Webler, 1999a). With regard to the latter, although some studies include other actors (decision-makers, experts), most are centred on the perspectives of process participants. In-depth empirical research on policy-for-real cases has focused almost exclusively on examining participation more generally with relatively less studies focusing on analytic-deliberative processes in particular, although notable exceptions exist (e.g. Ozawa, 1991; Limoges, 1993; Renn *et al.* 1993, 1998; Webler *et al.* 1995; Petts, 1997; Guston, 1999; Kinney & Leschine 2002).

The National Research Council's 1996 Report has called for continual improvement of participatory practice through evaluation and the sharing of knowledge/experiences at the organisational level (see also Innes, 1999). An initial example of such organisational evaluation and knowledge sharing has been provided in the case of the UK Environment Agency (Twigger-Ross & Smith, 2000). Stern & Fineberg (1996: 9) state that that systematic learning processes should be used to draw together understandings from experimental work and case studies that,

> "use a variety of formal and informal methods including, surveys, experimental tests of informational materials, evaluation research methods, simulations, quasi-experimental evaluations of new procedures, feedback from broadly based

advisory groups that review past practice, [and] systematic case study research on libraries of case files" (Stern & Fineberg, 1996: 9).

This thesis builds on, and makes a concerted attempt to capture, such experimental, case-based, and organisational learning experiences in relation to participatory risk appraisal through working at the broader level of professional networks developing in the UK. Through involving process experts and other policy professionals in in-depth reflection it is possible to gain an overview of how practice is developing and capture their learning experiences and evaluative judgements on effective practice. In this sense the methodological approach adopted in the thesis resembles a study by Clark *et al.* (2001) for the UK Environment Agency to develop principles for effective local outreach. The study involved public participation practitioners and professionals from a range of organisations/sectors in individual in-depth interviews to discuss local outreach strategies and suggest effectiveness criteria. While Clark *et al.* (2001) focus on participatory practice more generally; studies in the US by Adler (2000) and Yosie & Herbst (1998) engaged process experts and participatory practitioners in interviews and focus groups to capture their views on effective analytic-deliberative practice. Such a study where professional actors reflect on analytic-deliberative practice is without precedent in the UK context.

The methodological approach adopted in this thesis also draws on ideas from research methods in SSK. Authors have focused on how natural and physical scientists construct science and society (Woolgar, 1988), shown science to be an inherently social process (e.g. Latour & Woolgar, 1979; Knorr-Cretina, 1981), and explained the power of science to lie in its ability to organise networks over large distances (Callon 1986; Latour, 1987). A recent study by Wynne *et al.* (2001) has sought to develop this tradition through investigating how natural/physical scientists reflect on science and encounter the environment-risk policy domain. Fifty two scientists working across four scientific issue-areas (ecological protection, climate change, BSE, and genetic engineering), from a range of institutional settings, were involved in interviews and focus groups to reflect on their work and its relation to decision-making and policy on environmental risk issues (focusing on key issues such as uncertainty, precaution, accountability).

The methodology adopted in this thesis has similarities to that of Wynne *et al.* (2001), a key difference however is that this thesis focuses on 'process experts' (*i.e.* social scientists) along with other policy professionals and asks them to reflect on 'post-normal science' and its relation to environmental risk decision-making. This is a significant difference. There is a long history in the SSK/PUS fields of problematising and analysing the assumptions and prescriptions underlying conventional/normal scientific practice in different contexts. It is argued here that in certain instances process experts are beginning to play an increasingly influential and powerful role in shaping environmental risk policy processes and outcomes. This form of expertise should be open to similar empirical study and reflection[11].

3.1 Conceptualising a network approach

This Section describes the conceptual framework that underpins the network approach adopted in this thesis, which is based on the theory of epistemic communities. In this sense those associated with a democratic mode of environmental risk decision-making in the UK, or more specifically the networks of professional actors currently pushing forward PRA practice, can be seen as collectively belonging to an epistemic community. This conceptual framework is particularly suitable as is builds directly on the conceptual explanations of the dominant technocratic mode of operation and the emerging democratic/socio-cultural mode developed in Chapter 2, to analyse the degree to which a possible epistemic shift is occurring within the UK environment-risk policy domain.

3.1.1 Understanding participatory environmental risk appraisal networks

The theory of epistemic communities has its origins in the arena of international policy coordination. It was first developed by Peter Haas and others in the late 1980s

[11] It could be argued that situated SSK/PUS studies have lacked any real resolution on processes of expertise, or the citizen-expert relationship, in relation to innovative deliberative contexts, focusing for the most part on risk/technological controversies around which 'participation' is limited or constrained.

(e.g. Haas, 1989, 1990, 1992; Adler, 1992; Adler & Haas, 1992; Sebenius, 1992). Haas (1992: 3) has defined an epistemic community as "a network of professionals with recognised expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue area". Although coming from a diversity of backgrounds, disciplines, and professions, members of an epistemic community possess the following key characteristics (Haas, 1992: 3):

1. A shared set of normative and principled beliefs, which provide a value-based rationale for the social action of community members.
2. Shared causal beliefs, which are divided from their analysis of practices leading to or contributing to a central set of problems in their domain and which serve as the basis for elucidating multiple linkages between possible policy actions and desired outcomes.
3. Shared notions of validity – *i.e.* inter-subjective, internally defined criteria for knowledge validation in the domain of their expertise.
4. A common policy enterprise – *i.e.* a set of common practices associated with a set of problems to which their professional competence is directed.

What brings members of an epistemic community together is their shared belief in the variety and the applicability of particular forms of knowledge or specific truths. In this sense the notion of an epistemic community resembles Kuhn's (1962) definition of a paradigm as a constellation of beliefs, values, techniques, shared by members of a given community and that governs a group of practitioners (Haas, 1992).[12]

Taking these defining characteristics from Haas, and referring back to the conceptual model developed in Chapter 2, it is clear that policy professionals operating under the democratic mode of environmental risk decision-making, and more specifically those pushing forward PRA practice, could be taken to broadly represent or belong to an epistemic community. If identifiable in the UK context, these professional actors would have recognised expertise in analytic-deliberative processes and/or general

[12] Other notable characteristics of epistemic communities not included the formal definition provided by Haas (1992) that community members might share include: intersubjective understandings; a way of knowing (or episteme); patterns of reasoning; a policy project containing common values, causal beliefs, and discursive practices; and a commitment to the production and application of knowledge.

competence in public and stakeholder involvement in environmental risk policy processes that are particularly uncertain and contentious. Community members would also have authoritative claims to policy-relevant local/experiential knowledge and public/stakeholder perceptions, views, and concerns within specific issues-areas (social knowledge), knowledge resulting from analytic-deliberative processes (integrative knowledge), and knowledge of processes and expected outcomes (procedural knowledge).

With reference to the four defining characteristics of epistemic communities as defined by Haas (above), this potential epistemic community around PRA in the UK might possess:

1. Shared normative/principled beliefs in participatory/deliberative democracy, communicative rationality, or the democratisation of science - which manifest in the form of normative, instrumental, substantive or epistemological rationales for action (as defined in Section 2.3.1).
2. Shared causal beliefs on the relationship(s) between environmental risk decision context/process/outcome - partly based on analysing the failures of the technocratic mode of operation in specific situations, and understanding/experience of participatory processes – which serves as a basis for elucidating linkages between process design and desired outcomes (e.g. enhancing the legitimacy, acceptance and quality of, trust in, and relevant understandings and knowledge informing, a decision).
3. Shared notions of validity – *i.e.* commonly, internally defined criteria for evaluating the effectiveness of participatory (risk appraisal) processes and principles of effective analytic-deliberative practice (as outlined in Section 2.4).
4. A common policy enterprise relating to ensuring better environmental risk decision-making under uncertainty through deliberation and inclusion, with an associated set of common participatory (see Appendix 2) and analytic-deliberative practices (see Section 2.3.2.4).

Members of this possible epistemic community stand to gain legitimacy, authority, and access to the political system through professional training, prestige, and a reputation for having a high degree of expertise and competence in PRA by actors within and outside of the community. Their primary power resource in influencing policy debates is through authoritative claims to social, integrative and procedural knowledge, supported by appropriate tests of validity. Professional pedigree and internally defined tests of validity in turn define, and act as potential barrier to, community membership (cf. Haas, 1992).

Early discussions (e.g. Haas, 1992; Adler & Haas, 1992) and most applications (e.g. Haas, 1989, 1992, 2000; Adler, 1992; Zito, 2001; Gough & Shackley, 2001) of the epistemic community concept have a distinctly technocratic feel, focusing exclusively on epistemes rooted in the natural/physical sciences and dynamics of 'counter-science' in policy areas that assume the dominant authority of scientific expertise. However it would appear that analysis of a community based around process expertise is valid because, as Haas stresses, community membership need not be restricted to a modernist conception of knowledge,

> "Epistemic communities need not be made up of natural scientists; they can consist of social scientists or individuals from any discipline or profession who have a sufficiently strong claim to a body of knowledge that is valued by society. Nor need an epistemic community's causal beliefs and notions of validity be based on the methodology employed in the natural sciences; they can originate from shared knowledge about the nature of social or other processes, based on analytic methods or techniques deemed appropriate to the disciplines or professions they pursue" (Haas, 1992: 16).

The idea of epistemic communities appears even more relevant to participatory risk appraisal in post-normal decision contexts when we consider the conditions under which such communities operate, how they come into being, and how they evolve. These conditions are characterised by high levels of (technical) uncertainty and complexity, and the conditional and contested nature of knowledge. Under such conditions, the evolution of epistemic communities, as outlined by Haas (1992: 3-5, 12-16) and Adler and Haas (1992: 372-385), can be summarised as encompassing the following four stages:

1. Highly uncertain policy problems stimulate decision-makers to demand various forms of information and advice. As these demands for information arise, networks or communities of experts able to provide the required information emerge and proliferate. It often takes a 'crisis' or 'shock' for decisions makers to realise the true extent of the problem and that traditional procedures have broken down, before seeking help from an epistemic community. Alternatively information generated by an epistemic community might create the shock that initiates this process. Decision-makers tend to seek information from those who are deemed more credible, or from those who can provide evidence to justify their preexisting ends.
2. Members of an epistemic community become stronger as decision-makers demand their information and delegate responsibility to them. The extent to which a community consolidates bureaucratic power is positively related to the degree to which their worldviews become institutionalised and their advice has influence over policy processes. Members of an epistemic community can influence decision-makers by directly identifying interests, or illuminating salient dimensions, from which decision-makers then deduce their own interests. Selection of information and advice varies with political factors and related considerations, such as the degree to which decision-makers are familiar with the issue. Decision-makers can then in turn influence others based on the core beliefs of the community.
3. A community may contribute to the creation and maintenance of social institutions that guide behavior. Such institutions may allow community cooperation to persist even though systemic power concentrations may not be enough.
4. One of the main factors affecting how long an epistemic community remains influential is the degree of consensus among community members. If a community loses this consensus decision-makers pay less attention to its advice and its authority diminishes. Crises and shocks might also create an environment where new epistemic communities can emerge and gain authority and legitimacy.

Although providing a very useful explanation of how epistemic communities might come into being and evolve, Haas and Adler appear less clear on the relationships, linkages, and interactions between actors during this process. In seeking further understanding of actor-relationships it might be fruitful to touch upon complimentary perspectives on actor-networks from the SSK and science studies literature (e.g. Callon, 1986; Latour, 1987; Law, 1992). Callon's (1986) work on the 'sociology of translation' appears particularly relevant in this context. Although being primarily concerned with overcoming dualisms to understand action as mediated by both human/non-human entities and the development of actor-network theory at the situated case study level, Callon's work offers possible insights into how members of an epistemic community 'enrol' other actors into their network, impose their ideas on them, and influence outcomes.

Callon's ideas have been developed in relation to the case study of a scientific and economic controversy around the declining scallop population in St. Brieue Bay, northwest France, and the attempts by a group of scientists to develop a conservation strategy for the population. Callon explains how in doing this the scientists sought to impose themselves and their definition of the situation on other actors (*i.e.* the scallops and local fishermen) through 'four moments of translation', "during which the identity of actors, the possibility of interaction and the margins of manoeuvre are negotiated and delimited" (Callon, 1986: 203). Callon (1986) describes these four moments of translation as:

- *Problematisation.* Where the scientists sought to become indispensable to the actors in the controversy through defining a research agenda / problem (e.g. 'we need to know whether it is possible to cultivate scallops') and defining the interests and identities of other actors (*i.e.* scallops, fishermen, scientific colleagues) in relation to it. In doing this the scientists formed an 'obligatory passage point' which the identified actors had to pass (*i.e.* admit to the research programme) for the network/relationships they were building to develop;
- *Interessement.* Where the scientists attempted to impose and stabilise ('lock into place) the identity and roles of the other actors as proposed when defining the research agenda. In doing this the scientists actively strengthen their relationship with the other actors, impose their view, and attempt to break down / interrupt links with all those who hold competing definitions/problematisations. This

constructs a system of alliances between actors to be enrolled and forms an identity (boundary) around the network;

- *Enrolment.* Interessement does not necessarily lead to enrolement, but achieves enrolment if it is successful. "To describe enrolment is thus to describe the group of multilateral negotiation, trials of strength and tricks that accompany the interessements and enable them to succeed" (Callon, 1986: 211). In St. Brieue the scientists had difficulty in enrolling others to their beliefs – most notably the scallops who did not act as expected – but succeeded through negotiation by convincing scientific colleagues and gaining the passive acceptance of fishermen that their research answered the questions posed in problematisation.
- *Mobilisation*, which relates to the ability of a small number of actors to speak on behalf of others. In Callon's case the scientists - through showing that the scallops were successfully cultivated, convincing scientific colleagues that the results were valid, and gaining the support of the fishermen - became representatives, and spoke on behalf of, the other actors in the network. Where such consensus is achieved the margins of manoeuvre of actors within the network become tightly delimited and through the process of translation a constraining set of relationships has been built.

These four moments might help explain the stages by which epistemic community members build relationships with other actors and thus develop networks around specific environmental risk issues or policy processes based on their ideas. It may also describe how these relationships can break down. In this regard Callon's case had a final twist in which the scientists were betrayed by the scallops and fishermen leading to their central position within the network being compromised and alliances being broken down. In this final stage the *dissolution* of the network was brought about when as years passed the scallops continually failed to attach to the collectors (and thus be cultivated). Scientific colleagues became sceptical of the scientists' claims and the fishermen could not resist the temptation to fish the remaining scallops that had been part of the experiment.

Members of an epistemic community come from a wide diversity of backgrounds, disciplines, professions, institutions, organisations, sectors, and so on. A potential epistemic community based around PRA in the UK would be comprised of three main types of actor: (i) *process experts*, including participatory practitioners and researchers who design, manage, facilitate, and evaluate participatory processes; (ii) *decision-makers*, who sponsor, commission, manage, and make decisions based on outputs from participatory risk appraisal processes; and (iii) *specialists / scientific-experts*, who either act as independent specialists or conduct analysis. These three types of actor could be situated in any institutional context, organisation or sector. For the purposes of this thesis these three actor types are defined as being situated in one of four sectors, namely public, private, research, and voluntary[13].

It is important to clarify how epistemic communities are different from (and relate to) other possible networks or actor groupings. Haas (1992) defines epistemic communities as being distinct from interest groups, professions/disciplines, and bureaucratic bodies/organisations. It is the combination of having shared principled (normative) and causal (analytic) beliefs *as well as* consensual knowledge and common interests that sets epistemic communities apart. *Interest groups* tend to have shared beliefs/interests but knowledges and causal (analytic) beliefs that are disputed and unshared. An epistemic community would withdraw from a policy debate that went against or undermined its causal beliefs, whereas an interest group may remain. Although *disciplines and professions* have shared causal beliefs and consensual knowledge, they lack shared principles and interests. An epistemic community's ethical standards and involvement in a policy process arise from its principled approach to the issue in hand, unlike members of a profession/discipline who seldom limit their work or participation based on interests/principles as ethical standards are drawn from professional codes[14]. The beliefs and goals of epistemic communities differ from those of *bureaucratic bodies/organisations*. The latter largely operate to preserve their missions and budgets whereas epistemic communities will only operate in situations aligned to its normative objectives and common policy project.

[13] Early writing on epistemic communities (e.g. Haas, 1989, 1992; Adler & Haas, 1992) portrays a state-centred account of the policy-making process, focusing on decision-making by governments. The democratic mode of environmental risk decision-making - emphasising plurality, participation and inclusion - is more consistent with ideas of multi-sector 'governance' (Rhodes, 1997; Stoker, 1998).

Figure 3.1 clarifies how epistemic communities might relate to other possible groupings and networks (in addition to the three above), which exist around environmental risk policy processes. The figure shows an abstract representation of an epistemic community in relation to three distinct issues-areas (A, B and C) along with individual policy processes and participatory processes situated within each of these issue-areas. Each issue-area (which represents an environmental risk issue such as waste management, chemicals, genetic modification, air pollution, contaminated land, renewable energy technologies or mobile phone technology for instance) can be identified as having an issue network (Marsh & Rhodes, 1992) in relation to it. Similarly, each policy process within an issue area (e.g. a regional landfill siting planning processes in the area of waste management) can be seen as having a distinct policy network (Rhodes, 1997) of actors relating to it.

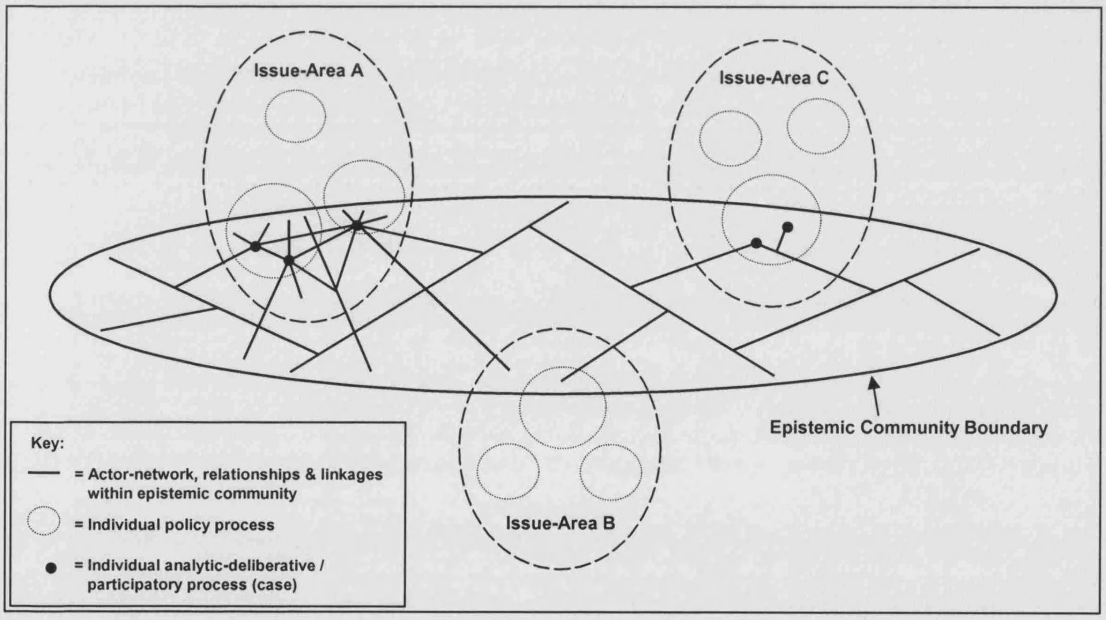

Figure 3.1. A diagrammatic representation of a hypothetical epistemic community and actor-networks within it; defining how it relates to environmental risk issue-areas (around which issue networks exist), individual policy processes (around which policy networks exist), and specific analytic-deliberative processes (cases).

[14] In practice however epistemic community members will also work in a professional capacity in short-term alliances on common research and concerns.

Epistemic community members are partly situated in or engage with each issue-area and certain policy processes within them, but the community as a whole goes beyond these to simultaneously engage with other issue/policy areas. Any specific epistemic community will almost always be only partially represented in a specific issue area (issue network) or policy process (policy network) given the presence of those participating on a different basis (e.g. interests groups, organisations and other groupings outlined above) and possibly other (competing) epistemic communities. It follows from this that any one epistemic community will have internal sub-groupings where certain members are also affiliated to the alternative networks outlined above (e.g. issue based, interest group based, disciplinary, professional, organisational, and so on).

Figure 3.1 provides a simplistic representation of the actor-network and the relations/linkages between actors making up the possible epistemic community based around PRA. It shows community members to be involved in and influencing issue areas, individual policy processes, and particular participatory processes within them. It also shows the movement of community actors, or interactions between them, between individual cases, policy processes and issue areas. In Figure 3.1 the number of community members and the network of relations between them are most dense within and around issue-area A, where the community has been influential in institutionalising analytic-deliberative processes. There are parts of issue-area A that remain unaffected by the epistemic community and where policy processes are devoid of participatory processes. The extent of the community (boundary) partially encompasses the two other issue-areas, although the network is less well developed. Community translation and influence has only just begun in issue-area B and there are no cases of participation. The network, and relations within it, is still immature in relation to issue-area C although community members are beginning to shape policy processes in the area.

3.1.2 Social learning in environmental risk policy networks

Given conceptual perspectives developed in this Chapter so far and earlier in Chapter 2 it is important to clearly define what social learning in environmental risk policy networks actually means. Within this context two types of social learning can be distinguished:

L1. *Social learning within the epistemic community / PRA network*, involving diffusion of ideas and development of shared understandings between professional actors, in relation to participatory risk appraisal and public and stakeholder involvement in technical environmental risk policy processes more generally.

L2. *Policy / Institutional learning*, involving the influence of epistemic community members on decision-making institutions, issue-areas and specific policy processes, bringing about a broader epistemic shift in the nature of environmental risk policy processes from the dominant technocratic mode (outlined in Section 2.2) towards a democratic mode (developed in Section 2.3).

The first type of learning (L1) involves collective learning and the development of 'shared' understandings between professional actors within PRA networks in relation to participatory risk appraisal, and public and stakeholder involvement in technical environmental risk policy processes more generally. This includes collective learning about beliefs, knowledges and understandings (developing normative and causal beliefs) and how to engage citizens and stakeholders more effectively (developing analytic-deliberative practices and effectiveness criteria/principles). The epistemic community literature tends to conceptualise such collective learning in terms of the diffusion (circulation and exchange) of ideas, knowledge, information, beliefs, experiences, practices, etc., within a community. Such community diffusion occurs through channels such as "conferences, journals, research collaboration, and a variety of informal communications and contacts" (Haas, 1992: 17). Adler & Haas (1992: 378) add that,

> "[m]embers of epistemic communities actively... diffuse their policy advice... through communication with their colleagues in scientific bodies and other... organisations, during conferences, and via publications and other methods of exchanging lessons and information".

Members who do not always meet regularly in a formal manner will remain connected through various relational forms of interaction and communication. As already noted, a key aspect of within community learning is the continual development of shared/consensual knowledge, practices and notions of effectiveness, in the light of emerging information and experience. As Haas (1992: 18) notes,

> "In relation to new information generated in their domain of expertise, epistemic community members may… engage in internal and often intense debates leading to a refinement of their ideas and the generation of a new consensus about the knowledge base".

According to social network analysis, effective diffusion and development of shared understandings in the sense portrayed in writing on epistemic communities depends on factors such as the connectedness (density) and reciprocity of relations between actors (Scott, 2000). The 'extent' of the community is also important. Given his focus on the international level, Haas (1992) argues that a transnational community's influence is likely to be greater (more sustained and intense) than that of a national community, by virtue of its larger diffusion network. Epistemic communities also exist at the sub-national level however. It follows from this that in the UK context a PRA network that transcends specific issue-areas, policy processes, and cases is likely to be more influential than one that is limited to one of these particular groupings. This is implied by Adler & Haas (1992: 378), who state that in the absence of broader

> "communication and socialisation processes that epistemic communities help promote, new ideas and policy innovations would remain confined to a single research group, a single… organisation, or a single [part of] government and would therefore have no structural effects".

It is clear from this that the potential for 'democratising science' in post-normal environmental risk contexts in the UK could (at least partly) depend on the specific nature and character of any possible epistemic community building up around the democratic mode of decision-making.

To situate this in the wider literature on learning processes, social learning in epistemic communities works at an inter-organisational level. While a considerable amount of work has gone into understanding learning processes at the individual and organisational level (e.g. Argyris & Schön, 1978; Senge, 1990) much less is known about inter-organisational learning in networks. As noted in the introduction to this Chapter, an inherent part of learning and development at the level of a PRA network will be formal and informal learning by individual actors and organisations based on their experiences of specific cases or policy processes.

On the subject of inter-organisational learning a comprehensive study by Knoepfel and Kissling-Näf (1998), though situated in the context of policy networks, supports and supplements perspectives from the epistemic community literature. They see inter-organisational actor-network based learning as exchange within and between specifically structured groups. Although interaction between actors results in cognitive adjustment, change in individuals' inter-organisational learning should be seen as a collective (extra-individual) social process. Knoepfel and Kissling-Näf (1998) emphasise that formalising learning and building up stores of knowledge that are then made accessible to other actors in time and space is an essential component of inter-organisational learning processes.

The second type of learning defined above (L2) relates to the influence or impact that professional actors within the PRA network are having on decision-making institutions and shaping policy processes in the environment-risk domain. A possible explanation of the processes by which such influence occurs already has been outlined in Section 3.1.1 in terms of stages in the evolution epistemic communities (Haas, 1992; Adler & Haas, 1992). Ultimately, social learning in this sense relates to a broader epistemic shift towards a more contextual mode of environmental risk decision-making, a more democratic science and the institutionalisation of participatory risk appraisal. It represents the degree to which decision-makers and scientific institutions are being reflexive in the face of contentious and uncertain environmental risk issues. This converges with Wynne's (1992c: 278) definition of social learning in relation to risk as

> "[a] kind of progressive, reflexive unearthing and negotiation of the pre-commitments shaping knowledge frameworks. It is reflexive in the sense that it critically examines and enlarges the self-knowledge of the social actors involved".

Again, the key features (or indicators) that define the nature of environmental risk policy processes under the dominant technocratic mode and the alternative democratic model have been outlined in Section 2.2 and Section 2.3 respectively and will not be repeated here.

3.2 Research methodology

So far this Chapter has argued that a network approach focusing specifically on professional actors is needed to better understand participatory risk appraisal, and outlined a conceptual framework that can assist the analysis of networks building up around such practice in the UK. This Section describes the research methodology and empirical work that has been undertaken to understand the nature of these networks and social learning occurring within them (Research Theme 1), assess how current participatory risk appraisal practice is being shaped by them (Research Theme 2), and capture practitioners' own grounded perspectives on effective PRA (Research Theme 3). An overview of this three-stage research approach is provided in Figure 3.2.

The central objective of *Stage 1* was to develop a comprehensive overview of the networks and practices building up around PRA in the UK, and gain access to these networks. In order to do this, in-depth interviews were conducted with ten carefully chosen 'gatekeepers' who operate at the national level, had good overviews of the UK situation, and collectively represented all three actor types (*i.e.* process experts, specialists/scientific-experts and decision makers) from across all four sectors (*i.e.* public, private, research, voluntary). Interviews focused on issues relating to networks and learning (Theme 1), but also covered respondents' overviews of current practice (Theme 2) and evaluative judgments on effective practice (Theme 3). The main

Stage 1 – Overview of the UK PRA Network

- *Objective/Purpose*: to interview key 'gatekeepers' in order to gain access to, and develop a comprehensive overview of, PRA networks/practice in the UK (across all issue-areas & cases).
- *Empirical material*: 10 in-depth interviews. Primary focus on networks & learning (Research Theme 1), but also addresses Research Themes 2 and 3.
- *Interview respondents*: Process experts, scientific-experts and decision-makers, from across all sectors.

Stage 2 – Focusing on area of Waste Management

- *Objective/Purpose*: to assess current PRA practice in the waste management area from the perspective of key actors identified in Stage 1, focusing specifically on radioactive waste.
- *Empirical material*: 16 in-depth interviews and supporting documentary evidence. Primarily focus on Research Theme 2, but also addresses Research Themes 1 and 3.
- *Interview respondents*: Process experts, scientific-experts and decision-makers, from across all sectors.

Stage 3 – Radioactive Waste Workshop

- *Objective/Purpose*: to bring network actors together in a workshop process to consider effective PRA practice in relation to a single case study within the area of radioactive waste management.
- *Empirical material*: Tape and written recordings of discussions; visual workshop outputs; record of effectiveness criteria developed. Primarily addresses Research Theme 3.
- *Participants*: Process experts, scientific-experts, decision-makers, and professional stakeholders from all sectors.

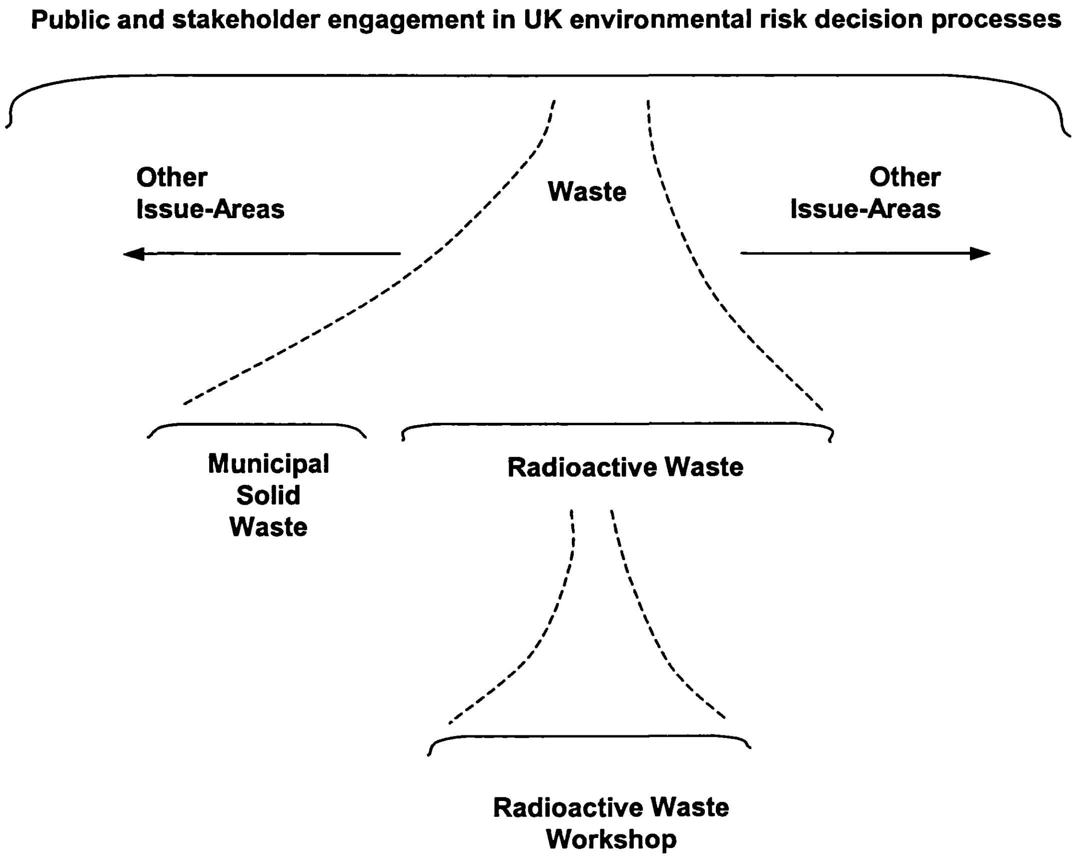

Figure 3.2. An overview of the research approach.

component of the interview used network methodology to map each respondent's unconstrained perspective of the UK PRA network and current situation, which cut across the patchwork of issue-areas and cases that exist in the UK (see Figure 3.2).

Iterative analysis of Stage 1 results significantly framed the remaining stages of the research and served to identify the issue-area deemed to be most important with respect to PRA in the UK. It was on this basis that the central objective of *Stage 2* was to assess current PRA practice in the waste area focusing specifically on radioactive waste and the cases that exist within it. Sixteen in-depth interviews were conducted with key actors (as identified by Stage 1 respondents) who collectively represented the full diversity of actor types and sectors. While the interview principally focused on assessing current practice (Theme 2), it also addressed their perspectives on networks and learning (Theme 1) and evaluative judgments on effective practice (Theme 3). The main component of the interview asked respondents to discuss current practice in relation to a model of the environmental risk policy process. This was supported by the consideration of documentary evidence relating to specific cases.

The final stage of the research approach sought to further explore actors' notions of effective PRA, either from the perspective of participants' who had been involved in a single case example or from the perspective of Stage 1 and 2 respondents' and other policy professionals brought together in group discussion. An ideal opportunity to undertake the latter of these options emerged from an in-depth interview in Stage 2. The author and two other colleagues at the Environment and Society Research Unit (ESRU), University College London, were commissioned by the Radioactive Substances Division (RASD) at the UK Department of Environment Food and Rural Affairs (Defra) to run a workshop to support the Government's *Managing Radioactive Waste Safely* (MRWS) decision process (for background to the MRWS process see Defra, 2001; Defra/ESRU, 2003). Given this opportunity, the objective of *Stage 3* was to bring network actors together in a deliberative process to consider effective PRA practice in relation to single case study within the issue-area of radioactive waste (see Figure 3.2).

Although Stage 3 has provided valuable empirical material that offers a comparative analysis with interview data, it is Stages 1 and 2 that form the core methodological component of the research approach summarised in Figure 3.2. In-depth interviews conducted at both these stages represent the principal empirical material drawn upon in this thesis.

Two key features characterise the way in which interviews were conducted and analysed. First, the interviews explored the three main research themes in open discussion between the interviewer and interviewee. This represented the main part for the majority of interviews and adopted an interview guide approach with a mix of both pre-worded questions and general themes to be explored. All interviews were audio-recorded and transcribed. The resulting discourse was subject to qualitative analysis involving description, classification/coding and interpretation in relation to the main research themes (Dey, 1993; Silverman, 1993, 1997; Denzin & Lincon, 1994; Crang, 1997), drawing on grounded theory methodology (Glaser & Strauss, 1967, Strauss & Corbin, 1998).

The second key feature of the interview method was the use of network methodology to map out each respondent's actual and perceived PRA network, and elicit their understanding of the relationships between professional actors within it. This part of the interview was directed by the interviewer in a more structured manner and produced discrete semi-quantitative (in addition to qualitative) data that was subjected to network analysis. The type of questions asked and the analysis of responses are partly informed by early work developed in the field of social network analysis (SNA)[15]. SNA is most appropriate for the analysis of relational data – *i.e.* "the contacts, ties and connections... which relate one [actor] to another" (Scott, 2000: 3), which cannot be reduced to the properties of the individual actors themselves.

[15] The origins of social network analysis lies in the work of Radcliffe-Brown and has been developed by an increasing number of social anthropologists and sociologists since the 1930s, building on his concept of 'social structure' and using the idea of 'social networks' as metaphor. The 1950s saw the initiation of more formal interpretations of this metaphor culminating in the development of highly technical and mathematical forms of analysis through the 1970s giving the field of SNA its defining contemporary characteristics (Scott, 2000). The approach to network analysis adopted here draws on earlier work in SNA that is more qualitative and less formal/technical in nature.

Rather than serving a theoretical purpose, SNA informs the network approach at a methodological level. The need for this partly arises because of the limited consideration of method in the network literature. A more significant reason, however, is that methods developed in relation to the conceptual framework outlined in Section 3.1 tend to be based on longitudinal or historical approaches which analyse networks 'after the event'. The focus in this study is on contemporary networks that are currently emerging in the context of participatory risk appraisal in the UK, where the membership, nature and extent of these networks is not known *a priori*. SNA therefore supports established methods for studying epistemic communities in producing a 'snap shot' of how networks and practices are currently developing and evolving. SNA is used here on a practical level to assist network mapping which builds the sample by identifying possible interviewees in a snowballing process, and serves as a possible indicator of the extent of an epistemic community. SNA is also a possible means of describing network characteristics such as boundaries, sub-groupings, level of development or maturity (e.g. the density, intensity, reciprocity of relations), and relationships between actors (Scott, 2000). Pennington and Rydin (2000) have used SNA techniques in a similar way to analyse social capital in UK local environmental policy networks.

3.2.1 Stage 1: Entering the UK participatory risk appraisal network

The central objective and purpose of Stage 1, and how it fits into the overall methodological context, has been defined above. This Section describes in more detail the process of research design, data collection, and analysis.

3.2.1.1 Selection and recruitment of key gatekeepers

The process of selecting a panel of ten key gatekeepers to take part in Stage 1 in-depth interviews was informed by developing an initial understanding of the UK participatory risk appraisal field. This involved reviewing documentary evidence, field observations, conducting four preliminary scoping interviews[16], and holding informal discussions with key informants within the field. A further input to the selection process was a workshop held in May 2001 to discuss the research approach with individuals knowledgeable in the area of PRA, after which the membership of the interview panel was finalised.

Gatekeeper selection is absolutely critical in the context of this thesis as it represents the starting point that bounds any understanding of actor-networks and frames later research stages. The Stage 1 objective of developing a 'comprehensive overview' demands that respondents are as diverse and inclusive as possible. Selection therefore adopted a reputational approach (Scott, 2000), given that a positional approach was not possible (nature and membership of the network was not known *a priori*) and the obvious deficiencies of a snowball technique starting from small number of informants. As Laumann *et al.* (1983: 22; cited in Scott, 2000: 56) note, "it is scarcely informative to learn that a network [solely] constituted by a snowball sampling procedure is well connected". In order to ensure that the choice of gatekeepers was theoretically and empirically justified the selection process had to meet four key selection criteria:

- *Reputation/influence.* The potential gatekeeper should occupy a position of importance in the UK participatory risk appraisal field, in that they are: (i) highly influential (people come to them for assistance/advice on PRA); (ii) well connected (broad reach across UK PRA networks); and (iii) highly central (representing a central contact within specific issue-areas or groupings).

- *Depth & breadth of experience.* The potential gatekeeper should have a comprehensive overview of current practice that goes beyond specific issue-areas and cases, and/or practical experience of PRA.

[16] Although tape-recorded, these scoping interviews with key informants were informal in nature and had the sole purpose of enhancing my understanding the UK PRA field. These four interviews have contributed to research framings and gatekeeper selection but have not been formally included in analysis.

- *Diversity of expertise.* The panel should represent the diversity of professional actor types involved in PRA processes including: (i) process experts (both participatory practitioners and researchers); (ii) decision-makers; and (iii) technical specialists / scientific-experts.

- *Sector diversity.* The panel should represent the diversity of sectors defined in Section 3.1 - *i.e.* public, private, research, and voluntary sectors.

The process of gatekeeper recruitment involved sending each selected respondent a covering letter with a brief outline of the research (see Appendix 4.1). This was followed up with a phone call to discuss the interview, ascertain whether the prospective interviewee was willing to participate, and if so arrange a time and a place for interview that suited them. An interview outline was sent out to respondents one week prior to the interview to provide further detail on the areas to be covered and prompt them on key areas to think about (this was deemed particularly important with regard to questions about actors and networks). All ten gatekeepers approached agreed to take part in the interview and were very enthusiastic about the prospect. Finalising the time and place of interview often involved correspondence back and forth with respondents (and their secretaries) over a number of weeks. It was very important to be flexible here given that all respondents operated at the national (and international) level, held senior positions in their respective organisations, and thus had very busy schedules.

A summary of the Stage 1 interview panel is given in Table 3.1. Respondents have been identified alphabetically, according to the date of interview, in order to preserve their anonymity. This is deemed essential on ethical grounds. Some participants were happy to be identified, although others did not state this so positively. The interview elicited a considerable amount of personal information about relationships with peers, colleagues, and even friends. On the whole respondents were very comfortable doing this, although some individuals expressed concern in relation to specific points. As shown in Table 3.1, clear diversity exists between participants in relation to professional actor type and sector in accordance with the gatekeeper selection criteria outlined above. Almost a third of the panel was female and just over two-thirds male, while the age demographic reflects the general seniority of respondents. All interviews took place between August-October 2001 and varied between 1 to 3 hours in duration.

Respon -dent	Actor Type	Sector	Gender	Age	Date	Duration (hour/s)
A	Decision maker	Public	M	50-65	6.8.2001	1
B	Process expert (practitioner)	Private	F	50-65	8.8.2001	2.5
C	Decision maker	Public	M	50-65	15.8.2001	2.5
D	Specialist/scientific-expert	Voluntary	M	35-50	17.8.2001	1
E	Specialist/scientific-expert	Private	M	50-65	18.8.2001	1.5
F	Process expert (researcher)	Research	M	50-65	21.8.2001	1.5
G	Process expert (practitioner)	Voluntary	F	20-35	29.8.2001	2.5
H	Process expert (researcher)	Research	F	50-65	2.9.2001	3
I	Process expert (researcher)	Research	M	35-50	26.9.2001	3
J	Process expert (researcher)	Research / Public	M	50-65	2.10.2001	1

Table 3.1. The Stage 1 interview panel: summarising each respondent's identifying code, actor type, sector, gender, age, and the date and duration of interview.

3.2.1.2 In-depth interviews

In-depth interviews adopted an interview guide approach with a mix of both pre-worded questions and general themes to be explored (Fontana & Frey, 1994; Valentine, 1997, Seale, 1998; Stroh, 2000). The interview guide used in Stage 1 in-depth interviews is given in Figure 3.3, showing the four main themes and related questions explored in each interview.

Introduction

A. Background, meanings and experiences

- (AI) Could you briefly describe your background and what you do now?
- (AII) 'Engaging science in participatory processes' - what does this mean to you?
- (AIII) Could you briefly summarise your experiences of participatory processes that make explicit attempt to engage with science?

B. Mapping the network

- (BI) Where and when is science being engaged with participatory processes that support environmental decisions in the UK?
- (BII) Of the individuals (or organisations) working in this area: (i) who are the most important / influential; (ii) who has the knowledge, skills or capabilities?
- (BIII) Of the individuals working in this area who are you in most regular personal contact with? Could you describe the nature of your relationship? Beyond this where do you go for help, assistance, information? Who comes to you and how do you help, assist, and inform others?

C. Current practice and understandings

- (CI) Why is science being engaged with participatory processes?
- (CII) Why is science not being engaged with participatory processes?
- (CIII) What actual practices, approaches or techniques are being used? How is science engaged in the process? How are uncertainties contested, negotiated and resolved?

D. Good practice, learning and principles

- (DI) Can you suggest principles that define good practice in engaging science with participatory processes?
- (DII) To what extent is good practice being captured, communicated, and adopted in the UK?
- (DIII) How might learning & development be better facilitated?

Close

Figure 3.3. The Stage 1 interview guide.

A key feature of the interview was that it could be flexible and responsive to the specific institutional context and role of each individual. For the most part it took the form of a highly interactive open discussion allowing the interviewee to lead discussion and contest meanings. In this sense the guide was used iteratively as a prompt to ensure that all relevant themes had been covered in the interview, rather than in a strict linear manner as depicted in Figure 3.3. Within this flexibility, questions relating to Sections A, B and D of the schedule were considered in a similar fashion in all interviews, ensuring direct comparability between responses. These three Sections formed the core of the interview, focusing on Research Theme 1 and also contributing to Theme 3. The consideration of Section C (relating to Research Theme 2) was optional and depended both on time constraints or whether the respondent had the experience and ability to discuss issues of practice. For the most part prompts were kept open, exerting minimal prior framing to ensure that the diversity of each respondent's experience was captured.

The opening Section (A) partly served as an 'ice-breaker' building the relationship between respondent and interviewer, as well as providing valuable background information on the respondent and key understandings that might 'shape' the interview (such as the meaning they attach to the topic and their range of experience). Section B represented the core component of the interview. As noted above, it drew on SNA techniques to map out each respondent's actual and perceived PRA network, and gain an understanding the relationships between actors within it. Part BI elicited each respondent's initial overview of where and when practice is occurring and the actors that are building up around it in the UK. Beyond this, out of the different techniques available for mapping networks[17], the simple method of asking each respondent to name all actors that they deemed to be the most important or influential in developing PRA, and those that possess the knowledge, skills, and capabilities to actually undertake it was employed (Part BII, Figure 3.3). In order to keep track and provide feedback to the respondent if needed, the interviewer scribed named actors as the interview progressed.

In terms of mapping the network (Section B, Figure 3.3), Part BI and comments made throughout the interview lead to the general identification of actors thus indicating the possible extent of the UK PRA network (or epistemic community). Within this range

[17] Early social network studies, such as Moreno's (1934) work on friendships, have asked interviewees to prioritise actors in terms of importance, significance or closeness. A common strategy is to ask interviewees name their top 5 actors and list any others (Scott, 2000) and has been used by Pennington and Rydin (2000) in their recent study of local environmental policy networks. This approach was trialed in the first three interviews and was found not to be suitable. In one case the respondent identified less than 5 actors, the need to meet this number appeared to inhibit the process of identification. Whereas another respondent produced a long list of actors initially and due to time constraints it was not possible to go back and rank them in the interview. As Scott (2000) notes, this technique works most effectively when a list of actors is known prior to interview. Other possible techniques such as mind-mapping or getting participants to draw networks diagrammatically were deemed too time consuming and would detract from the task in hand.

of actors Part BII identified the members of this possible epistemic community that hold the credibility and legitimacy. Finally, Part BIII elicited each respondent's personal network and relationships by asking them to identify who they are in most regular personal contact with, who they go to for advice, and who comes to them, on the issue of PRA. This begins to flesh out the nature of relationships between actors (strength/intensity, reciprocity), how relationships develop (enrolment, translation) and resources exchanged (e.g. information, knowledge, expertise, skills, trust, prestige).

Section B of the interview generated a large quantity of data from the perspective of one individual, an 'ego-centred' view of the network (Scott, 2000). Just as important as the semi-quantitative data produced by this method, however, is the qualitative judgments it elicits on the nature, character, and development of networks and actor relations, which verifies and goes beyond the discrete relational data produced.

Section D consolidated and developed aspects already touched upon within the interview. Part DI asked respondents' to offer principles of good practice based on their experience. In practice this served more as a recap as most interviewees offered judgments on effective practice throughout the interview (e.g. when considering what PRA means in Section A or in relation to Section C if covered) and proved important in structuring responses. Parts DII and DIII then connected back to discussions on networks (in Section B) to consider learning and development within networks more broadly. To close, respondents were asked to comment on the interview process and the research more broadly which served an evaluative function and allowed for adjustments to be made in the interview approach where necessary. All interviews were audio-recorded after seeking consent from the respondent in the introduction.

3.2.1.3 Analysis

The main analytic approach used for Stage 1 data was qualitative and interpretive drawing on Dey (1993), Silverman (1993, 1997), Denzin & Lincon (1994) and Crang (1997). It involved description, classification/coding and interpretation in relation to the three main research themes. This has been supported by the analysis of discrete semi-quantitative data on networks and actors using techniques informed by SNA. The main approach used has been matrix techniques, which offer the most appropriate solution given the large quantities of relational data produced in interviews (Scott, 2000).

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1. Immediate write up of interview
2. Transcription of audio-recording
3. Preliminary/summary analysis
4. Follow-up correspondence with respondents
5. Intensive coding, interpretation, and analysis using ATLAS.ti

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Figure 3.4. The Stage 1 analysis process

The Stage 1 analysis process is summarised in Figure 3.4. The first analytical task was to write up notes on the context, process and content of each interview immediately after it had been completed. This served to record important aspects of the interview setting, non-verbal interaction between interviewer and interviewee, and other factors that might impact on the data. It also served as a means of evaluating the quality of the interview and provided a backup in the event of an audio-recording failure. The tape-recording was then transcribed as soon as possible after the interview. During transcription a small number of codes were used to identify certain aspects of the discourse.[18] Transcripts were then formatted leaving margins down either side with line numbers, and converted into the necessary format for export into Atlas.ti the computer based qualitative analysis software.

Preliminary analysis was then conducted on the transcripts. This was chiefly to extract and summarise discrete semi-quantitative actor-network data, but also to memo and annotate the text and develop preliminary codes. In certain instances it was necessary to follow-up any uncertainties or questions expressed in the interview (e.g. in relation to names or affiliations of actors mentioned) with respondents. The major analytical task was coding or classifying the Stage 1 data and drawing interpretations

[18] The following codes were used to indicate aspects of the discourse: [left bracket to indicate points where the current speaker's talk is overlapped by another speaker's; . single dot to indicate a pause in the current speakers talk; ( ) empty parentheses to indicate inaudible words; (text) parenthesized words to indicate possible hearings (from Silverman, 1993).

on the basis of this in the Atlas.ti computer package. Atlas.ti is based on grounded theory methodology (Glaser & Strauss, 1967; Strauss & Corbin, 1998) and also informed by general methods methodology (Muhr, 1997). Analysis began with a small list of top-down (or etic) codes based on the three main research themes. Working closely with the text as coding progressed gave a greater appreciation of data across interviews and lead to the development of bottom-up (or emic) codes from the text itself. Codes were continually refined (cut up, collapsed, and merged) as the process of interpretation progressed.

The main findings of Stage 1 analysis will be considered in the following chapters. At this stage, however, it is important to consider how these findings have been iteratively considered in framing the research process. One of the most significant contributions in this regard was to identify which networks should be followed in order to focus on practice in latter research stages. The dominant framing used by all respondents to explain where and when participatory risk appraisal is occurring in the UK was in terms of the environmental risk *issue-areas* (and relating policy processes or decision situations) and specific *cases* of participation that occur within them in space and time. This corresponds with the recognised importance of decision context and the emphasis on case based understandings (see Section 3.1) in the participatory literature. According to Stage 1 respondents, citizens are currently being engaged in science-intensive policy processes across 27 individual 'issue-areas' across the UK. The ranked importance of these issue-areas, according (primarily) to the number of respondents that identified them and (secondarily) the number of direct references relating to them, is summarised in Table 3.2 (see Appendix 6.1.1 for a full overview of the data).

Radioactive waste was the highest-ranking issue-area, being identified by most respondents and the second most talked about (this would have been even higher if aspects of nuclear decommissioning that relate to waste had been included in this category). Municipal Solid Waste (MSW) was the most talked about issue-area but ranked second, being identified by 6 respondents along with GMOs and chemicals. In addition, a high proportion of the cases discussed by respondents were situated in these high-ranking issue-areas (see Appendix 6.1.2). Partly on the basis of this analysis it was decided to situate the remaining research stages exclusively in the general area of waste, focusing on radioactive waste for the most part but also continuing to explore networks in the MSW area.

Issue-Area	**Respondents**	**References**
Radioactive Waste	7	28
Municipal Solid Waste	6	32
GMOs	6	26
Chemicals	6	12
Health	5	14
Water	4	10
Nuclear (licensing/decommissioning)	4	6
Transport	4	6
Climate Change	3	7
Biotechnology	3	6
Sea Defence	2	5
Flood Defence	2	4
Contaminated Land	2	4
Biomass	2	2
Decommissioning of Oil Platforms	2	2
Wind Energy	2	2

Table 3.2. The issue-areas in which citizens and stakeholders are being engaged in environmental risk decision processes in the UK, as identified by the Stage 1 interview panel. Each issue-area is ranked primarily according to the number of respondents that identified it and secondarily to the number of direct references (or quotes) relating to it. (11 additional issue-areas, each identified by one respondent only, have been omitted from the table.)

This decision was reinforced by each respondent's reasonings as to why PRA is occurring in the issue-areas listed in Table 3.2. Respondents highlighted key contextual characteristics that you might expect to exist in issue-areas where analytic-deliberative processes take place, including high levels of scientific uncertainty, contentiousness, conflict, public concern, large scale impacts, media attention, cultural resonance, immediacy/urgency of decisions, and the fact that existing decision-making approaches are failing. There is considerable overlap between these factors and those highlighted in the literature as characterising post-normal environmental risk decision contexts (as outlined in Chapter 2). Respondents' argued that many of these contextual characteristics are in place in the areas of radioactive waste and MSW.

Radioactive waste was seen as a key area for PRA both now and in the future. This is partly forced by a history of failure in past decisions, and the notoriously contentious and high profile nature of the issue that invokes high public concern, fear, even dread,

> "[I]t's the dread factor really. I think that nuclear waste is still something that people are very concerned about; they are very worried about it. A lot of the problems that people have about nuclear waste still haven't been resolved. That's something that they're concerned about. And its going to be health concerns. It's going to be the fact that there is something unknown out there" (Respondent A: 948-959).

Similarly, MSW was seen as a key area where analytic-deliberative practice is developing in the UK due to factors such as a history of failure, scientific uncertainty, and the immediacy of, and public identification (cultural resonance) with, the issue,

> "I really believe that in this country at the moment waste is the leading edge issue in terms of bringing together these different forms of [knowledge]. It's something that people can understand because it affects all of them. There is immediacy about it... [Waste is] the only situation that I can think of in the UK at the moment where those calling the party are really interested in pulling it all together because they can't move on waste without people supporting them and participating" (Respondent B: 722-840).

3.2.2 Stage 2: Focusing on waste

The central objective of *Stage 2* was to assess current PRA practice across the waste area (Research Theme 2), focusing specifically on radioactive waste and the cases that exist within it, while continuing to seek actor perspectives on networks and learning (Research Theme 1) and evaluative judgments on effective practice (Research Theme 3). Although the focus was on radioactive waste, Stage 2 continued to pursue networks less intensively in MSW. The main rationale for this was to compare network development, learning, and linkages between the two issue-areas rather than exploring practice in MSW in any real depth. Many aspects of Stage 2 methods are the same as those used in Stage 1, the description of which will not be repeated here. This Section only emphasises differences in research design, data collection and analysis in Stage 2. The main difference is adjustments to in-depth interviews to focus on how actors are shaping current participatory risk appraisal practice.

3.2.2.1 Selection and recruitment of respondents

Stage 1 analysis provided a map of the actor-networks building up around participatory risk appraisal in the UK, and within this established the actors judged to be particularly significant, important and influential. This included the identification of actors situated in or engaged with the areas of radioactive waste and MSW. The selection of Stage 2 respondents was based on this analysis, with priority given to those identified as significant/important actors, while meeting selection criteria C and D from Stage 1 (see Section 3.2.1.1) to ensure diversity across actor types and sectors. This strategy resembles a snowball technique (Scott, 2000), but makes explicit attempts to enhance the validity of selections by being based on a composite analysis of information from a panel of informants and including checks for diversity and inclusiveness.

The process of recruitment was the same as for Stage 1, involving the sending of a covering letter with brief outline of the research (see Appendix 4.2) to each selected respondent. As well as arranging interview logistics, the follow up phone call was used to check the appropriateness of the potential respondent based on their practical experience of participatory processes[19]. A summary of Stage 2 interview respondents is given in Table 3.3. 16 in-depth interviews were undertaken in total with 11 respondents situated in the area of radioactive waste (K to U in Table 3.3) and 5 in MSW (V to Z in Table 3.3). In actual fact Respondent V considered radioactive waste and MSW equally and can therefore be seen as situated in both issue-areas. Just over a third of the panel was female, while the age demographic reflects the general seniority of respondents. All interviews took place between May-September 2002 and

[19] One selected respondent based in a private consultancy refused to participate on the basis that he didn't have sufficient time. A short telephone interview was conducted but has not been formally included in analysis.

varied between 1.5 to 2.5 hours in duration.

Respon -dent	Actor Type	Sector	Gender	Age	Date	Duration (hours)
K	Process expert (researcher)	Research	F	35-50	8.5.2002	2.5
L	Decision-maker	Private	M	50-65	10.5.2002	1.5
M	Decision-maker	Public	M	50-65	14.5.2002	2
N	Process expert (practitioner)	Voluntary	M	35-50	21.5.2002	1.5
O	Specialist/scientific-expert	Voluntary	F	35-50	11.6.2002	2
P	Specialist/scientific-expert	Private	F	35-50	25.6.2002	2.5
Q	Process expert (practitioner)	Private	M	35-50	22.7.2002	1.5
R	Decision-maker	Private	F	50-65	23.7.2002	2
S	Decision-maker	Public	F	35-50	2.8.2002	2.5
T*	Process expert (practitioner)	Voluntary	M	50-65	20.4.2002	1.5
U*	Process expert (practitioner)	Voluntary	F	20-35	20.4.2002	1.5
V	Process expert (practitioner)	Private	M	35-50	23.9.2002	1.5
W	Process expert (practitioner)	Public	M	35-50	13.5.2002	2
X	Decision-maker	Public	M	50-65	28.5.2002	2
Y	Decision-maker	Private	M	50-65	5.6.2002	1.5
Z	Specialist/scientific-expert	Research	M	50-65	29.7.2002	2

* These respondents did not take part in network mapping and questions relating to networks and learning in interview.

Table 3.3. The Stage 2 interview panel: summarising each respondent's identifying code, actor type, sector, gender, age, and the date and duration of interview.

3.2.2.2 In-depth interviews

The process of in-depth interviews was largely the same as in Stage 1, adopting an interview guide approach and involving unstructured open discussion as well as a more structured part around networks. Two key differences stand out. Firstly, Stage 2 interviews were more directed and framings more tightly defined in advance - for example, with respect to the definition of participatory environmental risk appraisal and discussion being restricted to a specific issue-area. Secondly, the main part of the interview focused on current PRA practice and asked respondents to refer to visual aids at this point to structure discussion and systematically consider elements of practice. The interview guide used in Stage 2 in-depth interviews is presented in Figure 3.5, showing the three main themes and related questions explored.

Introduction

A. Background and experiences

- (AI) Could you very briefly describe your background and what you do now?
- (AII) 'Engaging citizens and stakeholders in highly scientific (radioactive) waste policy processes' - what does this mean to you?
- (AIII) In your view how has citizen and stakeholder engagement developed over time in the (radioactive) waste area?
- (AIV) Could you briefly summarise your range of experiences where citizens and/or stakeholders have engaged with or influenced risk science? More generally, where and when is this occurring in the area of (radioactive*)* waste?

B. Current practice and effective practice

- (BI) For the one or two specific case(s) of citizen and/or stakeholder engagement in scientific areas of (radioactive) waste decision processes that you deem to most be important (and with reference to the different stages of the environmental risk decision process*):
    - To what extent are citizens/stakeholders being engaged in and influencing the process?
    - Who is involved and what is the nature and means of engagement?
    - How and to what degree is science and participation being integrated?
    - How is information and expertise made available and communicated?
    - How are uncertainties managed, handled and negotiated?
- (BII) In your experience of situations where citizens and stakeholders have been engaged what was the impact or influence of participation on: the 'quality' science; social learning; and the overall decision?
- (BIII) Based on your experience in the (radioactive) waste area can you suggest principles that define good practice in engaging citizens and stakeholders in technical policy processes?

C. Relationships, networks and learning

- (CI) Of the actors (or organisations) engaging stakeholders in risk science: (i) who do you think are the most important or influential; (ii) who do you think has the knowledge, skills or capabilities?
- (CII) Of the actors working in this area who are you in most regular personal contact with? Could you describe the nature of this relationship? Beyond this where do you go for help, assistance, information? Who comes to you?
- (CIII) Would you say there are networks forming around this practice? If so could you comment on the nature of these networks?

- (CIV) To what extent do you feel the (radioactive) waste area is learning to engage stakeholders in risk science? Is good practice is being captured, communicated, and adopted? How do you feel learning and development could be better facilitated?

Close

* These stages relate to two visual aids (*i.e.* models of the environmental risk decision process shown in Appendix 1 (Figure A1.3) and Appendix 4.2.3) that respondents where issued with at the beginning of the interview and asked to refer to when considering questions in BI if they so wished.

Figure 3.5. The Stage 2 interview guide.

The opening section of the interview on each respondent's background and experience served much the same purpose as in Stage 1, while providing important contextual perspectives on the emergence and development citizen and stakeholder engagement within the issue-area. Section B, and more specifically Part BI, represented the main component of the interview directly contributing to Research Theme 2. Respondents nominated one or two case(s) from their experience that they deemed to be particularly important or innovative in terms of citizen and/or stakeholder engagement with science. They proceeded to take each case in turn and provide an in-depth description of the extent, means and influence of engagement, as well as aspects relating to the integration of analysis (science) and deliberation (participation) and treatment of uncertainties. Respondents were asked to relate their description of each case to a visual aid handed to them at the beginning of the interview which provided a simplified representation of the environmental risk decision process (as shown in Appendix 4.2.3)[20]. On the whole respondents' welcomed this and utilised the model in discussion. It served to structure discussion and provide an effective way of eliciting the extent to which the different stages technical policy processes are being opened up to citizen and stakeholder influence.

The remainder of Section B attempted to capture respondents' understandings as to the influence of participation on process outcomes and their judgements of effective

[20] This is essentially the democratic model of the environmental risk policy process. Participants were also issued with the RCEP's conception of the environmental policy process (see Figure A1.3 in Appendix 1), which is similar, comes from an official source and is widely known. All respondents instantly recognised and clearly understood both conceptions. They preferred to use the former because it was deemed to be simpler and easier to understand (see Appendix 4.3.2).

practice (contributing to Research Theme 3) either in relation to the cases described in Part BI or wider experiences. Section C then considered networks and learning (contributing to Research Theme 1) in the same manner as described for Stage 1 interviews. These questions were of lesser importance in Stage 2 and therefore left until the end of each interview. In certain interviews this meant that the mapping of networks was truncated given time constrains. Despite this, the intention to pursue networks down into individual issue-areas and verify findings from Stage 1 was met.

3.2.2.3 Analysis

The analytical approach used in Stage 2 was almost the same as for Stage 1 (as described in Section 3.2.1.3), again centering on qualitative description, classification/coding and interpretation in relation to the three main research themes and supported by analysis of data on networks and actors using matrix techniques. The analysis process was also the same. The only difference was the use of documentary evidence, which was either highlighted by each respondent in interview or obtained through Internet searches, to support the qualitative analysis of current practice.

3.2.3 Stage 3: Drawing actors together in a workshop process

The objective of Stage 3 was to bring network actors together in a workshop process to collectively consider effective participatory risk appraisal in the area of radioactive waste. It had been an early intention of Stage 3 to draw together actors from Stage 1 and Stage 2 in a group process to consider emerging themes and negotiate effective practice. This would stand to provide a useful comparison to, and further develop, principles from in-depth interviews. Clearly such a proposition suffered from a range of barriers, most notably around resourcing and logistics. An ideal opportunity to (at least partly) meet this goal emerged out of an in-depth interview in Stage 2. In an informal discussion immediately after the interview the respondent asked about initial results emerging from Stage 1 and 2 of the research and sought advice on a related process within which they were involved. As a result of this and further discussions with others, the author and two colleagues from the Environment and Society

Research Unit (ESRU) at University College London were commissioned by the Department of Environment Food and Rural Affairs (Defra) and the UK Devolved Administrations to run a workshop process (called the 'Participatory Methods Workshop') that provided advice to government on public and stakeholder engagement in national UK policy-making on the management of long-term radioactive waste.

Although the workshop was specifically designed to meet the needs of the Government's *Managing Radioactive Waste Safely* (MRWS) decision process (the objectives of which are described in Defra, 2001 and Defra/ESRU, 2003), it converged significantly with the objectives and focus of the research approach adopted in this thesis. The following points are particularly important with regards to this convergence:

- Initial discussions with the respondent meant that ideas coming out of research Stages 1 and 2 fed into the initial workshop concept (e.g. initial observations about networks, actors and practice). In this sense the workshop process was in some way connected to, and partly framed by, this thesis.
- The workshop included the same types of participant as Stage 1 and 2 interviews (*i.e.* process experts, decision-makers, technical specialists/experts), drawn from the same sectors (public, private, research and voluntary). The 43 participants attending the workshop included 7 respondents from in-depth interviews, as well as 25 individuals/organisations identified in the Stage 1 and 2 network mapping exercise.
- In the workshop participants deliberated on how citizens and stakeholders should be engaged in a national level participatory assessment/appraisal process (the policy options assessment stage of the MRWS process) and what effectiveness means in this context. The process framework outlined by government[21] around which workshop discussion was framed bears a close resemblance to the democratic model outlined in Chapter 2 and considered by respondents in Stage 2 interviews. This ensures a high comparative element between the outputs of the workshop and in-depth interviews.

Essentially then, the MRWS Participatory Methods Workshop brought together process experts and policy professionals from the networks studied in research stages 1 and 2 to discuss effective participatory risk appraisal practice in relation to a specific decision (case) in the area of radioactive waste management. The workshop produced a large quantity of data, some of which has already been analysed to meet the specific needs of designing an effective engagement programme for developing the UK's national policy on long-term radioactive waste management. Details on the design, management, and outputs of the workshop are available in Chilvers *et al.* 2003a and Burgess *et al.* 2003. I will reflect on and make reference to this material, but it has not been subject to any further analysis. Interviews conducted in Stages 1 and 2 are the core empirical component of this research and will form the focus of the following three empirical chapters.

[21] This process framework is described in Defra/ESRU (2003) and further outlined and outlined in Chapter 6 (see Box 6.2).

4 Professional networks and social learning in participatory environmental risk appraisal

This chapter presents an analysis of the network currently building up around participatory risk appraisal in the UK and the degree to which social learning is occurring between professional actors within it. The analysis draws on in-depth interviews conducted in both Stages 1 and 2, and focuses exclusively on Research Theme 1 (as outlined in Chapter 1). First, Section 4.1 considers the extent, nature and character of the possible epistemic community currently forming around a more democratic mode of environmental risk decision-making, describing the actors within it and how they relate to each other. We begin with the gatekeepers and their unconstrained overview across the UK before moving through networks within the area of waste in general, and radioactive waste management specifically, drawing together actors' more situated perspectives which verify and provide further resolution on those from Stage 1.

Section 4.2 then describes the processes by which ideas circulate through the network and assesses the extent to which shared understandings are developing between professional actors within it. This analysis provides a partial indication of the degree to which actors and institutions faced with difficult environmental risk decisions under uncertainty are learning to engage citizens and stakeholders more effectively. Chapter 5 builds on the findings presented in this Chapter to consider how this possible epistemic community is influencing institutional decision-makers and shaping practices in the area of radioactive waste. Chapter 6 then considers the principled beliefs of actors within the possible epistemic community by analysing their grounded perspectives on effective PRA practice. Adopting a broader analytical frame than most studies of analytic-deliberative practice, the present Chapter offers novel perspectives on the potential for the democratisation of science and scientific reflexivity within the UK environment-risk domain.

4.1 Mapping the UK participatory environmental risk appraisal network

4.1.1 An overview of the UK PRA network

The overview provided by Stage 1 gatekeepers of where citizens and stakeholders are currently being engaged in technical environmental risk policy processes has already been introduced in Section 3.2.1.3 (see Table 3.2). Respondents saw UK practice emerging across 27 issue-areas and, collectively, deemed the areas of radioactive waste, municipal waste, genetic modification and chemicals to be most significant. In relation to these areas, 41 individual cases of citizen and stakeholder involvement were identified (see Appendix 6.1.2). In the course of the preliminary mapping, respondents also talked about a range of actors who relate to current practice across the issue-areas identified.

The full extent of the UK PRA 'actor map' is presented in the form of a 'respondents by actor' matrix in Appendix 6.1.3. Each cell of the matrix represents a possible identification or affiliation between each Stage 1 respondent and each actor identified. The number in a specific cell represents the number of times a respondent identified a corresponding actor (zero indicates non-identification). All identified actors have been ranked according (primarily) to the total number of respondents who identified them and (secondarily) by the total number of times they were identified (or quoted) within the interview discourse. This initial mapping provides an indication of the extent and membership of a possible epistemic community building up around the democratic mode of environmental risk decision-making in the UK. The possible extent appears quite large with a total of 205 actors (individuals or organisations) identified as relating to the practice of PRA in the UK. Within this total range, however, only a small group of 21 actors were identified by 3 or more respondents, with the majority being identified by a single respondent only. The Environment Council was the actor mentioned by most participants (7 in total and ranked first), while the Environment Agency was the actor most talked about (23 quotes and ranked second).

Although providing an in indication of the epistemic community's possible extent, the explanatory function of this initial mapping is limited. As argued in Chapter 3, community membership is defined by the expertise and competence of professional actors in a particular domain and their authoritative claim to policy-relevant knowledge within that area. The network methodology employed in the interviews attempted to further elicit gatekeepers' perceptions of the most significant actors in this regard by asking respondents to identify who has the 'knowledge, skills, and capabilities' (KSC) and who is particularly 'important and influential' (II) in relation to PRA in the UK. Actors identified in relation to the first of these categories (KSC) are deemed by respondents to have recognised expertise in analytic-deliberative processes and/or general competence in engaging citizens and stakeholders in environmental risk policy processes. Under the definition provided in Chapter 3 these are the actors who make up the epistemic community. The second category of actors (II), are those with the influence (political capital or power) to make participatory risk appraisal happen. This might include members of the epistemic community, along with other actors who are pushing forward PRA practice.

The actors identified as being members of a possible epistemic community, along with those deemed to be particularly influential, have been overlaid on to the initial actor map in Appendix 6.1.3. Each cell is highlighted in yellow where an actor was identified as having KSC by a respondent, in green where an actor was identified as II, and blue where identified as being both. This represents an unconstrained mapping by each respondent in that they could list an unlimited number of actors in each category (within interview time constraints) and were free to identify anyone (no prior actor categories were imposed). A summary of the actors identified as having KSC or being II is given in Tables 4.1 and 4.2 respectively. Each actor (or group of actors) is ranked according to the number of respondents who identified them. Where an organisation and individuals within it have been identified separately a composite score is given. Actors are listed according to their actor type using the categories derived in Chapter 2 (Section 2.3) and Chapter 3 (Section 3.1). These categories were not imposed in the interviews; actors have been assigned to them in analysis. Interestingly, the categories suggested in Section 3.1, were naturally adopted by most respondents in interview[22].

Table 4.1 shows the UK epistemic community developing around a democratic mode of environmental risk decision-making to be a much smaller, tightly defined core group than the initial mapping. Membership is made up almost exclusively of process experts. In the view of Stage 1 gatekeepers, much of the UK's knowledge, skills and capabilities in relation to participatory risk appraisal are currently held within the research community. Researchers feature most strongly, with a total of 28 identifications by Stage 1 respondents. Those deemed to be particularly important include the group of researchers based at the Centre for the Study of Environmental Change (CSEC) at Lancaster University, Jacquie Burgess and others at the Environment and Society Research Unit (ESRU), University College London, the CSERGE group and others at the University of East Anglia (UEA), and Judith Petts who is based at the University of Birmingham.

It is clear that the list of academics in Table 4.1, as identified by Stage 1 respondents, have been working on various dimensions of citizen participation in complex and uncertain risk areas for a long time and have build up a considerable wealth of experience and expertise. When identifying these actors three respondents emphasised the importance of the UK Economic and Social Research Council's (ESRC) Global Environmental Change Programme, particularly the decision-making under uncertainty strand. Most researchers identified were closely involved in or related to this programme. Researchers identified in Table 4.1 study citizen participation in risk, develop theory, and innovate new methodologies and trial them in the form of participatory experiments. A significant trend highlighted by respondents is the increasing role played by certain researchers in providing consultancy and advice to decision-making institutions. A number of cases identified by respondents in Appendix 6.1.2 have involved researchers working on a more

[22] Respondents B and C were most explicit in this regard. In terms of processes experts they differentiated between 'theorists' or 'thinkers' (*i.e.* researchers) and 'doers' (i.e. practitioners). They also made a distinction between these process experts and decision-makers who they referred to as 'users' or 'sponsors' respectively.

practical basis in designing, managing, facilitating and evaluating participatory processes.

Actor(s)	References
Process Experts – Researchers	(28)
Centre for the Study of Environmental Change + Robin Grove-White + Brian Wynne + Jane Hunt + Phil Macnaghten (Lancaster University)	7
Jacquie Burgess + Environment & Society Research Unit (University College London)	5
CERGE + Tim O'Riordan + Ian Langford + Nick Pigeon (University of East Anglia)	5
Judith Petts (University of Birmingham)	3
Jerry Ravetz (Research Methods Consultancy)	2
Patsy Healy (University of Newcastle)	1
Alan Irwin (Brunel University)	1
Jim Skea, Policy Studies Institute (University of Westminster)	1
Bill Sheate (Imperial College London)	1
Andy Stirling, Science Policy Research Unit (University of Sussex)	1
Chris Woods (Manchester University)	1
Process Experts – Practitioners	(20)
The Environment Council	4
Pippa Hyam + Andrew Acland (Dialogue by Design)	4
Roger Levitt + CAG Consultants	3
Pat Delbridge (Pat Delbridge Associates)	2
John Durrant (Science Museum)	1
Richard Harris (Independent Facilitator)	1
Alan Hickling (Independent Facilitator)	1
InterAct	1
Alison Millward (Independent Facilitator)	1
Projects in Partnership	1
UKCEED	1
Technical Specialists / Scientific-experts	(9)
Environmental Resources Management + Gev Eduljee	3
Enviros Aspinwall + Rod Aspinwall + Hugh Carl-Harris	3
ECOTEC	1
IEMA	1
Paul Scott (Independent Environmental Consultant)	1

Table 4.1. Actors identified by Stage 1 respondents as having the knowledge, skills and capabilities in relation to participatory risk appraisal in the UK. (Each actor is ranked according to the number of respondents who identified them, in relation to their given actor type.)

Stage 1 gatekeepers identify participatory practitioners as the other main group of actors holding the knowledge, skills, and capabilities relating to PRA, being subject to 20 identifications in total. Organisations such as The Environment Council (TEC), Dialogue by Design, Roger Levitt and CAG Consultants, and Pat Delbridge of Pat Delbridge Associates, are deemed to be important. TEC are particularly visible across all Stage 1 respondents and are seen by many to be one of the main convening organisations. The Environment Council also managed a number of the processes identified in Appendix 6.1.2. A defining feature of participatory practitioners appears to be the notion of 'independence', which is a clear operating principle for the charity/not-for-profit organisations identified (e.g. TEC, UKCEED) as well as a number of facilitators who work on an independent basis. Despite this, most respondents see all participatory practitioners to be consultants. A number of practitioners identified in Table 4.1 have decades of experience in facilitating, designing, and managing participatory processes and have begun to translate this experience to contentious and uncertain environmental risk controversies in recent years.

While the reputation and prestige of researchers and participatory practitioners is undisputed between Stage 1 respondents, the perceived pedigree of technical consultants in relation to PRA is less clear. When discussing knowledge skills and capabilities, most participants mentioned the traditional, science-based environmental consultancies (see Table 4.1) partly in relation to process expertise and also their role as specialists providing scientific expertise and support to analytic-deliberative processes. Technical consultants' competence with regard to the latter did not appear to be in doubt, with respondents providing examples where technical consultants, along with other specialists from NGO and interest groups, have interfaced with deliberative processes. The feeling from some respondents though, was that there are very few technical specialists capable of communicating effectively in participatory fora in the UK. Most discussion of technical consultancies centred around their possible role as process experts. Respondents were very aware, at the time of interview in 2000 that a number of technically based, environmental consultancies were claiming to possess process expertise in the environmental risk area. Almost all Stage 1 respondents disputed this claim, critiquing attempts to 'do a bit of process' as part of a technical project and arguing that the technical consultancies 'haven't really got it yet' (Respondent G). As Respondent H states,

> "Very very few... consultancy type companies could organise a deliberative process effectively. There's a lot of people who say they can do it ... I think that there are a lot of people out there who can read guide books on how to organise deliberative processes but they haven't got a clue" (Participant H: 1704-1798).

Interestingly, Respondent E, a technical environmental consultant, admitted that his company did not necessarily have process-based capabilities internally, but explained the complex reasons lying behind this absence. The main issue centres around the need for those facilitating and running participatory appraisal processes to be independent from the decision-maker, technical work undertaken for them, and other interested parties. Where consultancies provide technical advice to decision-makers, it is inappropriate for them to manage the process as well, particularly in post-normal decision contexts where science is disputed. All respondents who discussed the role of technical consultancies provided support for this view.

Respondents' discussions around the role of technical consultancies highlight the negotiated boundary of epistemic community membership. The interviewees clearly shared a view that technical consultancies have a role in providing technical expertise but not process expertise to support analytic-deliberative processes. They are acutely aware (as Respondent H's above quote suggests) that a range of technical consultancies through to market research and public relations companies are laying claim to competence in engaging citizens and stakeholders in environmental risk issues. Although all respondents agree that only a very small number of actors actually have the necessary competence, this wider observation indicates that the community boundary is not well developed or clearly defined. Respondents also commented that the principles or 'terms of reference' defining professional competence and effective professional practice in PRA are still being worked out. This is a theme that we will return to in Section 3.2. For now, it is important to highlight that 'internal tests of validity' are not yet well defined within the 'community'. In the absence of an agreed, professional standard, the current situation is still competitive, and open to many different actors with very different levels of expertise in PRA.

Legitimate expertise in PRA was discussed in many different ways in the interviews. Five main factors appeared to influence perceptions of actor competence:

- *Experience.* Respondents' favoured actors that had done, or were currently engaged in, projects that had a good 'track record'; with clear evidence of past success in involving citizens and stakeholders in risk issues and running analytic-deliberative processes.

- *Ability to manage contentiousness and complexity.* Participatory processes in complex and uncertain decision contexts are particularly difficult to manage and facilitate given the contentious nature of the issues; large epistemic (knowledge) and ethical (value) differences between participants; the propensity for external counter-science and debate, and so on. This requires a higher level of facilitation competence, not necessarily based on experience but may depend on the personal qualities and skills of individual facilitators. Although there are many process experts in the UK across a range of sectors (e.g. community development), very few may be said to have the higher-level skills needed to manage PRA processes in post-normal decision contexts successfully.

- *Independence.* As noted above in relation to participatory practitioners and technical consultancies, those running a PRA process need to be independent of the various technical and political interests surrounding a risk controversy, and be impartial as to outcome of any process. Organisations deemed to be independent or neutral are more likely to gain respect and legitimacy in the area of PRA.

- *Substantive understanding of the issue / decision context.* Respondents did not totally agree on this point but the majority felt that actors were more competent when they had a substantive knowledge and understanding of the decision situation within which they are operating. Rather than being technically expert, actors should have enough understanding to pull pictures together and intervene to ensure fairness. This ability to bridge process/facilitation expertise with a substantive understanding of environment, risk and uncertainty is very rare in individual actors. It depends on actors working in multi-disciplinary teams, again highlighting the importance of inter-personal skills and the capacity for collaborative working among key actors in the community.

- *Learning by doing.* Although conscious of a limited number of training courses (provided by some of the participatory practitioners and certain academic institutions listed in Appendix 6.1.3) and a larger number of training manuals and guidebooks that exist, respondents argue that expertise and competence in PRA is gained through practical experience. In this sense PRA is likened to a 'learned art' or reflective practice rather than something that can be taught in the abstract.

A striking feature of the actors identified in Table 4.1 is the total omission of decision-makers of any kind. Stage 1 gatekeepers see participatory practice in the UK as being exclusively developed by process experts who are building relationships with and influencing decision-making institutions that sponsor and commission work across a range of environmental risk issues areas. This relationship is evident in respondents' mapping of the actors who they consider to be important and influential – *i.e.* have the influence (political capital or power) - in making participatory risk appraisal happen in the UK. Table 4.2 shows the important and influential actors identified by Stage 1 respondents to include many of the processes experts (particularly researchers) associated with competence, but also decision-makers from the public and private sectors.

The public sector is seen as relatively more important being identified by 14 respondents in total, with the Environment Agency (EA) and the Parliamentary Office for Science and Technology (POST) deemed to be most important. In terms of the Environment Agency, this perception reflects a body of work the organisation commissioned over the period 1996-2000 carried out by the likes of ESRU at University College London (e.g. Clark *et al.* 1998, 2001; ESRU, 1999), Judith Petts at Birmingham, along with Pat Delbridge Associates and ECOTEC (e.g. Petts & Leach, 2000), amongst others.

Actor(s)	References
Process Experts – Researchers	(15)
Judith Petts (University of Birmingham)	4
CERGE + Ian Langford + Nick Pigeon (University of East Anglia)	4
Jacquie Burgess + Environment & Society Research Unit (University College London)	2
Centre for the Study of Environmental Change (Lancaster University)	2
Alan Irwin (Brunel University)	1
Jerry Ravetz (Research Methods Consultancy)	1
Andy Stirling, Science Policy Research Unit (University of Sussex)	1
Decision-makers – Public	(14)
Environment Agency + National Centre for Risk Analysis and Options Appraisal	5
Parliamentary Office for Science and Technology + Garry Kass + Chief Scientist + Ed Quilty	5
Cabinet Office	1
Hampshire County Council + Bob Lisney + Ian Avery	1
Angela Liberatore, European Commission	1
Royal Commission on Environment and Pollution	1
Decision-makers – Private	(6)
Nirex	1
British Nuclear Fuels Ltd.	1
Monsanto	1
Glaxo Smithcline	1
TXU Energy	1
British Petroleum	1
Process Experts – Practitioners	(4)
Pat Delbridge (Pat Delbridge Associates)	2
Alison Crowther (The Environment Council)	1
Roger Levitt (CAG Consultants)	1
Technical Specialists / Scientific-experts	(4)
Enviros Aspinwall	1
ETSU	1
Institute for Environmental Management and Assessment	1
Vivian Howard (University of Liverpool)	1

Table 4.2. Actors identified by Stage 1 respondents as being important and influential in relation to participatory risk appraisal in the UK. (Each actor is ranked according to the number of respondents who identified them, in relation to their given actor type.)

Interviewees discussed the role of POST in promoting wider participation in scientific decision-making within and beyond government through their role in commissioning work, such as the National Radioactive Waste Consensus Conference (in partnership with Nirex and NERC), and producing reports (e.g. POST, 2001). In terms of the private sector, certain companies were seen as important and influential by one respondent only, perhaps reflecting the importance of radioactive waste (Nirex and BNFL), genetic modification (Monsanto) and chemicals (BP) as issue-areas in the initial mapping exercise. There was a degree of ambivalence between participants as to the emerging pattern in relations between the private sector and decision-makers.

The actual *process* of undertaking the network-mapping exercise in interviews was just as, if not more, important as the discrete outputs outlined above. Importantly, the process prompted a wealth of qualitative interpretations that support and further explain the nature and character of actor-networks building up around PRA in the UK.

All Stage 1 gatekeepers agree that a network of expertise is forming. Although a number of the core actors seen as holding competence and expertise have an analytic-deliberative focus around the practice of participatory risk appraisal, the view of the interviewees is that the network is based around the democratic mode, more generally. Those outside the epistemic community, certain decision-makers and interest groups for instance, see a need to engage publics and stakeholders in environmental risk decision-making, more generally. There is also unanimous agreement that the network building up around PRA is embryonic and in the very early stages of development. Because of this it lacks coherence and is deeply divided. The network is alternately described as 'fragmented' (Respondent F), 'compartmentalised' (Respondent I), 'tightly defined' (Respondent H), 'patchy' and 'diffuse' (Respondent E), by different members of the Stage 1 interview panel. Respondent F provides a useful overview which represents the views of all Stage 1 respondents,

> "this whole area linking science to participation is still relatively novel. It's an area in which you would expect - because it's a relatively new endeavour - there to be lots of different groups and lots of different competing practices. And it

might only be when the whole activity becomes more mature that you can begin to identify the network or the key leading techniques and approaches. At the moment, it's a real kind of mish mash of different things that's not very coherent and probably not terribly consistent internally. There's an awful lot of different groups out there who are engaged in it, and there are a lot of people coming from different disciplinary perspectives who think that this is their area and their perspectives that count ... And there are lots of competing communities, frankly, at the moment" (Respondent F: 897-948).

The indication from Stage 1 gatekeepers then is that the epistemic community based around PRA is most likely to be early on in first stage of community evolution (in relation to the model of community evolution outlined in Section 3.1). It is certainly the case in that there is a proliferation of experts where lots of different groups have seen a gap and are trying to grab the process. A defining feature of the epistemic community is the intense competition and rivalry between different groups which further reinforces the compartmentalisation and fragmentation. Stage 1 respondents' paint a picture of participation in environmental risk becoming more like a business or industry, which sits in stark contrast to the ethical and normative dimensions of the field of participation emphasised in the literature. The other indication from Stage 1 respondents is the internal inconsistency of the network, which suggests a wide diversity of beliefs, knowledges and practices between actors within it.

When describing the broader PRA community in the UK, Stage 1 respondents have made frequent references to specific 'groups', 'communities', or 'camps' to describe sub-groupings and divisions. Three categories appear to be particularly significant: (i) divisions between researchers and practitioners; (ii) disciplinary and professional groupings that cut across core members of the community identified in Table 4.1; and (iii) groupings based around 'sectors' or issue-areas. The nature and character of these groupings resonate closely with the epistemic community concept developed in Chapter 3. For example Stage 1 respondents argue that various interest groups engaged in specific environmental risk issues interact with, but are distinct from, the community of actors building up around a democratic mode of decision-making.

Of particular importance, Stage 1 interviews show a strong sense of there being an academic or research 'community' who take on issues relating to participatory risk appraisal as their core work. As Participant I states,

> "one self conscious community is the research community... You know these bodies of work spanning planning through to scientific decision-making and so on. So there is a fairly self conscious idea of there being a research community" (Respondent I: 1503-1571).

Stage 1 respondents agree that the PRA research community is well developed and quite highly connected. In addition to established exchange processes of publication, peer review and conferences, respondents offer examples of collaborative working such as the ESRC Global Environmental Change Programme and the Deliberative and Inclusionary Processes (DIPs) Seminar Series held between the groups from ESRU, UCL, Lancaster University and UEA identified in Table 4.1 (as documented in O'Riordan *et al.* 1999). As well having expertise and competence in PRA, it is also implied that researchers within the wider epistemic community possess shared motives and beliefs,

> "there's a network of academics who work on the basis that this stuff should be done and we can all design it well" (Respondent H: 1210-1213).

Members of the PRA research community are increasingly building close relationships with decision-making institutions and adopting more practically based consultancy and advisory roles. In this sense the distinctions between the researchers and practitioners outlined in Table 4.1 appear to be becoming increasingly difficult to maintain. Respondents highlight that, in many ways rather than bringing researchers and practitioners closer together, this overlap in roles has served to make their relationship more complex and problematic. Respondents B, D, G and I, all express concern that academic and practitioner groups are not collaborating or communicating with each other effectively. Given both sets of actors have important roles in the epistemic community; this divide takes on great significance. Participant I attempts to explain the tension between the two groups,

> "At the moment I think there's... a little bit too much compartmentalisation and sort of mutual suspicion between many of the different camps. I mean the [practitioner] camp and the research camp, I think, definitely you've got that. And I think the consultancy groups, at least the ones that have been doing this for a while feel understandably miffed they don't get more credit than they do from the researchers who are suddenly discovering this stuff sometimes in a rather ham fisted way, from a remote discipline, not realising how much of this stuff has been thought through before" (Respondent I: 3144-3170).

Participant B, a participatory practitioner, confirms these sentiments more succinctly: 'we're sick of theorists'.

In addition to fragmentation between research and practice, respondents also identified the importance of disciplinary and professional groupings within the wider PRA community. As illustrated in Chapter 2, a wide range of disciplinary perspectives are being brought to bear on participatory risk appraisal, ranging from the social sciences (e.g. geography, sociology, political science, psychology) through to more natural scientific perspectives (e.g. risk analysis, decision science). Rather than drawing on any one disciplinary perspective, Respondent F identified a simple but highly important distinction between groups of actors within the wider community who tend to adopt either social scientific or natural scientific approaches.

> "So, for example, take what you might call the IEMA kind of constituency. The professionals of environmental assessment are getting the message that they need to get participation into their things. So they think largely - you know natural scientist kind of people think – 'well we can take our stuff and maybe extend it a little bit by having more participation there'. And then you've got people [who are] very much coming from a social science, human geography kind of background, who see it in terms of social science perspectives and social science understandings. And if only we can get a little bit of science into that we'll make it a little bit better" (Respondent F: 897-948).

In addition to highlighting the possibility for limited communication and exchange between disciplines, this quote also emphasises that although actors work within specific disciplines they also belong to a community that has a shared belief in developing more democratic forms of risk decision-making or integrating science with deliberation. This opens up possibilities for more cross-disciplinary collaboration with individuals perhaps finding more in common with colleagues outside their own disciplinary tradition. Related to this, different professional groupings might also occur between actors in the wider epistemic community. For example, Participant H, an environmental impact assessment professional describes an exchange around the subject of participation with a researcher who is an economist by profession.

> "I work in environmental impact assessment, and so I work with the International Association of Impact Assessment. But interestingly, I was asked to review a journal paper the other day by someone who's an economist who was writing about the use of citizens' juries as opposed to contingent valuation. Now what I was reading was a paper which didn't have a single reference in it that was the same as a reference that I would put down. Very interesting paper. And I sent him one of my papers, because he was not working in a similar circle although he was designing and running a citizens' jury" (Respondent H: 1933-1950).

The third major grouping between actors in the UK PRA network appears to be around sectors or issue-areas. Stage 1 respondents' feel that actors tend to work in tightly defined groupings based around the sector within which they work. As Respondent I states,

> "it's also happening between sectors. The health sectors have been doing an awful lot of stuff. I don't think we are sufficiently aware in the environment field or risk field of the work that has been done in the health field earlier. Or indeed planning. And probably, the planning and health fields are also quite different from each other. And that's because everybody's making their careers doing these things. And nobody's got an interest in actually saying, 'well what I'm doing isn't actually that new'" (Respondent I: 3144-3200).

A few participants emphasised the fact that interest groups are distinct from the community of actors building up around a democratic mode of decision-making. Interest groups do not tend to commission participatory processes nor carry them out. As noted above in relation to Table 4.2, interest groups can take up the role of specialists to support the process. They are more likely, however, to be involved as stakeholders with a particular relationship to science, as participant H points out,

> "Once you get to the activist groups themselves, they do not organise these things. They are very good at organising a public meeting. But they don't organise participatory processes because most activist groups do not wish to discuss science with others, they only wish to discuss their view of science. But they are actors in the game, if you like, as opposed to people organising" (Respondent H: 1281-1295).

4.1.2 The UK PRA network as seen from the area of waste management

Stage 2 interviews conducted with individuals identified by following networks in the area of waste in general, and radioactive waste management specifically, allow more detailed insights on the PRA network developing in the UK. Findings from the 16 interviews reinforce perspectives emerging from Stage 1 interviews, particularly in relation to the fragmentation and compartmentalisation of the epistemic community. Stage 2 respondents also highlight the same factors in defining the competence and expertise of epistemic community members, especially the importance of actors possessing experience, independence, and a substantive understanding of the issue. This Section takes the areas of radioactive waste and municipal solid waste in turn, in order to highlight two significant findings. First, while the PRA network appears to be particularly well developed in the area of radioactive waste management, professional actors appear to be grouping around two quite different approaches to participation. Second, it appears that there is compartmentalisation between the areas of radioactive waste and municipal waste, although findings indicate that a small number of process experts are moving between these two areas, providing a potential means of communication and exchange between them.

In mapping out current practice across the waste area, Stage 2 respondents talked about 29 individual cases of citizen and stakeholder involvement (see Appendix 6.2.1). This initial mapping of respondents' personal and perceived networks, along with additional actors identified throughout the interview, has been extracted from interview transcripts to produce a composite picture of the UK PRA network as seen by Stage 2 gatekeepers. The full extent of this map is presented in the form of a respondent by actor matrix in Appendix 6.2.2, highlighting actors identified as KSC (yellow), II (green), or both (blue).

Table 4.3 summarises the actors identified by Stage 2 respondents, situated in the area of radioactive waste management, as having the expertise (KSC) and/or being important (II) in relation to PRA. As in Stage 1, competence is seen as lying almost exclusively with process experts, the key distinction being that participatory practitioners (identified by 30 respondents) score slightly more highly that researchers (identified by 23 respondents). It is clear from Table 4.3 that key actors deemed to possess PRA expertise in Stage 1 are influencing or playing an active role in shaping practice in the area of radioactive waste. This holds both for practitioners (the Environment Council, Dialogue by Design, UKCEED, InterAct, and Richard Harris) and researchers identified in Stage 1 (Jane Hunt and CSEC, Jacquie Burgess and ESRU, Judith Petts, and SPRU).

If process experts hold the competence in the area of radioactive waste, it is clear from Stage 2 respondents that decision-makers hold the influence. In respect of the pubic sector Defra, with its *Managing Radioactive Waste Safely* process (briefly introduced in Chapter 3), is seen by respondents as important, in addition to the Radioactive Waste Management Advisory Committee (RWMAC) and the Environment Agency. Nirex, along with specific individuals within the organisation, are identified as the most important actor in the private sector, along with BNFL. Stage 2 respondents in the radioactive waste area also believe specialists, including technical experts from NGOs, academia, and the Royal Society, are influencing PRA practice.

Actor(s)	KSC	II
Process Experts – Practitioners	(30)	(2)
The Environment Council + Steve Robinson	6	2
Dialogue by Design + Andrew Acland	3	-
UKCEED	3	-
David Collier (Green Street Burman)	2	-
Institute for Public Policy Research	2	-
InterAct	2	-
New Economics Foundation + Perry Walker	2	-
The Future Foundation	2	-
Forth Road	1	-
Guy Dean (Public Concern at Work)	1	-
Goulson Science	1	-
Hansard Society	1	-
Richard Harris (Independent Facilitator)	1	-
Alan Hedges (Social Research Consultant)	1	-
Manor Resources	1	-
David Plater (Independent Facilitator)	1	-
Process Experts – Researchers	(23)	(3)
Jane Hunt, CSEC (Lancaster University)	6	1
Judith Petts (University of Birmingham)	6	-
Jacquie Burgess + Environment & Society Research Unit (University College London)	3	1
Institute for Food Research + Lynn Frewer + Catherine Reynolds	2	-
Science Policy Research Unit (University of Sussex)	2	-
CSEC + Brian Wynne (Lancaster University)	1	1
Simon Joss (PSI)	1	-
Alison Warburg (Warwick University)	1	-
Lynda Warren (University of Aberystwyth)	1	-
Decision Makers – Public	(2)	(18)
Defra + Margaret Beckett + Michael Meacher	-	8
RWMAC + Andy Blowers + Fred Barker + Ken Jackson	1	3
Environment Agency + Simon Pollard	-	2
DTI	-	2
Garry Kass (POST)	1	1
Health & Safety Executive	-	1
Scottish Executive	-	1
Decision Makers – Private	(2)	(11)
Nirex + Elizabeth Atherton + Anna Littleboy + David Wild + Chris Murray	2	7
BNFL	-	3
UKAEA	-	1

Technical Specialists / Scientific-experts	(-)	(5)
Ian Fell (Newcastle University)	-	1
Greenpeace	-	1
Malcolm Grimstone (Imperial College London)	-	1
Royal Society	-	1
Rachel Western (Friends of the Earth)	-	1

Table 4.3. Actors identified by Stage 2 respondents situated in the area of radioactive waste management as having the knowledge, skills and capabilities and/or being important and influential in relation to participatory risk appraisal in the UK. (Each actor is ranked according to the number of respondents that identified them, in relation to their given actor type.)

The development of relationships between members of the epistemic community and decision-making institutions, along with the nature of emerging PRA practice in the radioactive waste area, is considered in detail in Chapter 5. Here, the broader nature and character of the PRA network in radioactive waste will be considered. As noted above, the most significant finding in this regard is the grouping of most actors listed in Table 4.3, around two types of participatory practice.

The first grouping centres around BNFL and is inclusive of The Environment Council (TEC), Steve Robinson, Richard Harris, and a network of other independent facilitators associated with TEC who have been instrumental in developing BNFL's engagement work. Using the words of a Stage 2 respondent, this grouping will be called the **'BNFL network'**. This network subscribes to a stakeholder-based approach to participation which relates directly and seemingly exclusively, to engagement strategies 4 and 5 (as defined in Chapter 2, and further explained in Appendix 2). The actual practice favoured by the network centres on an approach called 'Stakeholder Dialogue' (SHD), which has its origins in consensus building and conflict resolution between stakeholders. The cases identified by Stage 2 participants (see Appendix 6.2.1) that relate to this network include the BNFL National Stakeholder Dialogue, including Working Groups on Waste and Spent Fuel management Options, and the Cricklewood Stakeholder Dialogue relating to the transport of radioactive waste in North London.

The second grouping centres around Nirex and is inclusive of Jane Hunt (and others at CSEC), UKCEED, David Plater (an independent facilitator who works with UKCEED), The Future Foundation, Manor Resources, Forth Road who have all assisted Nirex in developing their engagement work in various ways. We will call this group the **'Nirex network'**. Although Nirex are putting efforts into working with professional stakeholders a defining characteristic of the network building up around their engagement practice is the recognised importance of a 'citizen-based' model of involvement, based on engagement strategies 3 and 6 (as defined in Chapter 2, and further explained in Appendix 2). Much work conducted by members of the 'Nirex' network has sought to engage citizens, and includes the National Radioactive Waste Consensus Conference, and processes commissioned by Nirex on monitoring and retrieval, partitioning and transmutation, and various attempts and understanding public attitudes through focus group work (see Appendix 6.2.1).

It appears, then, that these two networks relating to BNFL and Nirex in the area of radioactive waste have different ideas about what form engagement should take and whose knowledges should be represented, which manifest in different forms of participatory practice and approach. Formal links do exist between BNFL and Nirex (BNFL sits on the Board of Nirex and is a major shareholder, for example). Stage 2 respondents argue, however, that the respective PRA networks are fragmented with limited communication and exchange occurring between actors on the subject of citizen or stakeholder engagement. Material from witnesses paints a picture of mutual hostility, suspicion and stereotyping between the BNFL and Nirex networks. There is evidence across the interviews of perhaps deliberate misunderstanding with both camps seeking to construct an identity by emphasising their differences whilst also, in moments of frankness, acknowledging their common processes, as these quotes from respondents associated with both groups imply,

> "I'd say the aims are similar, they're about engaging people in rad waste but... that's where the similarity ends" (Respondent P: 1923-1925).

> "it's [like] rugby league and rugby union parting company. Here you've got two [groups] basically playing the same game but a slightly different set of rules.

That's where we're at now. Whether there will ever be a happy merger or not I don't know"... "so we're probably doing similar things, calling it [something] different, with a similar set of values being applied" (Respondent Q: 1411-1417; 1473-1477).

The picture of the PRA network building up in the area of radioactive waste shows that, although the members of the epistemic community are shaping practice, the decision-makers (or clients) who are sponsoring and commissioning participatory processes are influential in shaping the actor-network. Respondents are conscious of the fact that certain decision makers (BNFL or Nirex for instance) have their 'favourites' - *i.e.* the people that they always go back to for assistance and advice. This is a possible source of fragmentation around practice within the network, while the tendency to go to academics for strategic advice and consultants for practical advice could be further perpetuating the academic-practitioner divide.

Table 4.4 summarises the actors identified, by the Stage 2 respondents situated in the area of municipal solid waste (MSW) management, as having the expertise (KSC) and/or being important (II) in relation to PRA. Although less actors have been identified by respondents in MSW (compared to those in radioactive waste), this does not necessarily mean that the network is smaller. Fewer respondents were interviewed from the MSW area (five in total). In addition, in interviews with Respondents Y and Z the consideration of network questions were truncated for reasons beyond researcher control. As is the case in the radioactive waste area, competence is seen as lying exclusively with process experts, but participatory practitioners (10 identifications by Stage 2 respondents) were deemed to be more significant than researchers (3 identifications by Stage 2 respondents).

It is clear from Table 4.4 that key actors deemed to possess PRA expertise in Stage 1 interviews, are also identified in the area of MSW. Perhaps more interesting, however, is that actors deemed to be most competent in the area of radioactive waste are also seen to be influencing or playing an active role in shaping practice in MSW. This includes The Environment Council, Dialogue by Design, along with three key groups of researchers: CSEC (Lancaster), ESRU (UCL), and Judith Petts (University of Birmingham). Stage 2 interviews provide clear evidence then that a small number of actors are moving between the issue-areas of radioactive waste and MSW, thus exchanging knowledge, experience and practices relating to PRA. Although some of these actors have high public profiles and their work is influencing practice from a distance, it is The Environment Council, Dialogue by Design and Judith Petts who are mentioned as being most actively involved and working in the MSW area.

Actor(s)	KSC	II
Process Experts – Practitioners	(10)	(-)
The Environment Council	3	-
Dialogue by Design + Andrew Acland + Pippa Hyam	3	-
Pat Delbridge (Pat Delbridge Associates)	2	-
Hampshire Local Facilitation Network	1	-
Alison Millward (Independent Facilitator)	1	-
Process Experts – Researchers	(4)	(4)
CSEC (Lancaster University)	1	1
Environment & Society Research Unit (University College London)	1	1
Judith Petts (University of Birmingham)	1	1
School of Environmental Sciences (University of East Anglia)	1	1
Decision Makers – Public	(-)	(5)
Environment Agency	-	1
Cambridgeshire County Council	-	1
Essex County Council	-	1
Oxfordshire County Council	-	1
Lancashire County Council	-	1

Table 4.4. Actors identified by Stage 2 respondents situated in the area of municipal waste management as having the knowledge, skills and capabilities and/or being important and influential in relation to participatory risk appraisal in the UK. (Each actor is ranked according to the number of respondents that identified them, in relation to their given actor type.)

One key distinction in competence in the area of municipal waste, compared with that reported in by respondents in radioactive waste and Stage 1 interviews, is the presence and importance of localised, process expertise. Respondents in MSW stressed the significance of process experts in local facilitation networks (such as the one developed in Hampshire) and the internal facilitation capabilities within County Councils. Rather than relying on external experts, the feeling was that such local expertise could deliver more commitment to the solution of MSW problems through a better understanding of the local contexts within which they are situated. In terms of influential actors, the Environment Agency and local authorities were deemed most important. There is evidence from Stage 1 and 2 respondents of a network building up around leading County Councils in the MSW area, including Lancashire, Oxfordshire, Essex, Cambridgeshire and Hampshire.

Even though a small group of process experts appear to be moving between the issue-areas of radioactive waste and municipal waste, the general view of Stage 2 respondents is that the two areas are compartmentalised with little linkage, communication, and exchange between them. Thus respondents O, P and W were not aware of any dialogue on the specific subject of citizen and stakeholder engagement between these distinct waste areas. Participant P vaguely recollected a conference held some seven years previously that attempted to bring together actors from the hazardous waste and radioactive waste communities. However the focus was around technical issues, the subject of participation was not discussed.

4.2 Social learning within the UK participatory risk appraisal network

The overwhelming view of all respondents in both Stage 1 and 2 interviews is that the epistemic community emerging around a democratic mode of environmental risk decision-making in the UK is not learning as effectively as it might. One fundamental reason is the fragmented nature of the network. As we have seen, there are points of connection, but significant divisions exist between researchers and practitioners, between those affiliated to specific disciplines or professions, between groups adhering to a particular type of participatory practice or approach (stakeholder as opposed citizen-based, for instance), between organisations (such as BNFL and Nirex), and between actors situated in different sectors/issue areas (radioactive waste and MSW; or risk, health and planning). Many respondents argue that compartmentalisation is severely limiting the diffusion of ideas, beliefs and practices within the community, hindering the development of shared understandings and consensual knowledge between professional actors. Ultimately, this appears to be undermining collective learning about participatory risk appraisal, and public and stakeholder involvement in environmental risk more generally within wider society. As Respondent H states,

> [G]ood practice isn't really being captured and communicated because the networks really aren't that good. It's happening but one could argue that its quite slow, and there's a hell of a lot of re-inventing of the wheel out there" (Respondent H: 2617-2623).

A number of respondents argue that duplication and reinvention of ideas, knowledge and practices between different groups within the community is undermining its effectiveness and potential influence. The other main factor limiting learning is the intense competition between different groups, which is both a cause and a consequence of fragmentation. Such fierce rivalry – whether motivated by a drive for intellectual kudos, competitive advantage, profit, or an inherent normative belief that one way is right – means that knowledge about participatory risk appraisal becomes a commodity or competitive good inhibiting communication and exchange between competing actors. Under such conditions, actors are more likely to become wedded to a specific participatory philosophy or practice and blinkered to ideas and alternatives offered by others (Respondent D). Characteristic of a competitive culture is the tendency for actors to be associated with a specific process tool or technique that they attempt to push or market into different contexts, rather than letting context be the determinant of process design (Respondent N). This isolation undermines collective learning within the community;

> "everybody [seems to be] doing it on their own, occasionally glancing over their shoulder, it [is not]... functioning as a community in the sense of the pooling, sharing of knowledge" (Respondent F: 1930-1957).

Without any learning, it is difficult to see how any claim to an epistemic community could be supported. In spite of these constraints there is evidence that that learning is occurring. There is significant agreement between Stage 1 and 2 respondents that the main form of learning between actors within the UK PRA network is informal, experiential and anecdotal. It takes the form of individual or small groups of professional actors reflecting on the individual cases or specific instances of PRA practice that they have been involved in. Experiential learning takes the form of learning through doing (as discussed in Section 4.1.1). Based on their experiences and understanding, of the process and outcomes of specific cases, actors conduct informal (tacit) assessments of how they felt it went. On this basis, actors continually develop their causal beliefs, knowledge, practices (methods and approaches) and notions of effectiveness in relation to participatory risk appraisal. Such learning often occurs on a personal or individual level,

> "I'm not sure that there's any kind of joint learning about the specifics of how to do it. I think individual facilitators learn that as they go along, but I'm not sure there's much sharing of that generally" (Respondent V: 1324-1328).

It is likely that an individual actor will share their learning with those in the immediate vicinity of a specific case example or through informal communications, contacts, discussions, and correspondence (e.g. e-mail) with other actors that they have a close relationship with (e.g. from their organisation, issue-area, or the wider network). Respondents term this kind of learning as 'story telling', 'personal networking' (Respondent W), 'immediate' (Respondent L) and communication by 'word of mouth' (Respondent N). They feel that it represents the dominant means of idea diffusion, exchange and debate occurring within the UK PRA network at the present time. The important point here is that learning is not formalised, communicated, made accessible to, and taken up by, other actors within the wider epistemic community. As Respondent Q reflects,

> "What we don't do is talk enough about the process learning... and spread it out there in the world. It's a very small group of people who've got a track on the inside process. And I don't know quite how we should be doing it but I do think

we have something to say to the rest of the world. That's the process work and apart from informal contacts, we don't do it very effectively" (Respondent Q: 1300-1307).

Much of the learning that occurs in the PRA network remains tied to individual cases or the specific grouping to which actors are most closely related. Stage 1 and 2 respondents do provide examples of learning that goes beyond this, although it appears at this stage to be patchy and sporadic. Examples of more formalised learning within the academic community through processes such as peer review, conferences and collaboration between researchers has been provided in Section 4.2.1. Here we focus on evidence from the radioactive waste and municipal waste areas of processes attempting to go beyond specific groupings that exist within the wider epistemic community.

In the area of radioactive waste, interview respondents' provide a number of examples of collaborative work that has drawn together actors belonging to various research, practitioner, professional, disciplinary, and organisational groupings. Formalised learning in relation to PRA is invariably not the objective of such collaborative exercises, although interaction and exchange between actors is having a possible learning effect. For instance, Respondents H, I, K, and N provide examples of two participatory processes – the National Radioactive Waste Consensus Conference and the ISOLUS project – which were overseen by Steering Committees comprising processes experts from research and practitioner communities, decision makers and specialist stakeholders. Another example provided by Respondents K, L, N, P and S is the European funded RISCOM II project which has brought together researchers from CSEC (Lancaster University), practitioners from Goulson Science, and individuals from Nirex and the Environment Agency, to develop more effective approaches to citizen and stakeholder involvement on radioactive waste decisions. These examples have involved actors from different groupings in the wider community interacting with each other, and negotiating and debating about various dimensions of PRA practice. It appears that this is enhancing communication and exchange between actors and the potential for mutual learning.

Another key feature of learning touched upon by all nine respondents situated in the radioactive waste area is the importance of the international dimension. Decision-making institutions and associated actors are in regular communication with sister agencies in other countries that are tacking similar issues of public and stakeholder engagement (e.g. Sweden, Finland, Switzerland, Canada, and the USA). In many respects, actors working in the area of radioactive waste are in closer contact with these sister agencies in other countries than those from other sectors or issue-areas within the UK. The international dimension includes joint initiatives and projects such as RISCOM II mentioned above. Respondents also point to the influence of conferences and other learning initiatives facilitated by bodies such as the International Atomic Energy Authority (IAEA) and the Nuclear Energy Agency (NEA). The NEA's *Forum for Stakeholder Confidence* is deemed to be particularly important. This has brought actors together across groupings from different countries in conferences and other fora to review public and stakeholder engagement practice in radioactive waste management internationally, to share experience and debate effective practice, and jointly produce publications to formalise and disseminate this learning (e.g. OECD/NEA, 2000; 2003).

Moving into the area of municipal solid waste, there are also instances of learning processes that go beyond the informal and the personal. One highlighted by Respondents B, E, H and X is the communication of experiences from individual flagship or beacon cases that are taken to represent good practice in citizen and stakeholder involvement in municipal waste management. Hampshire County Council's Waste Strategy process is seen as a key example of this type of learning. The Hampshire process is viewed in the waste area as one of the most innovative examples of deliberation and inclusion to date. The Council have been particularly active in disseminating their learning and experience. This has involved individuals using Hampshire County Council to look at what they had done as well as officers from the Council making presentations to most local authorities in the UK, the Scottish Environmental Protection Agency (SEPA), and conferences organised by professional bodies. Key individuals within the Council have also attempted to cascade their experience through local authorities and other networks by formalising their learning in papers, publications, and writing a book of their experiences.

Respondents B, E and H talk about how certain local authorities (such as Essex, Lancashire and Cambridgeshire County Councils) have learned from, and adopted aspects of the Hampshire process, indicating specific instances of participatory model transfer. It appears, however, that Hampshire's commitment to formalising and making their learning accessible to the wider community is the exception rather than the rule in the MSW area, as Participant H states,

> "Now [local authorities] don't network that well. That's not that people don't meet one another, I think there is a failure to cascade full case studies across the network. So people might talk as individual officers who go to a meeting and meet someone from another authority who's done x. But their learning is rather superficial, and there's very little writing up of case studies, amongst the local authorities, to share experiences" (Respondent H: 1239-1275).

This pattern of learning being limited to highly localised or sporadic instances is replicated across the wider UK PRA network. Stage 1 and 2 respondents also agree that there is currently a general lack of formal mechanisms to facilitate learning about participatory risk appraisal and an absence of systematic evaluation to analyse the effectiveness of existing practice.

> "So there's a sort of nascent infrastructure to do that kind of learning. Other than that, your individual projects just sort of stand in and of themselves and there isn't a wider learning process within the community. And you have to have a way of extracting those particular kinds of lessons" (Respondent D: 1245:1253).

The lack of formal learning mechanisms undermines the ability of the community to develop consensual knowledge and shared beliefs in the light of emerging information and experience of participatory risk appraisal. Respondents do provide a handful of examples of attempts to evaluate existing practice at the case or organisational level, but again such learning is the exception rather than the rule. Respondents O, M and W note that the Environment Agency has commissioned process consultants Greenstreet Burman to undertake an independent evaluation of its recent consultation processes on the relicensing of Magnox power stations. These respondents are also aware of initiatives within the Agency to develop personal (face-face) learning networks around public participation issues. This is being trialled in relation to community development in general rather than the issue areas of radioactive waste and MSW specifically. Respondents are also conscious of previous attempts by the Agency to formalise their evaluation of participatory environmental risk decision-making across issue-areas, more generally through work carried out by Judith Petts and others (see for example Petts & Leach, 2000).

Respondent W notes that Sustainable Futures, a group of process experts situated in the waste area, are developing mechanisms for formal learning at the organisational level. This involves developing a database of participatory processes that they have developed or been involved in, including feedback from those who participated in these processes, as a basis to assess practice. The company was in the process of considering how such knowledge could be best disseminated so that others could learn from it. Finally, respondents L, N, P, Q and R also provide indications that BNFL and Nirex, along with their respective networks, are beginning to reflect on and assess their existing practice. However, products of this learning were not at that time being communicated to others outside of the organisation.

So there is sporadic evidence that actors are beginning to formally evaluate the effectiveness of their practice and beginning to think about mechanisms by which learning can be captured, communicated and adopted by the wider PRA network. This very much resembles the current situation as seen from the academic literature (outlined at the beginning of Chapter 3). In openly acknowledging the lack of formal evaluation of existing cases PRA respondents highlighted a series of constraints currently holding back such learning. As Respondent G notes,

> "We are [bad] at writing up case studies. There is not enough money or time available. If we do this then we spend less time actually running processes and doing dialogue" (Respondent G: 2452-2456).

Almost all Stage 1 and 2 respondents highlight lack of time, money and resources as being the main factors inhibiting formal learning and evaluation throughout the PRA network. There is also a sense that formal evaluation of emerging participatory practice is not valued by organisations and decision-making institutions and is, therefore, never more than an afterthought. Respondents A and H see an additional constraint being the highly prescriptive and inflexible nature of the prevailing regulatory process. One further barrier to formal learning was suggested by Respondent N; individuals participating in a deliberative process, as well as those running it, may refuse to be evaluated. This occurred in the case of the National Radioactive Waste Consensus Conference where citizens participating in the processes were given the option of being evaluated but refused.

The highly personal, experiential and subjective nature of the knowledges created, the emphasis on learning by doing, and the contextual specificity of understandings generated mean that it is extremely difficult (and, some respondents argue, unwise) to generalise lessons from individual cases. Whatever the reason, the current inability of actors to formalise knowledge and make it accessible to other professional actors in space and time (Knoepfel & Kissling-Näf, 1998) is a significant indicator that the UK PRA network is not collectively learning effectively. Coupled with fragmentation and competition there is a lack of consensus over normative beliefs, knowledge and practices relating to participatory risk appraisal between actors in the wider community. Furthermore principles and criteria of effectiveness are not fully shared. As two respondents from Stage 2 confirm,

> "I think we are struggling to capture what best practice is... You know, I have my views but they may not be shared across the community" (Respondent P: 1941-1943).

> "[I]t's at a very early stage and it's got a long way to go, and there's no accepted standards. But when all's said and done, you're left at the whim of people running the process and the facilitator involved in process. If they get it wrong, you get it very wrong. So I think we're at a very early stage. It's up for grabs, and there isn't a lot of promotion of good practice" (Respondent N: 1360-1368).

Stage 1 and 2 respondents' notions of effective participatory environmental risk appraisal will be analysed in detail in Chapter 6. Here the important point to note is that respondents generally feel a degree of difference exists in actors' notions of effective PRA practice. Some respondents suggest that general principles are emerging within the community but that these remain at a very abstract or theoretical level. However, there is considerably less consensus around what effectiveness means in practice, and in relation to analytic-deliberative processes, specifically. As explained in Chapter 3, the primary power resource of an epistemic community lies in its 'authoritative claims to policy relevant knowledge' and, importantly, internally shared 'notions of validity' and 'criteria for knowledge validation' in relation to participatory risk appraisal. It follows from this that the current lack of internally shared notions (principles/standards) and tests (criteria) of effective PRA between actors within the epistemic community is limiting its potential influence in shaping environmental risk policy debates in the UK.

4.3 Conclusions

This Chapter has shown that an epistemic community does appear to exist around a democratic mode of environmental risk decision-making in the UK. But this community is in a very early stage of development. Although many actors lay claim to expertise in the area of participatory risk appraisal, the membership of the epistemic community is currently made up of a core group of process experts (comprising researchers and participatory practitioners), and to a much lesser extent specialists/scientific-experts, who have the reputation, pedigree and competence in PRA. The epistemic community is currently operating in a range of environmental risk issue-areas in the UK, including radioactive waste and municipal waste management, and forming relationships with key decision-making institutions within these areas. There are indications that community members are having an influence in opening up technical policy processes to citizen and stakeholder inclusion, and potentially enhancing scientific reflexivity in institutionally specific or geographically localised situations. Findings also confirm that a core group of process experts are highly visible, or actively operating, across distinct issue-areas, potentially enhancing the diffusion of ideas, knowledge and practices between them. There is a limited indication, at this stage, that decision makers are developing expertise and competence in PRA and becoming part of the epistemic community.

Although there is some evidence of social learning occurring within the community it is limited. Fragmentation and intense competition between different groups within the network are posing fundamental constraints on learning, by preventing the diffusion of ideas and development of shared understandings in the light of emerging information and experience. Learning tends to remain localised, being informal, experiential and anecdotal in nature and communicated by word of mouth or other personal exchanges. Formal learning (e.g. through publications, conferences, collaboration) appears patchy and sporadic, or limited to tightly defined groupings. There is also a general lack of any formal mechanisms to facilitate learning or systematic evaluation of existing practice. The main consequence of the community's inability to learn collectively is the currently limited consensus over beliefs, knowledge, practices and notions of validity between actors. This lack of internally shared principles, standards and criteria by which to define effective participatory risk appraisal, is limiting the influence of the epistemic community in shaping environmental risk policy debates in the UK.

Unless the emerging epistemic community described in this Chapter makes concerted efforts to more faithfully represent a 'learning community', the institutionalisation of effective participatory risk appraisal practice, and potential to 'democratise science' in contentious and uncertain environmental risk policy processes in the UK remains highly unlikely. A general move towards becoming a more effective learning community demands two kinds of action. First, collaborative working relationships must be forged between the different groupings to facilitate joint learning through practice. Given the current state of the community, it appears that such constructive cooperation is most crucial between researchers and participatory practitioners, but should also involve decision-makers in developing their role as 'informed clients'. This would depend on groups of actors recognising the relative merits of each other's ideas and practices, and how they might have misunderstood each other in the past. The second action needed is to develop mechanisms, at the actor through to institutional levels, to capture and formalise experiences of PRA practice and share this knowledge with the wider community. The formalisation process could range from simply writing down case studies through to systematic evaluation via agreed effectiveness criteria. This latter requirement depends on resources (time and money) being made available, and the need for formalised learning within the community to be taken seriously.

Respondents offered perspectives on the form that a learning community might take which fit within these two general requirements. First, they suggested that a number of formal communication and exchange mechanisms that already exist within the community (including conferences, workshops, journals, publications, guidelines, etc.) should be tailored to focus on the specific subject of participation in environmental risk. Essentially these represent forms of communication or places where people can go to learn together. A smaller number of respondents identify the need for training and other forms of capacity building in participatory risk appraisal within the network. Second, respondents identify the need for collaboration as outlined above. In addition to existing instances of collaboration within the area of radioactive waste respondents also pointed to collaborative initiatives such as InterAct and Foresight as possible models. Finally a number of respondents mentioned the possibility of a professional institute or body that facilitates networking and learning across groups, draws together existing learning and makes it accessible, and oversees the development of shared principles and standards relating to participation in environmental risk decision-making. However the centralisation and exclusivity that inevitably comes with such a body goes against the very ethos of participation for some.

There is no doubt that the fragmentation and competition that currently exists within the UK PRA network partly results from its immaturity and early stage of development. It is clear however that the future development of this emerging community cannot be left to market forces alone. Some, if not all, of these measures will be necessary to ensure the learning and development of the epistemic community and its potential for 'democratising science' in contentious and uncertain environmental risk policy processes in the UK.

5 Current participatory risk appraisal practice in the area of radioactive waste management

The previous chapter has described the epistemic community emerging around participatory risk appraisal in the UK and the social learning that is occurring between actors within it. This Chapter focuses down on radioactive waste to analyse how this community is influencing decision-making institutions and shaping environmental risk policy processes within the area. The analysis draws predominantly on Stage 2 in-depth interviews, and is supported where appropriate by documentary evidence, in directly addressing Research Theme 2 (as described in Chapter 1).

First, Section 5.1 traces the evolution of the epistemic community in the area of radioactive waste. It begins by describing the changing context of radioactive waste decision-making in the UK which has led over the past half a decade or so to the active development of public and stakeholder engagement within the area. Within this context the analysis describes how members of the epistemic community are building relationships with key decision-making institutions and potentially influencing their beliefs and behaviour. In order to better understand how the epistemic community has influenced the shape of decision-making processes, Section 5.2 then presents an analysis of the nature and extent of current participatory risk appraisal practice in the area of radioactive waste management. This analysis offers a possible means of gauging the extent to which an epistemic shift from a technocratic to a democratic mode of decision-making has occurred, or in other words, the degree to which key actors within the area are learning new ways of making decisions on this complex and uncertain environmental risk issue.

5.1 Epistemic community evolution in the radioactive waste area

The current make up of the epistemic community and the character of the network in the area of radioactive waste has already been described in Section 4.1.2 (see Table 4.3). Here we take a step back to trace the evolution of this community within this specific issue-area. To fully appreciate its emergence and subsequent development requires a better understanding of the origins of the current institutional framework for managing radioactive waste in the UK and how national decision-making on radioactive waste developed through the 1980s and 1990s.

The current regulatory system for radioactive waste management in the UK involves a separation between government who set the national policy direction through the Department of Environment Food and Rural Affairs (Defra); the organisations responsible for the disposal of wastes - *i.e.* UK Nirex Ltd. (Nirex) and British Nuclear Fuels Ltd. (BNFL); and regulatory agencies (including the Environment Agency and Nuclear Industries Inspectorate). This institutional context has its origins in the Royal Commission on Environmental Pollution's 6th Report (RCEP, 1976), which recommended that a national radioactive waste disposal facility should be developed and operated by a National Waste Disposal Corporation. Nirex was established in 1982 to assume this role.

After a substantial period of scientific research and site evaluation Nirex announced its intention to develop a deep underground repository for radioactive waste disposal in 1988. Underground disposal represented the UK Government's proposed option for managing long-term radioactive waste at the time, and the Sellafield site was one of a number of sites in the UK being considered as a possible location to implement this solution. In the early-1990s Nirex decided to concentrate investigations on the suitability of a site at Sellafield in Cumbria for which it put forward proposals to build a Rock Characterisation Facility (RCF). The RCF was needed to allow further analysis of the underlying geology in the area to determine the suitability of the site as a possible location for an underground radioactive waste repository. The proposed RCF was the culmination of over a decade of scientific research into the safe design and possible location of an underground repository.

Nirex's application for planning permission for the RCF was met with considerable local and national opposition and was refused planning permission by Cumbria County Council in 1994. Nirex appealed and a public inquiry ensued. As a result of the RCF public inquiry process the appeal was eventually dismissed by the Secretary of State in 1997. Nirex finally accepted defeat in its quest to site an underground laboratory at Sellafield. Not only did this represent a significant failure for Nirex, it also meant that the UK government's proposed solution for the long-term management of radioactive waste had received a massive set back. For Stage 2 respondents Nirex's failure at the RCF inquiry represents the defining moment or turning point in the story of radioactive waste decision-making in the UK. It was the 'crisis' that forced decision-making institutions to acknowledge that existing policy procedures had broken down, and thus seek help from participatory process experts. The events that followed were influential in building the epistemic community practice in the area of radioactive waste. As Respondent N explains,

> "Post 97 the landscape changed completely and we were left without any kind of policy at all. And in a way, the interest in getting involved in engagement was always desperation. We failed. What do we do next? Well one of the main reasons you failed was you failed to engage people initially and therefore to move forward you're going to have to engage people" (Respondent N: 191-197).

The event of the RCF inquiry and its aftermath has been so significant in shaping the radioactive waste policy context in the UK that respondents invariably refer to policy developments in terms of "pre-" or "post-97". Although the RCF inquiry was the turning point, Stage 2 respondents see a history of continuing failure throughout the 1970s and 1980s. Prior to 1997, radioactive waste policy-making in the UK was a technocratic and closed process, dominated by the constructions and framings of scientific-experts working in close relationship with decision-makers. Decision-making took the form of an exclusive dialogue between proponents (Nirex, UKAEA or BNFL), the regulator (the Environment Agency, Nuclear Installations Inspectorate, or the Health and Safety Executive), and other professional stakeholders deemed to hold sufficient technical competence. The involvement of members of the public in decision-making was limited or non-existent, with participation never going beyond minimal levels of consultation (Hunt, 2001; Chilvers *et al.* 2003b). Furthermore these limited opportunities for public debate came at the end of policy processes after definitions, options, and assessments had been framed and constrained by decision-making institutions through a strategy of decide-announce-defend (POST, 1997;

House of Lords, 1999). A deficit mode of public understanding prevailed where any engagement was seen to be about educating and reassuring the public that 'we know best' (Respondent N); 'believe us, we're scientists' (Respondent L).

In contrast, the period since the RCF inquiry in 1997 has seen the beginnings of a shift to a more democratic decision-making mode, emphasising the legitimate role of publics and stakeholders in the process. The full extent of this shift will be considered in detail when assessing existing UK practice of participation in radioactive waste in the next section. The rapid increase in public and stakeholder engagement processes, including the introduction of innovative deliberative and dialogue-based approaches which did not exist before, is remarkable. Stage 2 respondents offer 21 cases that have developed across the area of radioactive waste management in this relatively short space of time (see Appendix 6.2.1). This innovative activity has directly contributed to the development of the epistemic community, in that theoretical advances in support of more deliberative and inclusive processes have been tested through a range of empirical 'case studies'.

A number of contextual factors also help explain the rise of public and stakeholder involvement in radioactive waste policy processes. Many interviewees made reference to the influence of the House of Lords report on the *Management of Nuclear Waste* (House of Lords, 1999), international networks (as described in Section 4.2, Chapter 4), and the influence of various interest groups and NGOs (Respondents K, L, O, R and Q). In this dynamic political context, the emergent PRA network found many opportunities to grow. In order to trace the development of the epistemic community and its influence in bringing about change in radioactive waste decision-making, the remainder of this section will focus on the three key decision-making institutions within the issue area, namely Nirex, BNFL, and Defra. Each will be taken in turn to better understand epistemic community development, how relationships have been built between community actors and decision-makers, and whether the former are influencing the beliefs of the latter.

5.1.1 The Nirex network

Of all the decision-making institutions across the radioactive waste area most respondents agree that losing the RCF inquiry impacted most directly on Nirex. As Respondent N notes,

> "I think of all the people who've been most affected by this, Nirex have been the most affected and have been the most willing to change, particularly since the consensus conference. They really bent over backwards to change the way they're perceived and the way they do business. And I think that's quite an interesting result. Fairly hard nosed engineers who thought they were right about everything, got a shock in 97... but none the less they've done a large U turn" (Respondent N: 197-208).

Failure at the RCF inquiry prompted Nirex to make a series of organisational changes, such as appointing a new Director, Chris Murray. Nirex began a period of deep introspection, to learn what went wrong in 1997, to understand the true extent of the problem and how their existing approaches to decision-making had failed. The period immediately after the 'crisis' of the inquiry saw Nirex turn to seek help from particular members of the epistemic community described in Chapter 4. Nirex's demands for information and advice brought about the emergence and proliferation of process experts, which has lead to the existing 'Nirex network' described in Section 4.1.2.

An early example of a member of the epistemic community building relationships with Nirex is the UK Centre for Economic and Environmental Development (UKCEED). Jonathan Selwyn and colleagues at UKCEED initially approached Nirex in an attempt to enrol them into a network supporting a proposal to hold a National Consensus Conference on Radioactive Waste (NCCRW). UKCEED felt that immediately after the RCF inquiry there was a national level policy vacuum in the area of radioactive waste management and diagnosed the problem as a need to involve citizens in shaping future policy choices. Consensus conferences had been successfully employed at the national level in Denmark since 1987, and one had been held in the UK in 1994 on biotechnology. After a series of negotiations, UKCEED succeeded in persuading Nirex, the Parliamentary Office for Science and Technology (POST), and the Natural Environment Research Council (NERC), to sponsor the process. These early exchanges with UKCEED (and other members of the epistemic community), as well as the experience of the NCCRW itself, began to influence the beliefs and behaviour of Nirex, as the following anonymous respondent related to the organisation suggests,

> "We've turned the thing on its head. And we're saying – we believe actually – that all our experience over the last few years, that people are very sensible... they can engage with complex scientific problems and actually the UKCEED panel... and the conversations we were having with people, was showing that they were able to grasp, eminently able to grasp what the issue was. So we then began to say to our colleagues inside, can we do it? That's how we couched it. Can we do this? Can we do this? Can we leave the backfill out? And after a period of time they came back and said yes" (Respondent L: 227-245).

Two aspects of epistemic community influence on Nirex seem particularly important here. The first is an influence on the beliefs of individuals within the organisation, particularly in respect of their engagement with elements of the science and society debate, and the capacity of lay publics to engage in discussions on complex and uncertain environmental risk issues. Key actors within Nirex were then able to use the evidence from the NCCRW to show others within the organisation and the wider nuclear industry the validity of this belief. The second relates to the behaviour of the organisation in seeing citizens' views as legitimate and responding to the output of the consensus conference. As implied by the above quote, the recommendations of NCCRW appear to have had an influence on Nirex's scientific concept for the management of radioactive waste. Their long held strategy had been deep disposal in an underground repository that remains closed. Suggestions from the NCCRW that waste stored in any such repository should be monitored and retrievable, *i.e.* the repository should remain open at least in the short-term, were actually taken on board and fed back into the organisation. After conducting some research on such a possibility, Nirex found it to be feasible and built monitoring and retrievability into their proposed solution for radioactive waste management in the UK. In this example, members of the epistemic community influenced Nirex in various ways and helped them come to the realisation that their inability to be reflexive and change their concept in the face of public and stakeholder concerns was a major element in the RCF failure.

Another early example of relationships being built between Nirex and members of the epistemic community relates to the CSEC group at Lancaster University. In contrast to the previous example, it appears that Nirex approached CSEC at a time when the organisation was trying to forge alliances with actors within the community that they deemed to be influential. CSEC produced a paper on deliberation, public acceptability, and creating a legitimate authority for radioactive waste (see Hunt & Wynne, 2000), which Nirex found very useful. CSEC, and Jane Hunt in particular, have gone on to carry out a number of public and stakeholder engagement processes for Nirex (see Appendix 6.2.1). Interactions between researchers from CSEC around one of these cases provides a further instance of epistemic community influence identified by some respondents. The case in point was a series of citizen and stakeholder workshops on monitoring and retrievability (M&R) that were initiated, in part, to respond to outcomes from the NCCRW mentioned above. Part of the early advice provided to Nirex by CSEC and others had introduced the idea of front-end framing – *i.e.* involving publics and stakeholders early on in the framing and scoping stage of policy processes. The M&R workshops were an early example of Nirex attempting to put this concept into practice.

Members of the epistemic community appear to have had a significant influence in assisting Nirex make the necessary move from information provision to deliberation which involved listening to people's concerns and allowing participants to frame the problem. For instance, this meant not opening workshops with a presentation, nor setting the agenda. In addition the seemingly 'alien' concept of front-end framing meant stepping back to allow others to define the problem to be addressed which inevitably included wider concerns. This represented a learning process in itself, as one anonymous respondent related to Nirex reflects,

> "Well it was a cultural thing. I think we were so used to looking, developing ideas and developing options [ourselves]... It's a kind of whole new step put in and culturally I think that's hard. When we did the monitoring and retrievability workshop we put ourselves right up against that, you know making that shift in mindset. So the idea that you could get stakeholders, and by that we weren't going for industry people or consultants we were trying to get the public in the room, and expecting to come up with something sensible without us giving them the benevolence of all our wonderful knowledge, was actually quite hard for us. But it worked and they came back with some really sensible suggestions" (Respondent P: 416-417; 437-447).

In these two examples, and others identified in Appendix 6.2.1, the advice and practical assistance of members of the epistemic community has had some influence of the beliefs and practices of key actors within Nirex.

> One of the things that we worry about is, in some of this regard, we would be amateurs... There's a whole sort of skill in the whole thing and that's been very interesting for us. We've been learning from having these professionals actually involved. It does bring it home to you what a skill area it is. It's not something you can just drop into and think it's going to be straight forward (Respondent L: 639-651).

The full extent of epistemic community influence is difficult to gauge from Stage 2 interviews. Although all Stage 2 respondents acknowledge that there has been a change in Nirex, some believe this to be limited to key actors who are continually negotiating the benefits of wider participation. Others remain entrenched in the 'mindset of old industry'. Other respondents suggest that everyone within the organisation has brought into the idea of PRA. What is clear however is that the epistemic community that has built up around Nirex is in the second stage of community evolution identified within the model proposed by Haas (1992) and Adler & Haas (1992).

A key indicator of this is that certain individuals within Nirex (e.g. Elizabeth Atherton and Anna Littleboy, as identified in Table 4.3) have developed expertise and competence in PRA and are influencing other radioactive waste decision-makers, drawing on the core beliefs of the epistemic community. A key example of such influence identified by Stage 2 respondents is Elizabeth Atherton who was asked by the Ministry of Defence to assist them with their ISOLUS consultation in 2000 and played a formative role in shaping the process while on secondment to the MOD. An additional indication that the community has evolved to the second stage, is the level of responsibility Nirex is delegating to epistemic community members who are given complete control in managing often highly contentious participatory processes. One final point on the 'Nirex network' alluded to in Section 4.1.2 is the very tight relationship that exists between Nirex and selected community members. Nirex tends to be dependent on the advice of a few process experts whom it continually goes back to. It would appear that these actors, in successfully enrolling Nirex to their ideas, beliefs and definition of the problem, may well have cut off possible linkages with other (competing) actors from within the community through the process of interessment (Callon, 1986; Latour, 1987).

5.1.2 The BNFL network

As in the case of Nirex, BNFL began to form relationships with certain members of the epistemic community just after the time of the RCF inquiry. Respondents do not provide any clear link however between the inquiry and this move by BNFL. It appears that what prompted the organisation to seek help from the epistemic community was their problematic relationship with certain stakeholders, particularly environmental NGOs and campaigning groups. This relationship was highly adversarial, a 'war of attrition', that was seen to be damaging to the organisation and its decision-making processes. It is not clear who initiated the relationship but in 1997 BNFL began a series of negotiations with The Environmental Council (TEC) to seek advice on alternative ways of operating and involving stakeholders in more open and constructive manner. This lead to the initiation of the BNFL National Stakeholder Dialogue in 1998 which has been independently managed by TEC and has continued until the present time. As described in Section 4.1.2, a very tight network of community members based around BNFL has evolved over this period, made up of

TEC and associated independent facilitators. It remains divorced from the Nirex network.

BNFL already had a history of stakeholder work in the area of corporate relations. It is perhaps this familiarity with the ideas and beliefs of TEC which led the BNFL to seek advice from them rather than other members of the epistemic community. In many ways it appears that TEC have been even more successful than actors within the Nirex network at enrolling the decision-making institution to their definition of the problem and cutting off possible linkages between BNFL and other competing actors. TEC and associated actors make up a smaller network than the Nirex network but seem to have had a comparable if not greater influence on the ideas and beliefs of the managers of BNFL. In particular, the organisation have unwaveringly adopted the stakeholder 'philosophy' of participatory practice to the exclusion of all other possibilities, including citizen based approaches.

A number of Stage 2 respondents comment that BNFL has begun to change its decision-making approach to one that is more open and transparent. Although the influence of community members on BNFL is clear, respondents are doubtful about its extent throughout the organisation. It appears that influence has been greatest amongst senior management who have realised that the 'keep it closed, keep it quiet' approach is simply unworkable. Although many individuals within BNFL have been involved in the dialogue process at some point, parts of the organisation remain unconvinced of its value. As one anonymous respondent related to the organisation points out, this is a process of negotiation,

> "it was an uncomfortable experience for BNFL as well as some of the other people involved in this. Because some managers within the company say, "why the hell are you doing this? You're giving away things, you shouldn't be talking to these people." But it's giving people an appreciation that there is actually some bloody value in this, that you can move the business forward, you can shape what the business is going to be looking like in a very inclusive, proactive way. I think everyone recognises now that unless you engage with your stakeholders, then you're not going to develop the business" (Respondent R: 676-687).

Although relationships between community members and BNFL are strong and well developed, it appears that the network of process experts based around the organisation is either in the first or second stage of community development (Haas, 1992; Adler & Haas, 1992). Clearly BNFL has devolved a high level of responsibility to TEC and others, including the commitment of significant resources which are independently managed by TEC. There is much less indication from respondents that BNFL are actually going out and influencing other decision-makers, based on the core beliefs of the epistemic community.

5.1.3 The Defra network

As this Section has shown so far, over the last five years, most development of public and stakeholder engagement practice in the area of radioactive waste, and the epistemic community of actors based around it, has been sponsored by the private sector decision-makers in the form of Nirex and BNFL. This situation began to change in 2001 with the start of the UK Government's *Managing Radioactive Waste Safely* (MRWS) process (Defra, 2001) led by the civil servants in the Radioactive Substances Division of Defra (RASD/Defra). The MRWS process, which has already been briefly introduced in Chapter 3, is seeking a solution for the long-term management of the UK's radioactive waste. A key feature of the process set out by Government Ministers is the importance of public and stakeholder engagement. Stage 2 respondents see this as a significant shift in the national government's approach to decision-making on radioactive waste, and environmental risk issues more generally. Until recently, national UK policy formulation has been limited to bottom line consultation and feedback. Although perhaps less clear and more delayed than the case of Nirex, some respondents see this shift in the government's approach as a reaction to the 'crisis' of the RCF inquiry and a recognition that existing decision-making approaches for national policy on radioactive waste were failing.

A network of epistemic community members based around RASD/Defra has developed very rapidly since the initiation of the MRWS process. This 'Defra network' is different in character to the two previously mentioned in this Section. Not only does it involve a much larger number of community members, it is also more inclusive. It cuts across existing groupings within the radioactive waste area described in this Section so far and draws in other actors. For instance, in reference to Table 4.3 (Chapter 4), the Defra network draws together those in the BNFL network (e.g. TEC and associated facilitators), those in the Nirex network (e.g. Jane Hunt at CSEC, UKCEED, and Nirex themselves) as well as additional epistemic community actors not formally included in these two networks (e.g. Judith Petts, Alan Hedges, David Collier).

Relationships between RASD/Defra and members of the epistemic community were initiated soon after the start of the MRWS process when RASD/Defra approached individuals and actively sought their advice. It was a lack of expertise and competence in field of participation as well as mounting pressure to engage with people that lead RASD to seek advice from the epistemic community. As an anonymous respondent related to the MRWS process states,

> "we were standing around in the dark. We just knew that we had to try and talk to people and we didn't know how to, and we were running out of time because we were well into the consultation period. People here began to realise that this was going to be a hell of a lot more difficult than we thought" (Respondent S: 1499-1506).

Defra's demands for information and advice has led to a further proliferation of process experts within the radioactive waste area, inclusive of but also going beyond those in existing networks around BNFL and Nirex. One respondent attempts to describe the extent of this proliferation,

> "there are a bunch of consultants who think they know how to do consultation... you know Defra are going to do a big public consultation on radioactive waste and it's a feeding frenzy of consultants getting in there to get the contract" (Respondent K: 609-703).

An initial example of epistemic community influence at Defra was a meeting in December 2001 that brought together members of the community to offer advice on how to engage citizens and stakeholders in the consultation period during the first Stage of the MRWS process. This very much marked the beginning of Defra's engagement work. It appears that they took the advice of the process experts and acted upon it,

> "there was a feeling, 'oh heck, we're not getting anybody interested, people are telling us and criticising us because we haven't been very innovative in asking people, and we'd better get a bloody move on.' And... there was a meeting with [process experts] to discuss the proposals to do this work, and also they offered all sorts of opinions on the consultation process generally. And that was really the start of it followed by a lot of frenetic activity to try and actually do some of these things" (Respondent S: 293-303).

In addition to traditional forms of consultation conducted in the past, the initial engagement period of the MRWS process has seen Defra initiate deliberative processes such as reconvening the NCCRW citizens panel (UKCEED, 2002a), and conducting focus groups to capture public attitudes on radioactive waste (Kelly & Finch, 2002). Stage 2 respondents are clear that the network of community members building up around RASD/Defra have had an influence in shaping their engagement work. The group of process experts brought together in December 2001 was reconvened after the first consultation phase and on further occasions since then. As has been described in Chapter 3, RASD/Defra have recently taken the step of further expanding this group through the MRWS Participatory Methods Workshop (organised and facilitated by ESRU, UCL), which sought to provide them with guidance on the design of a public and stakeholder engagement programme for the MRWS policy options assessment phase.

Although recently formed, the network of community members building relationships with Defra has developed very rapidly and is already much larger than the previously described networks based around Nirex and BNFL. A major reason for this difference is that Defra appear to be demanding information and advice from the epistemic community in way that is much more inclusive or 'democratic' than private sector decision-makers. As yet, no one group of actors has been successful in enrolling RASD/Defra to exclusively adopt their definition of the problem and impose their specific ideas, beliefs and practices. On one hand, this leads to a confusing plurality of perspectives and advice for the decision-maker to make sense of. On the other hand, respondents acknowledge the very important role that the MRWS process could play in building bridges across the currently fragmented network in radioactive waste area and drawing together the wealth of practice and experience that has emerged over the past five years. For now the 'Defra network' is in the first stage of epistemic community evolution. Relationships built up at this stage tend to be informal in nature, based on goodwill and trust rather than any formal reciprocal exchange of resources. This stands to change with the imminent set up of the Committee on Radioactive Waste Management (CoRWM) by government, an independent body that will oversee the MRWS process and provide advice government on the final decision. Given the potentially powerful role of CoRWM it is not yet clear how the existing network will develop.

5.2 Current PRA practice in radioactive waste management

The previous Section has traced the rapid evolution of the epistemic community over the past half a decade around three key decision-making institutions in area of radioactive waste. Over this period there has been a shift away from a distinctly technocratic mode of decision-making that was based on a mentality of decide-announce-defend, and excluded citizens and most stakeholders. The community appears to have had a significant influence in bringing about the rapid development of citizen and stakeholder engagement within the area since 1997, including the introduction of innovative deliberative and dialogue based practices. To what extent then does this represent an epistemic shift from a technocratic to a democratic mode of decision-making? To what degree is the area of radioactive waste management learning from its mistakes?

In order to better understand how the epistemic community has influenced the shape of decision-making processes, this section presents an analysis of the nature and extent of current participatory risk appraisal practice in the area of radioactive waste management. The analysis draws on Stage 2 respondents' discussions of current practice in relation to case examples of PRA that they nominated as being particularly important or innovative, and is supported by documentary evidence. In order to gauge the extent of any shift that might have occurred current practice is assessed against the ideal type model of participatory risk appraisal presented in Figure 2.4 and described in Chapter 2. To rephrase, the two key characteristics of the democratic mode of environmental risk decision-making are that it is *participatory and inclusive* emphasising the active involvement of citizens and stakeholders at all stages in the process (*i.e.* framing/scoping, assessing, and evaluation), and *analytic-deliberative* through integrating analysis (science) and deliberation (participation) so that deliberation frames analysis and analysis informs deliberation.

The analysis, therefore, describes the nature of the engagement approaches used and how analysis and deliberation has been integrated in relation to each case nominated by stage 2 respondents, as well as providing a qualitative assessment of:

- the extent of citizen and/or stakeholder engagement in each stage of the decision-making process; and
- the degree of integration/interaction between analysis and deliberation at each stage of the decision-making process.

A summary of the analysis is shown in Table 5.1. The eight cases nominated by Stage 2 respondents are listed in relation to engagement strategy (according to the typology given in Appendix 2), which is indicated along with the engagement approaches employed in the second left column of Table 5.1. The engagement strategy that each nominated case relates to indicates the general level of engagement (*i.e.* information, consultation, or deliberation/dialogue) and who is represented within the process (i.e. professional stakeholders, local stakeholders, or publics/citizens). The third left column identifies the techniques for integrating analysis and deliberation used in each nominated case.

The three columns on the right of Table 5.1 provide qualitative scores (high, moderate, low, none) of the extent of engagement and degree of integration between analysis and deliberation in the framing, assessing, and evaluation stages of each nominated case. A high level of engagement in a specific stage equates to public and/or stakeholder involvement in most steps that make up that stage. The extent of engagement placed alongside the staged PRA model gives an indication of the degree to which technical environmental risk decision processes are being 'opened up' to extended peer review or the incorporation of lay/experiential knowledges and extended facts. The degree of integration/interaction that occurs can be differentiated into three levels (which equate to scores of high, moderate, and low respectively):

- *Active integration* - participants actively contribute 'extended facts' and lay/experiential knowledge to analysis and/or work together with specialists/experts in conducting analysis (e.g. participatory research, joint fact-finding, expert representation/translation, deliberative multi-criteria techniques, value-tree analysis);

- *Interactive integration* - direct interaction between analysis and deliberation, and direct exchange between participants and specialists/experts, in a process of 'extended peer review' (e.g. expert panels, ICT);

- *Non-interactive integration* - analysis and deliberation remain separate, with no direct exchange between participants and specialists/experts (e.g. written material, remote presentation, face-face presentation, Delphi process).

Each nominated case in Table 5.1 will be taken in turn before drawing conclusions across the analysis. Further description of each case, including details of the process, its objective/purpose, and decision-making level at which is operates, is provided in Appendix 7.

Case	Engagement approaches (Engagement strategy - ES)	Analytic-deliberative Techniques	Framing	Assessing	Evaluation
ISOLUS Consultation (Respondent: K)	Citizens Panel; Stakeholder Workshops; Focus Groups (ES: 6, 4/5, 3, 2, 1)	Expert panel Written material	**(*) +(+)		
National Consensus Conference on Radioactive Waste (Respondents: M, N, P)	Consensus Conference (ES: 6)	Expert panel Presentations Written material	**(*) ++	(+)	
Citizens Panel on Partitioning & Transmutation (Respondents: K, L, P)	Citizens Panel (ES: 6)	Expert panel Presentations Written material	*(*) ++	+	
Monitoring & Retrievability Workshops (Respondents: L, P)	Stakeholder Workshops (ES: 4/5)	Presentations Written material	** +	+	
Cricklewood Stakeholder Dialogue (including JASM) (Respondents: R, T, U, V)	Consensus Building (ES: 5)	Joint Fact-finding, Expert representation / translation		** +++	
BNFL National Stakeholder Dialogue (including SFMO Working Group) (Respondents: O, Q, R)	Consensus Building (ES: 4)	Joint Fact-finding; Deliberative multi-criteria analysis; Expert representation	**(*) +	** +++	*** +++
Benchmarking Public Opinion on Radioactive Waste (Respondent: S)	Focus Groups (ES: 3)	Written material	*(*) +		
Magnox Relicensing Consultations (Respondents: M, O)	Consultation Document, Surgeries, Public Meetings (ES: 2,1)				

* Signifies the extent of engagement in each stage of the process: High (***); Moderate (**); Low (*); No involvement ( ).
\+ Signifies degree of integration/interaction between analysis (science) and deliberation (participation) at each stage: High (+++); Moderate (++); Low (+); No integration ( ).

Table 5.1 A comparative analysis of current PRA practice in the area of radioactive waste against the ideal type model of participatory risk appraisal outlined in Chapter 2. (A description of each case, including its objective and details of the process, is given in Appendix 7.)

The **ISOLUS (Interim Storage of Laid Up Submarines)** process, conducted by CSEC for the MoD in 2001, engaged citizens and stakeholders in the early stages of a national level policy process to find a solution for the management and decommissioning of nuclear submarines (CSEC, 2001). This process is distinct from other nominated cases as it employed multiple engagement approaches including focus groups involving representative members of the public, stakeholder workshops involving professional and local stakeholders, and the convening of a citizens' panel. These approaches were supported by a web consultation for open feedback and wider information provision. It is on the basis of this multi-method approach to engagement that the ISOLUS case is listed above all others in relation to engagement strategy (see Table 5.1). Respondent K nominated the case. Some other respondents deemed the approach of running different forms of engagement in parallel to be an example of good engagement practice in the area of radioactive waste.

Respondent K was clear that, although innovative, the ISOLUS consultation was limited to the framing/scoping stage and did not engage participants in assessing or evaluation. The intention was to find out what people thought should be taken into account in the following decision process on nuclear powered submarines. It appears that the extent to which participants were engaged in framing was moderate to high (Table 5.1). At the time of the consultation, the problem had already been partly defined by the MoD. In addition the MoD had already produced a report evaluating possible options and established two main management options (either cut out the radioactive waste (reactor core) now and manage it, or in 50 years when the radioactivity had decayed), thus limiting the scope for participants to discuss alternatives. Participants did however engage in the discussion of acceptability criteria for deciding between the two options and deciding where to put the wastes, and raised a range of wider issues and concerns.

The integration of analysis and deliberation appeared to be generally low in the ISOLUS process, with questions of analysis remaining quite separate or removed. The main type of integration was non-interactive in the form of written material that provided participants with basic information on the location of submarines and the type of wastes. Possible limitations on access to information and analysis noted by

Respondent K included issues of secrecy surrounding the case and the limited number of available independent specialist relating to the issue. Part of the consultation did, however, involve a degree of interaction through questioning and debate between participants and four expert witnesses in a citizens' panel. It is on this basis that the degree of integration between deliberation and analysis within the case is scored low to moderate (Table 5.1). Although not the focus of the framing stage, there are indications that participants considered broader issues relating to the possible conduct of science and analysis later in the decision process, such as information needs, effective monitoring, and the possible formation of an independent expert panel to oversee information provision. Such a link to analysis in the process remained indirect being communicated through written material (reports). There was no indication at the time of interview that this had influenced or framed analysis, nor stages of assessing or evaluation. Respondent K did note the possibility of a further second consultation phase, which could possibly engage citizens and stakeholders in the evaluation stage, but that this remained very much at the conceptual level at the time of interview.

The next case shown in Table 5.1, is the **National Consensus Conference on Radioactive Waste (NCCRW)** carried out by UKCEED under the sponsorship of Nirex, POST and NERC in 1999. It sought to generate better informed public debate on the radioactive waste issues, identifying issues of public concern, and contribute the views of informed citizens to the national policy process (UKCEED, 1999). The NCCRW adopted the standard Consensus Conference design (as described in Appendix 7) and involved a panel of 15 citizens recruited by random selection. Participants received background information material before attending two preparatory weekends where they received further information, presentations, selected expert witnesses, and formulated questions to ask of them. The two-day conference involved short presentations from the expert panel followed by interaction between citizens and experts, expert questioning and debate. Participants produced a report outlining their recommendations and presented these to an audience of decision-makers and the public. The NCCRW was not formally linked to a specific decision-making process and occurred early on (or preceded) the national policy process on radioactive waste management. Respondents M, N and P, therefore, deem the consensus conference to have engaged citizens in the framing stage, and not in assessing or evaluation. Although the steering committee overseeing the process set the remit for the panel and aspects of process design were predetermined, participants had significant control in framing the issues and questions to be addressed. It appears then that citizens engaged in the framing stage at a moderate to high extent (see Table 5.1).

The NCCRW made significant efforts to achieve the integration of science and participation at interactive and non-interactive levels. Non-interactive integration was achieved though written material produced by a science writer (the editor of the journal *Nature*). The information material was then refined through an iterative review process with a group of stakeholders taken to represent the range of existing views on radioactive waste, with the intention that the material should be balanced and inclusive of these views. Efforts were also made for information provision to be responsive. If participants raised questions, process experts attempted to find out information in between meetings and feed it back to the panel. Interactive integration was achieved within the conference itself through critical questioning of experts by participants. Participants were provided with biographies of around 200 expert witnesses in the area of radioactive waste from which they chose the experts they wanted to question. From this it appears then that the degree of integration between analysis and deliberation in the framing stage was moderate (see Table 5.1). As already documented in Section 5.1 above, a number of respondents highlighted the influence that recommendations from the NCCRW had on Nirex initiating a research programme and changing its scientific concept from that of a closed repository to one that is monitored and retrievable. Although not an initial objective of the conference there is clear indication then that it had an indirect influence on analysis conducted in the assessing phase at Nirex through written material in the form of a citizen's report (as indicated in Table 5.1).

In addition to the NCCRW the other nominated case that has engaged citizens and specialists in a deliberative process is the **Citizens Panel on Partitioning and Transmutation**, carried out by CSEC for Nirex in 2001 (Hunt & Thompson, 2001). The objective of the process was to discuss and explore the issue of partitioning and transmutation (P&T) as a waste management option and consider Nirex's review of its research programme into the P&T technique. P&T is a new and as yet unproven technology that offers a possible means of breaking down and destroying certain radioactive substances. The citizens' panel was therefore set up to inform Nirex, at an organisational level of citizen views, on whether it should pursue research into the technology and help develop its position on P&T. The citizens' panel involved 12 members of the general public over two weekends to discuss issues relating to the partitioning and transmutation technology. Respondents K, L and P state that it engaged participants exclusively in the framing stage (as opposed to assessing and evaluation), but contributed to 'assessing' through framing issues relating to analysis. Participants reviewed what had already been assessed (including a possible re-framing role) and framed assessments still to be undertaken. It appears that the extent to which participants engaged in framing was moderate to low (see Table 5.1). The problem had already been defined by the organisation, the process largely designed, and discussion limited to the one option of P&T. Participants did however have a role in defining questions to be considered and scoping criteria of acceptability in relation to the technology through their discussions.

As with the NCCRW, it appears that efforts were made to achieve the integration of analysis with deliberation at interactive and non-interactive levels. In the first weekend participants received an introductory presentation and written material on P&T. Process experts worked with specialists on P&T to ensure that this material was relevant and accessible to participants. In addition, attempts were made through the process to make information provision responsive to the questions and demands of participants in a similar manner to the NCCRW. Participants scoped issues to be addressed and developed questions for expert witnesses but did not have a role in selecting experts. In the second weekend, citizens received presentations from a panel of four expert witnesses and directly interacted with them in questioning and debate on issues relating to P&T. The overall degree of integration between analysis and deliberation within the process was therefore moderate (see Table 5.1). As noted above, it was intended that the citizens' panel should contribute to framing issues relating to Nirex's scientific assessment work on P&T. Respondents K, L and P confirm that this has been the case, the link between deliberation (in the framing stage) and analysis (in the assessing stage) being provided in the form of the report produced by those running the process (Hunt & Thompson, 2001).

The three cases of ISOLUS, the NCCRW and the citizens' panel on P&T described so far are distinctive in that they are examples of citizen/public engagement at the level of deliberation and dialogue (engagement strategy 6, as defined in Chapter 2). Respondents nominated three further examples of deliberation and dialogue that exclusively involved stakeholders (engagement strategies 4 and 5, as defined in Chapter 2). The first nominated case in this category is the **Monitoring & Retrievability (M&R) Workshops**, conducted by CSEC for Nirex in 2000 and 2002 (UKCEED, 2000; 2001; UKCEED, 2002b). The purpose of these workshops was to preview (frame) Nirex's work programme at the organisational level on monitoring and retrievability. As noted above, and in Section 5.1, Nirex's decision to initiate a research programme on M&R was influenced by the recommendations of the NCCRW. The intention of these M&R Workshops sought to feed into and assist the development of this programme and Nirex's disposal concept for managing radioactive waste. In the first instance, two one-day M&R Workshops were held in 2000 that sought to explore the technological and social dimensions of the M&R issue. The first workshop predominantly involved professional stakeholders, although a small number of local stakeholders and 'informed' publics (*i.e.* original panel members of the NCCRW) also attended. The second workshop exclusively involved professional stakeholders. Both workshops took the same format involving information provision in the form of written material and presentations (from Nirex), facilitated breakout discussion groups, and plenary sessions. Independent reports were produced to summarise workshop outputs (UKCEED, 2000; 2001).

The outputs of these initial workshops were then taken back into the organisation and framed the assessing stage, a programme of technical assessment which lasted for more than a year, out of which came the revised phased disposal concept which had M&R built into it. A third M&R Workshop was held in 2002, combining participants from first two, in which the revised concept was presented back to participants for review (UKCEED, 2002b). Although discussing the concept, this workshop possibly adopted an even wider framing than the first with participants also considering issues relating to Nirex's overall strategy. Taken together then, the M&R Workshops represent an iterative programme of deliberation (Workshops 1 and 2, framing stage), analysis (technical assessment, assessing stage), and deliberation (Workshop 3, framing stage). All three workshops engaged stakeholders in the framing stage to a moderate extent, and although they did not actually take part in the assessing stage participants had a significant influence in framing it (see Table 5.1). Interestingly, although Participants L and P emphasised this influence, the degree to which analysis and deliberation interacted within the process was generally low in both stages of framing and assessing (see Table 5.1). Integration was facilitated through non-interactive means such as written material and presentations to inform participants and written reports to communicate the outputs of the process. This nominated case example of the M&R Workshops is similar in nature to a number of additional processes that have occurred since which have seen Nirex attempting to engage with a range of professional stakeholders (Hassard and Naji, 2001; Forth Road Limited, 2002a, b, c, d, e; Manor Resources, 2002; Nirex, 2002).

The second case of deliberation and dialogue that exclusively involved stakeholders (Table 5.1) is the **Cricklewood Stakeholder Dialogue** that took place between 1998-2000 and was carried out by The Environment Council for BNFL. This included the Jointly Agreed Sampling and Monitoring working group (JASM) that was part of the process and took place between 2000-2002 (The Environment Council, 2001). The JASM group was in fact the reason why Respondents R, T, U and V all nominated the Cricklewood case and was the aspect of the process that they talked about most. They saw this part of the process as a good example of local, as well as, professional stakeholders being actively involved in the assessing stage.

The main Cricklewood Stakeholder Dialogue sought to mediate a conflict that arose between BNFL and local/professional stakeholder groups, following a decision by BNFL's rail freight subsidiary to marshal trains carrying spent nuclear fuel at a site in Cricklewood, North London. The dialogue engaged stakeholders through using consensus building and mediation techniques, as well as stakeholder workshops. The front-end of the process was a long mediation phase where stakeholder groups met separately and information was exchanged between them via facilitators.

Stakeholders were then brought together in workshops to agree recommendations on a way forward. The eventual resolution to the problem was that BNFL should not move to their proposed site at Cricklewood but continue use an existing site at Willesden Junction for the marshalling of trains carrying spent nuclear fuel. The main Cricklewood dialogue, then, was a mediation process around a local level siting dispute that involved stakeholders in the management/action (decision) stage. Engagement in this main process is therefore not indicated in Table 5.1. During the process, however, there was significant concern and contestation over the possibility that the leaching of radiation from spent fuel transport flasks was leading to contamination and significant health risks at the existing site in Willesden. One of the recommendations from the main dialogue was that a smaller working group should be set up to investigate these concerns (The Environment Council, 2001).

The JASM working group involved local and professional stakeholders from the main dialogue selected to represent the range of interests present, as well as representatives from BNFL. In order to assess the levels of contamination and possible health risks the group were brought together in stakeholder workshops. Early on in the process the group found that analysis offered or conducted by either individual stakeholders or by BNFL itself was routinely contested, questioned and distrusted by others. Seeking data and analysis that they could all agree on in assessing the problem, the group were provided with resources to undertake a joint fact-finding process. This involved the stakeholders scoping and framing the range of questions that they each felt to be important in assessing the levels of contamination and health risks at the site. They scoped and agreed on the methods of analysis to be used to answer these questions (e.g. in what locations should measurements be taken at the Willesden site, the location of control sites, etc.).

Once stakeholders had agreed the research questions and methodology (and agreed to use the results as a basis for future discussions) they went about choosing technical experts to undertake the analysis they had scoped. While the experts undertook the analysis, stakeholders maintained a steering role in overseeing the work. After a period of analysis, stakeholders had input into how the findings should be presented and results interpreted before the experts presented the findings back to the group.

This initial investigation showed low levels of contamination that posed no immediate health risk to local residents. Although most participants were satisfied with the evidence, the possibility of conducting further investigations is still being considered at the time of writing. Respondents R, T, U and V see the JASM case as an example of local and professional stakeholder involvement in the assessing stage. It appears that participants were involved in this stage to a moderate degree, being involved in framing data collection and analysis undertaken by experts and playing a key role in interpretation and synthesis of the results produced (see Table 5.1). The integration of analysis and deliberation was high in this example with participants actively working together with experts in the deliberative process.

The third case of deliberation and dialogue that exclusively involves stakeholders is the **BNFL National Stakeholder Dialogue (NSHD)** which is run also by The Environment Council for BNFL. The overall objective of the NSHD is to inform BNFL's decision-making process at the organisational level about the improvement of its environmental performance (Environment Council, 2003). As noted, when describing the BNFL network in Section 5.1.2, the process was initiated in 1998 and is still ongoing. It engages a main group of over 70 professional stakeholders in facilitated workshops and meetings intermittently throughout the process. A series of working groups, each composed of around 15 members who are brought together over a defined time period, feed into and support this main group. Respondents O, Q and R believe that the BNFL NSHD has, at some point over the last five years, engaged professional stakeholders in all three stages of framing, assessing and evaluation (see Table 5.1). Respondents Q and R also believe this to be the case with the Spent Fuel Management Options Working Group (SFMOWG) (Environment Council, 2002), and take this working group to illustrate the nature and extent of engagement in each of the three stages.

The SFMOWG group has been looking at the range of possible management options for spent nuclear fuel and considering their environmental and socio-economic impacts in relation to different scenarios. In terms of the framing stage, it appears that professional stakeholders have been engaged to a moderate to high degree, and that the integration of analysis and deliberation is low (Table 5.1). When initially set up, the working group defined the problem, the issues and questions to be addressed, established their own terms of reference, and agreed aspects of process design. In the case of the SFMOWG, the group were involved in developing around 14 options, agreeing criteria to evaluate these options, and then narrowing down the range of options.

In relation to the assessing stage, professional stakeholders have been involved to a moderate extent in the steps of data collection, interpretation and synthesis. This has involved high levels of interaction between analysis and deliberation, with participants taking an active role in shaping scientific assessments conducted at this stage (Table 5.1). Respondents Q and R provide two examples of stakeholder involvement in the assessing stage. The first example is a joint fact-finding process. The working group was concerned that it did not have enough information on socio-economic impacts on the Cumbrian economy, in relation to the options and scenarios it had developed, in order to make reasonable judgements. It therefore undertook a form of collaborative research where participants agreed what information was needed; jointly scoped a piece of technical research/analysis; agreed on the research questions, methodology, and forms of analysis; identified and commissioned technical experts to undertake the work; and maintained contact with the experts to guide the work (see ERM, 2001). The second example is the use of expert sub-groups to collect data, and analyse and interpret it in the assessing stage. A subgroup of internal (BNFL) and external (NGO) experts was formed to undertake work on the costing of different options. Experts within the sub-group worked separately and together, and intermittently presented their work back to the main working group where their findings were questioned, challenged and debated. Individual members of the working group also collated information and offered it to the group.

Finally, it appears that professional stakeholders have been engaged in the evaluation stage to a high degree, where the integration between deliberation and analysis is also high (see Table 5.1). This has involved various ways of evaluating the management options developed in the framing stage. Again Respondents R and Q offer two examples. The first was a form of deliberative multi-criteria analysis (based on multi-attribute decision analysis or MADA) where participants made judgements about each option in relation to the criteria developed in the framing stage. Second, the agreed options were then subject to a strategic action planning approach (SAP) which makes underlying assumptions explicit and plans contingencies based on alternate future possibilities. The BNFL NSHD, then, is distinct from other nominated cases as it involved participants (professional stakeholders) at all stages of the PRA process. It is also distinctive in the sense that it is an ongoing process of engagement.

The two remaining cases nominated by respondents in Table 5.1 both relate to participant involvement at the lower engagement level of consultation. The **Benchmarking Public Opinion on Radioactive Waste** study, by Market Research Services for Defra in 2002, sought to provide government with a benchmark of the general public's views, understandings, knowledges, and reactions, in relation to radioactive waste management issues (Kelly & Finch, 2002). It engaged publics representing different demographic characteristics in focus groups over two sessions. The first session imposed minimal prior framings to explore spontaneous attitudes, top-of-mind environmental concerns and levels of awareness and knowledge. In between sessions, participants were provided with written material to inform them of radioactive waste issues and management strategies. The second session then explored informed views, the reaction of participants, and wider perspectives on public involvement in decision-making.

As Respondent S states, this process engaged publics exclusively within the framing stage, and the indications are that the extent of engagement in this stage was low to moderate (Table 5.1). It was undertaken as part of the initial MRWS consultation phase and helped understand how publics define the problem, their possible criteria of acceptability, and their views on how publics should be engaged. However it remains separated from the MRWS process and does not directly address framing issues such as wastes, options, or criteria explicitly. The degree of interaction between analysis and deliberation was low, being limited to non-interactive means of written material. The final report of the process does not appear to have influenced analysis undertaken in the MRWS so far but possibly could in the future. This Benchmarking Public Opinion study nominated by respondents is similar in form to a number of other focus group processes undertaken over past few years in the area of radioactive waste (e.g.

Future Foundation, 2000, 2002b; Hunt & Simmons, 2001; Lennie & Davies, 2001; Scottish Council Foundation, 2002). This means of engaging citizens in framing has been one of the most popular forms of participation in radioactive waste decision-making in recent years.

The other case nominated by respondents at the lower level engagement strategy of consultation is the **Magnox Relicensing Consultation**, conducted by the Environment Agency between 2000-2001. The consultation sought to gain the views of stakeholders and the public for consideration in decision-making on the reauthorisation of 8 Magnox power stations as a result of a change in ownership. The process at each site involved the publication of a consultation document; a programme of public meetings and face-to-face surgeries with individuals. Although not strictly about radioactive waste, Respondents M and O saw the Magnox consultation as representing a form of current engagement practice that remains prevalent throughout the area of radioactive waste in the UK (see footnote 25, in Appendix 7, for a list of analogous processes that have occurred recently).

Although the example was an attempt by the Environment Agency to advance its traditional approach to consultation (e.g. through including surgeries and a facility for access and feedback by phone or Internet) Respondents M and O were clear that it occurred at a very late stage in the decision process and thus failed to engage publics or stakeholders in the stages of framing, assessing or evaluation. Although attempting to go beyond the decide-announce-defend model that has traditionally existed in the radioactive waste area, such forms of consultation do little to convince people that the decision has not already been made. It could possibly be argued that more intensive forms of engagement are not appropriate in such decision contexts but it appears that there were demands for higher levels of engagement at some of the sites. Respondent O suggested, in decision contexts such as the Magnox relicensing, attempts should be made to engage those interested and affected much earlier on, preferably in the framing stage.

The comparative analysis presented in Table 5.1, supported by the above discussion of nominated cases, confirms the observations of Stage 2 respondents noted in Section

5.1 that a shift towards a more democratic mode of decision-making on radioactive waste in the UK has been initiated since 1998. Current practice sits in stark contrast to the pre-1997 technocratic mode of decision-making. Far from being excluded, in six out of the eight nominated cases, citizens and/or stakeholders have been involved at the high engagement level of deliberation and dialogue. In terms of professional actors, in addition to the epistemic community of process experts, the key change has been the extended role of scientific experts both as expert witnesses and collaborative analysts who assist process participants. Apart from the Magnox consultation, every nominated case has engaged citizens or stakeholders in at least one of the three stages in the ideal type model of PRA. In addition, a number of techniques for integrating analysis and deliberation identified in a review of the literature (see Section 2.3.2.4, Chapter 2) are being employed.

Despite this it is clear, however, that current practice falls short of the ideal type model that is characteristic of the democratic mode. Although a shift has been initiated, and the area of radioactive waste has learned considerably over the past 5 years or so, there is still a long way to go before technical policy processes within the area can be considered to have been democratised. Just by looking at the overview provided in Table 5.1, current PRA practice remains sporadic, being limited to isolated cases rather than being integrated throughout the whole decision process. The BNFL National Stakeholder Dialogue is the only nominated process to provide coherent engagement and high levels of reciprocal interaction between deliberation and analysis, in all three stages of the PRA process. All other cases (apart from the Magnox consultation), engage citizens or stakeholders in one out of the three stages only. It appears then that the 'bitty' and isolated nature of the cases of current PRA practice documented in this section mirrors the fragmented nature of the epistemic community described in Chapter 4 and Section 5.1 above. We can conclude from the current analysis that, although there was has been a marked change in opening up of technical policy processes, current PRA practice has not as yet been effectively institutionalised in the area of radioactive waste.

In addition to these broader observations, the comparison of current PRA practice against the ideal type model has produced three key findings. The first, as Table 5.1

clearly shows, is that publics are not being offered a role in actively contributing to the stages of assessing and evaluation. This leads to the likely exclusion of lay/local knowledge and 'extended facts' from these stages of current policy processes. The only processes that allow participation in assessing and evaluating exclusively involve stakeholders. Even here, practice appears to be limited across the area. The BNFL NSHD is the only process to actively engage participants in both the assessing (through joint-fact finding) and evaluation stage (through deliberative multi-criteria analysis). Participants in this case are limited to professional stakeholders who come to the process with high levels of existing specialist and procedural knowledge. It is also significant that this is the only process to have involved participants over a long period of time, a necessary factor in engaging people actively in analysis, particularly in the assessing stage. The Cricklewood Dialogue JASM group is the other example of involvement in assessing, again via the technique of joint fact-finding. Here it could be argued that citizens, in the form of local stakeholders, actively contributed 'extended facts' to the analysis. But the representation of citizens in the group was limited, and the JASM group did not have any link to the formal decision at Cricklewood, which had already been made.

Significant advances have been made, then, in the development of participatory risk assessment and evaluation in the area of radioactive waste. Current practice, however, is privileging the specialist knowledges of professional stakeholders over lay/experiential knowledges held by publics and citizens. This clear demarcation, once again, delegitimises the role of publics in stages that have traditionally been the exclusive domain of experts. It suggests the implicit or explicit institutional assumptions about the limited capabilities of citizens to usefully contribute to these stages still hold.

The second, and perhaps most striking feature of Table 5.1, is the significant degree to which publics and citizens, as well as stakeholders, are currently being involved in the framing/scoping stages of radioactive waste decision-making processes in the UK. Participants are being engaged in framing to a moderate or high extent in six of the eight cases nominated by Stage 2 respondents. In assessing the degree of shift away from a technocratic mode of operation, this is highly significant given the fundamental importance of framing stressed in the ideal type model of PRA (e.g. Burns and Uberhorst, 1988; Ozawa, 1991; Webler & Renn, 1995; Stern & Fineberg, 1996; RCEP, 1998). Participants appear to be playing a key role in defining the issues to be addressed and discussing acceptability criteria, thus expanding the range of values and ideas that shape the decision process. Existing framing exercises are involving citizens in processes of extended peer review (or perhaps more accurately extended peer pre-view), creating spaces that place them in interactive relationships with specialists and issues of science/analysis. It is clear that the importance of involving publics in framing decision and assessment processes is one of the key learning points in the development of PRA practice in the radioactive waste area over the past few years. Respondent P confirms this finding and highlights the role of idea diffusion from researchers in the epistemic community in bringing this about,

> "I think the idea of front end consultation, getting the values out, articulating the values, I think that is being captured and communicated and people are looking at how to build that into their approach. So I think that is something that has been learned. And it's quite a nice example where you can see it coming out of the academic research in decision theory and options appraisal. And then people are beginning to adopt it in their strategies, struggling a bit maybe just to see how do you practically implement that. But you can see that it is being fundamentally built into practice now. So I think there is a key learning element there that is generally now adopted as best practice" (Respondent P: 1943-1956).

The third main finding of the comparative analysis presented in Table 5.1 is evidence that iteration and recursive influences appear to be occurring between deliberation and analysis in some of the cases identified. A specific instance identified as particularly important in this regard is the impact of citizen and stakeholder deliberation in the NCCRW and the M&R Workshops on shaping analysis conducted in the assessing stage within Nirex. A number of respondents have highlighted the framing influence of the NCCRW on Nirex, initiating and shaping its research programme on M&R. The M&R Workshops represent a specific instance of an iterative process between deliberation in the framing stage that has directly influenced technical assessments undertaken in the assessing stage of Nirex's decision process, which was then subject to further deliberation and (re)framing. Further evidence of deliberation framing analysis is provided in the cases of the BNFL NSHD, the JASM group linked to the Cricklewood Dialogue, and the Citizens Panel on P&T.

This section has shown that elements of the ideal type model of participatory risk appraisal are being taken up and adopted within the area of radioactive waste in the UK. There is significant evidence to substantiate the claim that a shift away from the traditional technocratic mode of decision-making has occurred. Current practice within the area indicates, however, that there is still long way to go before a democratic or contextual mode of policy-making can be seen to be operating fully. Further caution is necessary when considering that the evidence on which this analysis is based comes from cases deemed to be innovative or important by Stage 2 respondents. The case of the Magnox consultation which failed to engage people in any stage of the PRA process indicates that practices characteristic of a technocratic mode are still prevalent, if not dominant, within the area.

5.3 Conclusions

The epistemic community based around participatory risk appraisal in the UK has evolved very rapidly in the area of radioactive waste over the past half decade. There is considerable evidence that this evolution was triggered by the shock of the RCF inquiry in 1997 leading key decision-making institutions within the area (with possible exception of BNFL) to turn to epistemic community members for information and advice. The community has evolved furthest around the private sector decision-making institutions of Nirex and BNFL. The network around Nirex appears to be the most developed. It is currently at the second stage in the model of epistemic community evolution proposed by Haas and Adler, as indicated by the presence of internal process expertise within the organisation and its active promotion of the community's core beliefs and practices. The BNFL network, currently at stage one or stage two of community evolution, is less extensive and more tightly defined, indicating that community members within the network have been particularly successful in enrolling the organisation into exclusively taking on their specific beliefs and practices. More recently, a network of process experts from the community has built up around Defra and the UK Government's MRWS process. Although currently at the first stage in epistemic community development this network is already more broadly based and inclusive than the longer standing networks around Nirex and BNFL. There is no evidence at the current time that members of the community operating in the area of radioactive waste are effecting the introduction of social institutions that might stabilise their presence and help to ensure the institutionalisation of a more democratic mode of environmental risk decision-making.

This Chapter has provided clear evidence that members of the epistemic community are having a significant influence on the beliefs and practices of decision-makers in geographically localised and institutionally specific instances. Certain actors have played a key role in initiating a shift away from the distinctly technocratic mode of operation that dominated decision-making on radioactive waste prior to 1997, and brought about the rapid development of public and stakeholder engagement in what is a relatively short period since then. Most evidence of epistemic community influence on the beliefs of decision-makers has been provided in the case of Nirex, where the early examples of engagement by the community appear to have engendered learning about the legitimacy of citizens' lay/experiential knowledge and enhanced 'scientific reflexivity' within the organisation. A key instance in this regard is represented by the response of Nirex to recommendations from the NCCRW in changing its scientific concept for radioactive waste management from a closed repository to one where wastes are monitored and retrievable.

The analysis of current participatory risk appraisal practice confirms that over the past five years, the epistemic community has brought about a shift away from a technocratic mode of decision-making. It is clear, however, that current practice falls short of the ideal type model of PRA that is characteristic of a democratic mode of decision-making. Although the area of radioactive waste has learned from past failures, it still has a long way to go before technical policy processes within the area can be considered to have been democratised and PRA practice effectively institutionalised. Current participatory risk appraisal practice remains sporadic, being limited to isolated cases. Greater efforts are needed therefore to ensure that citizen and stakeholder engagement, and the interaction of deliberation and analysis, is integrated throughout all three stages of the policy process.

Despite this, a key indication from current practice in the area of radioactive waste is the significant degree to which publics and citizens, as well as stakeholders, are currently being involved in framing decision-making processes. This shift represents a fundamentally important aspect of the ideal type PRA model that is being adopted in the area of radioactive waste. Such practice is involving citizens in processes of extended peer review and expanding the range values and ideas that frame, and ultimately shape, decision-making processes. A key indication that radioactive waste decision-making institutions have not learnt as much as they might, however, is indicated by the current exclusion of citizens and stakeholders from the assessment of environmental risks and impacts, and the evaluation of different policy options for the management of radioactive waste. The only processes that allow people to participate in these stages of assessing and evaluating have almost exclusively involved professional stakeholders. Although these instances of participatory risk assessment and evaluation represent advances in themselves, professional stakeholders, albeit in less inclusive ways, have long been involved in radioactive waste decision-making processes. The inability of current practice to engage publics and citizens in stages beyond framing suggests that the privileging of the specialist knowledges of professional stakeholders over lay/experiential knowledges held by publics and citizens remains embedded in certain aspects of decision-making on radioactive waste in the UK.

This exclusion of public engagement beyond framing partly reflects the fact that this is the stage which the government's national policy process has currently reached. Such an explanation neglects the fact, however, that, over the past five years, the rapid development of practice around organisational policy processes of key private sector decision-makers has also failed to actively engage citizens in assessment and evaluation. This current situation appears to be at odds with constructivist perspectives developed in Chapter 2 which argue that effective environmental risk decision-making under conditions of complexity and uncertainty depends on a more symmetrical, constructive, and interactive relationship between citizens and experts, to facilitate mutual learning and the epistemological transformation of their respective knowledges. Although citizens currently have an important role in framing science this relationship is largely non-interactive. Citizens remain separated or removed from assessing and evaluation in a manner that at least partly upholds a distinction between values (deliberation) and facts (analysis). This greatly limits the incorporation of lay/local knowledge and 'extended facts', along with the negotiation of scientific uncertainties and indeterminacies, in the important tasks of assessment and evaluation in radioactive waste decisions. The effective development of PRA practice in the area depends on developing ways that take seriously the important, and arguably essential, role that citizens and publics can play in these stages of decision-making. This requires the development of analytic-deliberative learning processes where citizens are involved of over longer periods and develop the necessary understanding to enable their active engagement in assessment and evaluation. Given its current stage of development, the UK Government's national (MRWS) policy process is ideally placed to draw together fragmented groups of epistemic community actors, as well as the wealth of practice and experience of PRA that has emerged over the past half a decade, in realising such a requirement.

6 Epistemic community perspectives on effective participatory risk appraisal practice

The two previous Chapters have considered the nature of social learning processes occurring between actors within the epistemic community (Chapter 4), and the extent to which the area of radioactive waste management has learned to develop participatory risk appraisal practice (Chapter 5). In this Chapter we take a step back to look at the actual content of learning that has taken place within the broader epistemic community based around PRA in the UK. This is important for two reasons. First, it provides further insights into the degree to which shared understandings and beliefs about participatory risk appraisal are developing between actors within the community. Second, the analysis contributes to current understanding of what constitutes effective participatory risk appraisal practice. In this sense it represents an attempt to develop principles of effectiveness from the grounded perspectives of practitioners involved in the study, based on their own experiences. The analysis centres on competence, the specific focus of which emphasises questions of knowledge, expertise and science in relation to deliberative and inclusive processes, and the integration of, and interaction between, science and participation. It therefore provides an insight into how ideas of competence are being negotiated between members of the epistemic community, and directly addresses Research Theme 3 (as described in Chapter 1).

The first part of the Chapter (Section 6.1) draws on Stage 1 and 2 in-depth interviews to consider respondents' perspectives on effective practice. In addition to being directly elicited in interviews, participants also offered such perspectives when discussing the meaning, and current practice, of participatory risk appraisal. The interview discourse has been coded based on the following four themes of effective participatory risk appraisal:

- the overall shape of the analytic-deliberative process;
- the nature and role of science/analysis within the process;
- access to information and specialist expertise; and

- the nature of deliberation.

The analysis emphasises where respondents hold consensual beliefs in relation to these themes, and highlights areas of difference between them where significant. Respondents' grounded principles of effective PRA are highlighted throughout the analysis in areas where a high degree of shared understanding exists between them. Section 6.2 offers further insight into the epistemic community's beliefs about effective PRA through briefly reflecting on the results of community members' deliberations in the *Managing Radioactive Waste Safely* (MRWS) Participatory Methods Workshop held in Manchester, March 10-11, 2003. It is important to note that the validity of gaining further insight into the beliefs of the epistemic community through Stage 1 and 2 interviews and the MRWS workshops participants does depend on individuals identifying themselves as members of the epistemic community. This is confirmed by the fact that all interview respondents, and most workshop participants, were identified in the network mapping analysis presented in Chapter 4.

6.1 Interview respondents' perspectives on effective practice

Towards the end of Chapter 4, it was noted that certain respondents believe general principles of effective participatory practice to be emerging within the epistemic community at a very abstract and generalised level. Understanding in specific relation to analytic-deliberative processes is perhaps less developed. The analysis of effective practice conducted in this Chapter confirms this distinction between general principles of participation and those specifically relating to the integration of deliberation and analysis. While focusing down on issues of competence in discussion, respondents mentioned a number of more generic principles relating to effective participatory practice. Rather than consider these in depth, most respondents mentioned them in passing. Even so, there was broad agreement between Stage 1 and 2 respondents around these general principles, including the assertions that an effective participatory process should be: *representative, inclusive, clear, transparent, fit for purpose, independent*, and *enhance learning*. Almost all of the general principles offered by respondents match those in the list of ten effectiveness criteria identified in a review of the UK practitioner literature (see Box 2.2 in Chapter 2). Respondents' understandings of these criteria broadly match the definitions given in Section 2.4 (Chapter 2) and therefore will not be outlined here. The one generic principle offered by respondents not listed in Section 2.4, 'fitness for purpose', has also been described in Section 2.3 (Chapter 2).

Ideas of competence that form the focus of this Chapter are inherently related to these wider principles. The main difference, however, is that they focus down on and provide further practical resolution of aspects relating to the integration of deliberation and analysis. This distinction was recognised by respondents in discussion, as Respondent H notes,

> "alongside the participatory process, because most guides are on just participatory process, I think the guide on [engaging people in] science itself doesn't exist except if you put it in the risk language and then it's very generic again. The concept that science needs is something different... that doesn't exist and hasn't been captured" (Respondent H: 2686-2713).

There is a sense, as indicated in Chapter 4, that understanding of effective participatory risk appraisal and competence is less developed within the community. This is further confirmed by the number of participants who expressed how difficult they found the integration of science and participation when reflecting on practice. The notion of an analytic-deliberative process appears simple but its realisation appears to be much more problematic. As the following respondents note,

> "[I]t's terribly obvious when you say it but it's quite difficult to know how you implement it" (Respondent J: 145-147).

> "So for me it's hard to answer the question of what is a scientific-analytical process - you know, how you use science in these processes because it is so hit and miss" (Respondent B: 133-138).

> "How you present information, what information you present, as well as the understandability stuff, and how that relates to how the problem then gets

framed, is a problem I have yet to solve. I'll make my fortune if I ever do" (Respondent K: 982-986).

Despite their considerable experience of citizen and stakeholder participation in general, it is clear that a coherent understanding of what effective analytic-deliberative practice means remains illusive for most respondents. There is a sense that, although attempts are being made to engage citizens and stakeholders in post-normal environmental risk decisions, individuals developing practice are very much feeling their way in this emerging field. Despite this, through reflecting on their experience respondents provide a rich variety of perspectives on what form participatory risk appraisal processes should take. The degree to which coherent principles are emerging between respondents forms the focus of analysis for remainder of this section.

6.1.1 The analytic-deliberative process

The first theme that Stage 1 and 2 respondents talked about in relation to effective practice concerns the overall 'shape' of the participatory risk appraisal process, with particular emphasis on who should be represented in each stage of the process and the extent to which they should engage in analysis. These discussions directly relate to the ideal type model of PRA (introduced in Chapter 2, Section 2.3.2), which emphasises the importance of citizen and stakeholder engagement, and the integration of analysis and deliberation, in the three stages of framing, assessing and evaluation. This ideal type model has been used to assess current practice in the previous Chapter. Here, respondents offer their own views on what form they think the PRA process should or could take based on their experience.

Every interviewee offered perspectives on how the analytic-deliberative process should be most effectively shaped. The area of most consensus centred on the need for broadly based deliberation and inclusion in the framing stage. There was complete unanimity between all respondents that in complex and uncertain environmental risk decision processes, *citizens and stakeholders should be engaged as early as possible in the framing/scoping stage to define the problem, policy options and criteria of* *acceptability (1).* The fundamental importance that all respondents assigned to this principle is represented by the views of two respondents from interviews in Stage 1 and Stage 2 respectively,

> "Well I think that the most important thing is problem definition - understanding what the issues are and understanding what the stakeholders see as what the issues are. Very often the understanding of the stakeholders and the appreciation of the technical people are quite at variance because they are coming at it from quite different mindsets. So defining the problem, understanding it and understanding what the underlying issues are is very important" (Respondent E: 868-899).

> "The issue again, when you define the problem, the issue is a societal one. Why is there waste and what does waste do? If you can get them engaged there and people come up with – "well, it's about packaging" - and these sort of things, even if they're red herrings it's important to get at. At the framing-scoping stage we get people involved in saying, "well, how are we going to handle the possible outcomes. How are you going to handle those possible outcomes in the time scale?" Get them involved - then they'll help you and this should be anybody in society, because everybody has a view and wants to be involved" (Respondent X: 703-714).

In this regard each respondent's individual beliefs converge significantly with the ideal type model outlined in Section 2.3.2. There was a general feeling that failure to broaden the scope of problem definition, along with possible options and outcomes, through incorporating wider issues, concerns, fears, and lay/experiential knowledges held by citizens and stakeholders, is likely to undermine any decision process in the longer term. Some respondents emphasised the need for wider involvement in defining the process by stating this is good practice in any participatory process, although this view was not widely held across respondents. On balance, respondents felt that inclusive deliberation should lead the framing of contentious and uncertain environmental risk decisions and play a higher (or at minimum equal) role at this stage, relative to analysis.

There was also consensus between respondents in arguing that *broadly based deliberation in the framing stage should shape and guide scientific analysis conducted in further stages of assessing and evaluation (2).* As Respondent F states,

> "lay people almost have the leading role to play in what the issues are and the questions science actually ought to be addressing. Because science is about answering questions not necessarily posing them. And I think that the lay public has a very relevant role to play in posing them and, you know, setting the agenda" (Respondent F: 1823-1831).

There was considerably less consensus about the possible active involvement of citizens and stakeholders in the assessing and evaluation stages. Two groups of respondents can be identified who appear to represent significant minority views in relation to this issue. The first group, comprising a relatively small number of respondents, argued that lay publics and stakeholders should not take an active involvement in analysis. Respondent K encapsulates this view,

> "[T]he ordinary member of the lay public is perfectly capable of engaging with complex scientific areas and we've got the evidence to prove it... But I also think that there is an area of what you might call technical review. And there is some indication that the public don't actually want to get involved with that. What they are perhaps - and I'm deliberately putting this as a tentative hypothesis - are much more concerned about is the process by which such things might be conducted. So the public have got a lot to say about the way in which science is done and, particularly in relation to radioactive waste, I think that is an extremely important thing to explore properly in order to produce (...) [something called] 'authoritative science' (...). So I suppose I have more interest in the front-end, than saying 'here's a complex technical scientific question, what's the answer' with the public. Rather it's how the answer is found where I think the emphasis lies. But I'm open to discussion on that one, I'm not convinced fully of that" (Respondent K: 258-289).

As is clear from this respondent's reasoning, the belief that wider participation is not necessary in assessing and evaluating environmental risks is not based on an assumption that citizens are not capable of such things. It is explained by the pragmatic argument that citizens do not have any great desire to be involved in these 'technical' stages. Nor is this the strongest area for citizens to be involved in, they have more to offer in the framing stage. In this sense, citizens' influence over assessing and evaluation is through non-interactive means, with the main task being left to those who are scientifically expert.

The second group holding a significant minority view also saw little or no active role for citizens in assessing and evaluation. This was constructed through the slightly different belief that any active involvement in these stages is best left to (professional) stakeholders rather than citizens. As Respondent Q argues,

> "I think very often it's a knee jerk reaction wanting to be seen to involve everybody and their aunt, when often it doesn't do anyone any particular good - except those with the most power, usually. It isn't particularly empowering to put people in situations that they aren't necessarily able to affect... So, for me, it would be up to stakeholders in such a process to determine what questions need to be put to the public and how they might handle the results. And it maybe that you wouldn't lay out the scientific assessment but you'd lay out of some kind of slightly different cut to get you close to the kind of information you're after. (...) There's absolutely no reason why the public shouldn't influence what the stakeholders themselves determine" (Respondent Q: 133-139; 260-271).

This view sees stakeholders as the central participants in the assessing and evaluation stages of the PRA process. Citizens might be kept informed or contribute to informing stakeholder views through 'extensive' means such as opinion polls that attempt to capture their reactions or values in relation to the results of a scientific assessment. Any direct citizen role is ruled out on the basis that they neither have sufficient competence or power to have any chance of participating effectively.

Contrary to these two views held by a significant minority, most respondents felt that citizens do have an active role to play in the assessing and evaluation stages of the PRA process. There were differences within this majority view however, based on the extent to which they might be engaged. Some respondents felt that although citizens would not necessarily want to be involved in tasks of assessment and evaluation, they should still be offered the opportunity to do so. As Respondent X notes,

> "people are happier to let people go and collect data and know about it. But if you offer again openly, 'do you want to give us some data? Do you want to come with us or go and get it?' a lot of people generally say 'as long as we can see it and that you've gone and got what we've asked you to get, then we're happy with it'. You bring experts in to talk and so on" (Respondent X: 714-720).

Most respondents holding this majority view believed that citizens should be engaged in the assessing and evaluation stages. Lay publics are more than capable of doing so, provided they are properly supported through the learning process, and in many post - normal environmental risk decision contexts their lay/experiential knowledge and perspectives are just as valid as those held by experts. Respondent N encapsulates this perspective,

> "we're confident that if you put the information in front of people, no matter how expert or non expert they are, they can assimilate the information and come to a view. And the point is that opinion polls do that all the time. They don't put any information in front of people, so they want a knee jerk reaction, and therefore you don't know whether people have got any view on it, any knowledge of it or anything. The knee jerk reaction. (...) But what we're about is knowledge. What is their view after they gained knowledge. So we're confident they can be used at any of those stages... [I]t's no less valid than an expert looking at a range of options and saying, 'well I think this one because scientifically I'm convinced.' You can't separate the politics from the science (...) so they would have just as valid a role to play in assessing (...) If people feel there's a reason to do it and they're going to be listened to, they'll be happy to do any of that sort of thing that contributes to sensible policy" (Respondent N: 982-995; 1006-1018).

Interestingly Respondent N's reference to a 'knee jerk reaction' has a meaning that is directly opposite to that of Respondent Q (shown above). Rather than offering citizens a removed role in 'technical' stages of the PRA process via opinion polls

(Respondent Q's desired approach), Respondent N, and most others holding the majority view, believe that spaces should be created that allow people to meaningfully participate as 'informed citizens'. Involving citizens in longer term process that allow them to develop understanding of the issue is the fairest, and most effective, way for them to participate in the assessing stage. In addition to offering a role as 'extended peers', this might also offer citizens the opportunity actively to contribute 'extended facts'. In such situations, they might conduct or shape their own analysis via participatory research or specialist/expert representation, as Respondent A believes.

> "[T]here is another way in which they can participate as far as I'm concerned. I would like to see them owning their own part of the discovery process. I mean, I would be prepared to make a certain amount of resource available so they can specify what they wanted to do, which they can commission or we can commission or whatever. And then they will feel some kind of ownership around that knowledge. These are not easy things to resolve. (...) My feeling is that if some of these external constituencies could have access to scientific resources it would help them structure their arguments better and that would be all to the advantage" (Respondent A: 776:797).

So while a minority of respondents take the view that citizen influence on assessing and evaluation should be indirect via framing/scoping or removed via stakeholders, most Stage 1 and 2 respondents hold the belief that *citizens and stakeholders should be actively engaged in assessing environmental risks and evaluating environmental risk management options in situations where they demand to do so or where science supporting the decision process is particularly contentious or uncertain (3).*

In sum then, most interview respondents were of the view that citizens and stakeholders have a role to play in all three stages of the participatory risk appraisal process. With regard to the overall shape of the analytic-deliberative process, respondents share highly consensual beliefs that effective PRA depends on broadly based citizen and stakeholder involvement early on in the framing/scoping stage, and this deliberation in turn should shape and set the agenda of science and analysis conducted within the process. There is less consensus between respondents over the possible role of citizens in tasks relating to assessing and evaluation. Although some see these stages as the exclusive domain of specialist experts, the majority of respondents share the belief that effective PRA depends on citizens engaging in assessing and evaluation and actively incorporating their lay/experiential knowledges into the process. From this analysis, it would seem then that the beliefs of the epistemic community regarding how the overall PRA process should be shaped are broadly consensual, though a degree of difference exists within the community about the who (the types of actor) and what (kinds of knowledge) should be legitimately represented in assessing and evaluating environmental risks.

This Section has shown epistemic community beliefs to be centred around a democratic/contextual conception of the environmental risk decision process as indicated by their convergence with the ideal type model of PRA suggested in the literature (e.g. Burns and Ueberhorst, 1988; Ozawa, 1991; Webler & Renn, 1995; Stern & Fineberg, 1996; RCEP, 1998). Community beliefs are very much contrary to a technocratic mode of decision-making which would see citizens excluded from the three stages of the PRA process with involvement being limited to consultation at the end of the policy process. Understanding within the community replicates the need identified by the ideal type model of PRA to incorporate lay/experiential knowledge and represent cultural forms of rationality in the framing environmental risk policy processes. Differences within the community on the degree to which science-intensive policy processes are 'opened up' beyond the framing stage indicate that beliefs do not entirely converge with the democratic mode. However, a number of authors have noted the ambiguity surrounding the possibilities for wider involvement in assessing and evaluation (Stern & Fineberg, 1996; Perhac, 1998; Fischer, 2000; Rowe & Frewer, 2000). As noted in Section 2.3.2, this tension exists between advocates of the PRA model from those who see little role for wider participation in assessment (e.g. RCEP, 1998), through to those that see an active substantive role for citizens and stakeholders (e.g. Stern & Fineberg, 1996).

Variations between respondents on the potential role of citizens in assessing/evaluation could possibly be explained by the belief that it might not be appropriate to involve citizens in science in certain contexts. Examples cited by respondents included particularly contentious and uncertain issues (including radioactive waste and municipal waste for those in Stage 2; genetic modification, chemicals, and others for those in Stage 1). Constructivist perspectives on the citizen-expert relationship presented in Chapter 2 (e.g. Funtowicz & Ravetz, 1992a, 1993a; Wynne, 1992a,b, 1996a) provide powerful epistemological arguments for the active involvement of citizens in such contexts. It would appear then that difference between respondents is at least partly explained by assumptions that they hold about the capabilities of citizens to participate, and the legitimacy of their knowledge, within technical stages of the PRA process.

6.1.2 Science/analysis

The second theme around which Stage 1 and 2 respondents discussed effective practice centres on the role of analysis in participatory risk appraisal and how science should be conducted within the process. Approximately half Stage 1 and 2 respondents offered perspectives on effective practice in relation to this theme (including Respondents A, D, E, F, H, I, J, P, O, W, V and Z). These respondents mainly, though not exclusively, represent the actor categories of decision-maker and specialist/expert. The degree of consensus between them appears to be higher than that of the theme considered above. All the respondents argued that science's main role in the PRA process is to support deliberation. Science should not lead or drive the participatory process. In this sense, scientific analysis is seen as a 'facilitator' at the service of the deliberative process, its main role being to answer questions. Respondent E captured the belief of those discussing this theme,

> "Well I see science as providing the tool for a process that involves the public and other stakeholders as equal partners, if not the prime partners. They're the ones who ought to be driving the process. The science is basically used to quantify the risks and to assess impacts. I think it's also the job of science to point out the uncertainties and the alternatives. So it's really to support a deliberation process that is driven by other stakeholders" (Respondent E: 101-121).

This is not to undermine the role of science which remains crucial in understanding environmental risks and impacts and in informing the deliberative process with the best available knowledge. Analysis helps to understand the range of possibilities that exist in relation to environmental risk decisions and helps set the boundaries of, or circumscribe, what is feasible. Respondents addressing the role of analysis also agreed that effective PRA depends on constructing science that meets the needs of participants within the process and helps them formulate their views. As Respondent F states,

> "I think for me the question of engaging science actually begins to bring in the expressions 'analytic' and 'deliberative' (...) it also might mean producing information, data, models, and turning them into useable devices that lay people could use to help inform their own opinions - so that lay understanding could be raised at the same time as people sort of express their values and get engaged in decision-making processes. So I think it has an element [of]... making knowledge and analytical approaches accessible to lay people in ways that can help them formulate their views and participate" (Respondent F: 123-151).

Respondents strongly agree then that to be effective *science/analysis should support deliberation and participation and be accessible, relevant and useable to participants within the process (4).*

Respondents also described the type of analysis and the nature of the scientific process that is necessary for effective participatory risk appraisal. Their beliefs resonate closely with the principle suggested in Section 6.1.1 that deliberation should frame analysis within the overall process. Essentially this means having a scientific agenda that is framed by participants whereby *science/analysis conducted within the process should respond to the needs, issues and concerns expressed by participants in an iterative way (5).* As Respondent F continues,

> "The other critical element to this would be a responsive science that is responsive to how these perceived needs are actually being defined. And often that would mean that it's a different kind of science - about synthesis and

gathering together, interpreting - rather than necessarily gathering new knowledge perhaps" (Respondent F: 1831-1840).

Respondents are acutely aware that this is a very different type of analysis to that associated with a traditional or 'normal' conception of science (as defined in Section 2.1.2, Chapter 2) which remains isolated from, and makes its own assumptions about society, as well as setting its own agenda. It very much deconstructs the notion of a linear policy process framed by science and uncontaminated by social interests. It also goes beyond any form of applied science or professional consultancy constructed prior to the PRA process, to one that is necessary post-normal (see Figure 2.1, Chapter 2). As Respondent F notes, the nature of a more responsive science is likely to be one of synthesis, translation and interpretation rather than one that (necessarily) discovers new knowledge. Respondent P further describes the type of scientific process that might be necessary to respond to the views expressed by citizens and stakeholders, and describes the relationships that would have to be formed in order to do this,

"you need to be very receptive to the dialogue that happens around it. You consider it as a starting point and then you build your knowledge base (...) You would then have very recursive little discussions because you say 'we're not going to limit you. We'll listen to what you say and then go away and think about our methods'. You then need to go back and say, 'We listened to what you said. This is the way we're trying to respond to it. If it's not responding to it, then what are the issues?' So you build up your knowledge base very iteratively, and that then has implications for the process that you might use. (...) It does mean that you take a group of people with you" (Respondent P: 1332-1344; 1963-1972).

It is clear that responsive analysis conducted within the time frame of the participatory risk appraisal process not only poses significant difficulties for scientific practice, it also has important implications for the process of participation.

A final principle identified by a smaller number of respondents but around which there was a similarly high degree of consensus was that *scientific-analysis should be transparent to participants within the process and make underlying uncertainties and* *assumptions explicit* (6). This is both a recognition of the conditional nature of science and a recognition that effective participatory risk appraisal depends on communicating this to participants within the process. As two respondents from interviews in Stages 1 and 2 note,

> "So this is important. I think there should be a standard format for risk assessments with pro forma listings of [the hazards that have and have not been addressed] so that the areas of uncertainty are definitely identified. Because currently the idea is that you give the impression that you really understand what's going on (...) The people who are being asked to assess these things would know that it's not all rosy. I mean then they can make an informed assessment" (Respondent Z: 910-929).

> "You should never find yourself in a position of giving a particular scientific datum - you know this is the scientific assessment of this or that issue. It should always be that this is the scientific assessment under this assumption; this is it under another assumption" (Respondent I: 2667-2674).

There is a high degree of shared understanding within the epistemic community in relation to this theme. As seems to be the case in relation to the shape of the overall analytic-deliberative process (explained in Section 6.1.1), community beliefs are more closely related to a contextual model of the environmental risk decision process than a technocratic mode often associated with scientific practice. Within a traditional or normal conception of science promoted under a technocratic mode of decision-making analysis tends to: ignore or hide underlying assumptions and uncertainties embedded within it; remain inaccessible to those lacking the necessary expertise to understand it; and is predominantly framed by scientific-experts. The views expressed by respondents are very much the opposite of these characteristics of normal science on all counts. Respondents' views are more in line with the US National Research Council's statements that effective environmental risk decision-making under uncertainty depends on 'getting the science right' and 'getting the right science' (Stern & Fineberg, 1996).

The third principle of effective science/analysis suggested by interviewees directly relates to the former NRC statement which emphasises the need for clarity with regard to analytic limitations, the plausibility of its assumptions, the magnitude and character of uncertainty. The first and second principles identified by respondents are about getting the right science which Stern & Fineberg (1996) see as a need to make analysis that is shaped by, and responsive to, the needs of participants, while informing them in an understandable, accessible and relevant manner. The need to involve participants in conducting analysis was not expressed by participants when discussing the specific role of science/analysis, but has already been expressed in relation to the first theme of effective PRA considered above (Section 6.1.1). It appears then that the beliefs of the epistemic community relating to the role of science/analysis in PRA are closely aligned with those in identified in the literature (as reviewed in Chapter 2).

6.1.3 Access to information and specialist expertise

The third theme of effective participatory risk appraisal practice discussed by respondents was the need to provide access to information and specialist expertise to participants within the deliberative process. As outlined in Section 2.4 (Chapter 2) this theme is central to ideas of competent citizen participation. It was an aspect of effective practice deemed to be particularly important by all Stage 1 and Stage 2 respondents who offered a wide range of perspectives in relation to it. It is also a theme that a number of respondents found particularly problematic. Discussion centred on questions of information provision, and access to specialist expert resources. The former received most attention with respondents focusing on the communication of information within participatory fora through written material and expert presentation.

In relation to the provision of information, respondents considered four principles to be important in ensuring effective participatory risk appraisal processes. These principles essentially focus on the integration and communication of (technical) information. For most respondents an immediate principle around which there was considerable consensus, was that any *information provided should be appropriate,* *meaningful and understandable from the perspective of those participating (7).* The aspect most obvious to respondents in relation to this principle was the notion of 'understandability'. A number of respondents offered perspectives on this, emphasising that information provided should be 'clear' (Respondents N, K), 'simple' (Respondent E), 'straight forward' (Respondents K, N), and presented in a language that is the 'participant's own' (Respondents AC) or 'plain English' (Respondents R, X). Several commented that specialists often think participants need a lot more information than is actually necessary, and suggested that any information provided should refrain from using specialist language or jargon. A further aspect of this first principle of information provision within deliberative processes was the need for it to be appropriate or relevant to the type of participant receiving it. Not all participants will enter a PRA process with the same initial levels of competence and understanding in relation to the issues being discussed. Information provision must be sensitive to this, as is asserted by the following respondents from Stages 1 and 2 respectively,

> "any science which is discussed at an event or through dialogue needs to be at the right level for the people that are listening to it and it needs to be relevant and that's it" (Respondent G: 393-398).

> "one of the comments I would certainly make on complex science is that it's perfectly possible for people to engage and understand sufficiently to make informed comments and all the rest of it. But the form in which it is presented needs to be appropriate to those using it" (Respondent K: 426-430).

A final aspect of this first principle of information provision is the need to understand the context of each participant's own experience and to render the information meaningful to them. In addition to making information interesting, interviewees talked about the importance of using analogies or equivalents that relate to people's everyday experience as a means of communicating technical concepts and information more effectively. Respondent V describes how he used such an approach to communicate information to citizens and local stakeholders in a contentious process about the health risks from contaminated land,

> "there are substances on the site which are very complex organics and things like that so we need to find some way of telling people what that means. I was just saying the other day that PAH is there and most people say 'well, so what does that mean?' If you don't tell them what the likelihood is, they'll assume that those things are very, very dangerous. So you need to come up with an everyday equivalent if you can, so they don't try and do that. So there will be equivalent things like road tar, bleaches that are used in the house, and where possible they will try and make parallels between what's on the site and what people are used to using. So that's another way of getting the technical information into a useable form" (Respondent V: 733-746).

A second principle offered by respondents is a response to the inherent difficulty of information provision brought about by the constructed, conditional, and contentious nature of scientific knowledge in post-normal environmental risk decision contexts (as explained in Section 2.1, Chapter 2). Given this, *information provided within the process should faithfully represent the range/diversity of views that exist on the issue being considered (8).* This principle appears to have been learned by the epistemic community through participatory practice, which has shown that the pursuit of an unbiased (single) objective view to communicate with citizens and stakeholders is not only unrealistic and unattainable but also damaging to the PRA process. In contentious and uncertain environmental risk decision contexts, any attempt to communicate a single 'objective' viewpoint, when other competing views exist, will quickly come under attack from stakeholders, and engender suspicion and mistrust amongst citizens. It would also be a failure on the part of the specialist or process expert not to present available information in a fair way. The belief that information should represent the range of views that exist was forcefully argued by a number of interviewees including K and S,

> "I give [citizens] a set of information that would, fingers crossed, not come apart if official stakeholders look at it. So that we wouldn't be accused of misinforming people by any of the sides of the debate. That people would be able to agree that this was reasonable information. I mean obviously it never is neutral, but people would agree that this was reasonable (...) it seems to be the fairest way: there are different views. We use attributed quotes, you know,

'Greenpeace say this. NRPB say that. What do you reckon?" (Respondent K: 383-390; 1007-1020).

"You would need to present the range of opinions. You would need to say, 'Greenpeace say this. The government energy review says this', and leave it up to people to see that there's a range of information which in itself undermines everything" (Respondent S: 532-537).

So an effective way of managing, handling and communicating the uncertainties and assumptions that are inherent to scientific knowledge and technical information is to represent the range of viewpoints that exist. A number of processes by which this might be achieved seem to be emerging within the epistemic community. One process noted by respondents is to use a steering board overseeing the participatory process to review information materials to be presented to participants. Steering boards with a diverse membership are increasingly used to ensure the validity of participatory processes, and have been used for instance in the ISOLUS Project and the National Consensus Conference on Radioactive Waste. A more sophisticated process, but one that appears to be being accepted as good practice within the community, is to have a standing panel of stakeholders who represent the range of views on an issue. The stakeholders iteratively review information as it is being developed before it is provided to participants in a deliberative process. Respondent N further describes this process,

"The advisory committee felt there was a need for a broad range of introductory material which was very straight forward and very easy to assimilate and... we wanted somebody independent to do that. Somebody who was well respected in the broader scientific community, but was used to writing articles that had a popular dimension... that was interestingly one of the most complex parts of the whole process, because we had a shadow stakeholder group involving the key players like Greenpeace and Nirex and people like that. And we wanted them to approve the introductory material to make sure they were broadly happy with its balance. That was a very convoluted and complex process. Ultimately we got a form of introductory material that was neither liked or disliked particularly by any of the stakeholder groups... I think we need more time to do that in future" (Respondent N: 494-510; 682-700).

A smaller number of respondents believed that a way of improving the effectiveness of information provision would be to improve the abilities of specialists/experts who interact with citizens in participatory processes. Certain respondents forcefully argued that most scientific experts were poor communicators and noted experiences where they felt the root cause of misunderstanding between participants and specialists lay with the latter and not the former. Given this, respondents believed that *where appropriate process experts should assist specialist experts in developing their capacity and ability to effectively communicate with participants in deliberative fora (9).* This highlights the importance of the relationship between facilitators and specialist expert witnesses, and was seen to be an element of good practice. The support provided by the process expert can range from a short written briefing given to expert witnesses or the reviewing of drafts prior to presentation, through to interaction between the facilitator and specialist expert over time during which a presentation is jointly prepared. Participant G highlights the rationale underlying this process and the relationship that is built between process and specialist experts,

> "So a scientist cannot sit down and say this is what the stakeholders need to know because he has no idea unless he lives in their house, walks up their street. He has no idea about what it is that they need (...) and it often is the case that scientists will give them too much stuff (...) that's where the facilitator comes in because the facilitator spends ages with the scientist saying 'why do you think they need to know that?' And it takes along time but if, over the next few years, we can get scientists engaged with people and realise that they are going to help them and not hinder them then that's great, the way forward in my view" (Respondent G: 388-449).

In many ways, the three principles of effective information provision in the PRA process considered so far in this section centre around communication *from* specialists and process experts *to* participants within deliberative processes. There was a high degree of consensus between respondents that, on their own, these three principles are not enough to ensure effective information provision. The three principles of good communication do not constitute effective PRA unless underlain by a fourth principle based on the belief that *information provided within the PRA process should be responsive to the needs of participants (10).* In this sense, information provision has to be at least partly controlled by the participants themselves. The majority of Stage 1 and 2 respondents therefore viewed information provision as a two-way process. Participants identify information needs that have to be responded to in a timely manner,

> "The other thing within a deliberative process, of course is two-way communication. You're not just putting it out there to some blanket generalised audience. You have a specific audience who feedback and ask you questions, and you need to respond to that and clarify, which can get a bit tricky" (Respondent K: 442-447).

> "If it's important for people, they'll squeal about it and say 'I just don't get it. Why is this affecting our thinking here?' And then you need to spend time (...) it should be responsive to what needs are being expressed. After all, I think an enormous amount of time, money and effort can be wasted preparing all sorts of documents that don't see the need. Better to get the need expressed correctly (...) It's about them getting what they want and about the facilitation team enabling them to be clear, and enabling some clarity about who is going to do it and when they're going to see it" (Respondent Q: 868-906).

Although stated as an important principle by most respondents it seems that such exchange is inevitable in a deliberative process that is open, fair, and empowers participants. Any process that is not responsive in this manner will be seen as deficient in the eyes of those participating. It would also lead to participants not being properly informed and undermine their ability to contribute in a competent and fair way. This two-way process also involves the legitimate provision of lay/experiential information from participants to experts within the process, a principle learnt by the epistemic community through doing participation,

> "Then [participants] say, 'what impact will that have?' You hadn't got a bloody clue. Or they'd ask questions which were common sense, basic questions which

were not in the realm, and we didn't have any answers. So we would then take the question away and say 'we'll give the answer directly' which we always did. Then we learnt a bit more and generally as a result of needing to ask people literally all round the world, and within the industry and so on, we therefore built our own bank of knowledge up" (Respondent X: 1026-1035).

As noted at the beginning of this section, the other sub-theme that respondents focused on is access to specialist expert resources in relation to the deliberative process. Although this sub-theme received relatively less attention, there was one principle around which there was a high degree of consensus between respondents. This shared understanding centred on the belief that *participants within the process should have access to specialist expertise and have control over who provides this assistance (11).* As Respondent X argues, such a principle is as much a matter of fairness as it is about competence,

> "A contractor can spend tens of thousands of pounds doing environmental impact assessment; if the community wants to challenge that, how are they going to get fifty grand to get a good consultant of equal reputation? So we said to the contractor, give them the money, let them choose. You might need to vet in the sense to make sure they are representative, that would be the only caveat (...) why should you not empower the little person to be equal, why should you let a global private sector company who's going to suck off millions of quid of money? That's the perception. It's a David and Goliath thing. We are a public intermediary, supposed to provide services to the public. So lets put some effort into making sure they have equal resources" (Respondent X: 1183-1195; 1207-1213).

Most respondents maintained that the PRA process should not refuse participants access to specialist knowledge and resources on any grounds, although a few respondents expressed caution that access might have to be constrained in exceptional circumstances on commercial or security grounds. (This was shown to be the case in the example of the ISOLUS Project, as described in Chapter 5). Respondents broadly believed that offering participants access to specialist knowledge and resources in principle is central to effective participatory risk appraisal. Respondent A represents this view,

> "Now the way to engage properly is to share knowledge with [participants] but also to enable them to build their own knowledge base if necessary" (Respondent A: 805-809).

Processes that are currently being employed to offer participants control over the selection of specialist expertise have already been outlined in Section 5.2 (Chapter 5). Emerging practices considered to be most effective by respondents include:

- providing participants with information on the background of a wide range of expert witnesses which they discuss and collectively agree on the specialists who they want to be represented (in processes involving expert panels for instance); and
- situations where participants jointly agree criteria for selecting experts who either work with them or conduct analysis on their behalf (for example in processes involving expert representation and collaborative forms of analysis).

As with the theme on science/analysis (Section 6.1.2, above) there appears to be a high degree of consensus between interviewees about what constitutes effective access to information and expertise in the PRA process. Also in accordance with the two previous themes considered in this section so far, the beliefs of members of the epistemic community appear to be closely aligned to a democratic mode of environmental risk decision-making, and based on a socio-cultural or contextual model of risk communication and public understanding of science (PUS). This is clearly indicated for example by the four principles of effective information provision around which respondents converge.

The alignment with a democratic mode might not be immediately apparent when considering the first and third principles identified by respondents, which centre on the need for experts to communicate more effectively to the public and stakeholders. For example, the notion of understandability in relation to the first principle converges with recommendations from early literature on risk communication, emerging from work within the psychometric paradigm (as reviewed in Chapter 2). Much of this literature advised that information provision should be clear, concise and unbiased, and warned against communications that were too technical, full of jargon, and inconsiderate of public perception (see Renn & Levine, 1991, for a comprehensive review of factors controlling effective risk communication based on early studies within the field). Such work on risk communication tends to centre on mass communication models of individuals receiving information which is subject to cognitive processing: 'all we have to do is get the numbers right' or 'all we have to do is tell them the numbers' (Fischoff, 1995). Such a view underpins the deficit model of PUS (described in Section 2.1.2, Chapter 2) as defined by authors such as Irwin (1995) and Wynne (1991, 1995).

Contrary to this, the four principles of effective information provision identified in this section provide significant evidence that far from reconstructing the deficit model within deliberative contexts, the beliefs of the epistemic community closely relate to constructivist accounts that emphasise an interactive model of PUS (Layton *et al.* 1993) (see Section 2.1.2, Chapter 2). For instance, the first and third principles see the need for information provision to be meaningful and make sense to citizens within the specific context of their own experience. The second principle can be seen as a direct recognition of the conditional and value-laden nature of scientific knowledge, and the need to communicate its inherent uncertainties and subjectivities to participants. Perhaps the strongest evidence that the epistemic community is working with an interactive model of PUS, however, is provided by the fourth principle of information provision, which underpins all others. This principle sees information provision and communication as an interactive, multi-way process of mutual exchange. It assumes that citizens have a legitimate role in shaping knowledge needs by providing lay/experiential information to experts within the process. Members of the epistemic community see information provision as a process of 'deliberative risk communication'. This is aligned with best practice emerging in the risk communication field (e.g. Fischoff, 1995; Bier, 2001).

One final point on the epistemic community's beliefs on access to information and expertise in the PRA process is their resonance with effective practice identified in the literature. As noted at the beginning of this section, access to information and expertise is closely related to ideas of competent participation. Webler's (1995) criteria on effective explicative discourse (comprehensibility and clarity of communication) and theoretical discourse (communication and discussion about facts) underpin interviewees' analysis. More specifically, the first four principles identified by respondents centre around the criterion that participants should have equal access to definitions, terms, and concepts relating to the decision process. With regard to theoretical discourse, there is significant convergence between the fifth principle identified by respondents and Webler's criteria, with the possible exception of equal access to local/experiential knowledge, which was not emphasised by most respondents in discussion. The five principles identified in the section also converge with Stern and Fineberg's (1996) criterion of 'getting the right participation' in the PRA process which includes the need to ensure: the full range of knowledge and information enters the process, that the process is informed by best available knowledge and the full range of perspectives and providing access to specialist information.

6.1.4 Deliberation

The final theme focused on by Stage 1 and 2 respondents is the nature of deliberation required to ensure effective participatory risk appraisal. As explained at the beginning of this section, participants mentioned seven general principles that define effective participation and emphasised their importance in good PRA practice. Respondents spent more time in discussion focusing down on specific aspects of deliberation that are necessary to ensure competent participation in complex and uncertain environmental risk policy contexts. Respondents talked about competence, and linkages between science and participation, in relation to four pragmatic principles. These principles explicitly or implicitly emphasise the need to ensure an equitable interactive relationship between citizens (be they publics or local stakeholders) and experts, and uphold cultural rationality within the PRA process. They also stress the need to prevent technical expertise being reified in deliberation through ensuring that uncertainties and social assumptions are negotiated and exposed.

One of the aspects of deliberation that respondents focused on most is the nature of interaction between participants and specialists in general, and the relationship between citizens and experts, in particular. Although there were areas of difference between respondents, most held the belief that the *deliberative process should ensure a highly interactive and critical relationship between participants and specialists (12).* Most respondents felt the need for closer interaction between participants and specialists in order to ensure the negotiation and transformation of their respective knowledge and worldviews. Respondents either emphasised closer interaction between participants who hold epistemic differences, or interaction between participants and external experts. Respondents K and R represent each of these views,

> "What we've done with the... process primarily is try and bring lay public and stakeholders together horizontally so they're actually talking to each other as people" (Respondent K: 915-918).

> "The experts came back and gave presentations to the group in its entirety and people obviously challenged some of the information, they sought explanations and clarifications. So there is a very strong interaction with the technical community who are producing the information" (Respondent: 583-588).

A minority view deemed closer interaction between participants across epistemic differences as being unproductive and unfair on those who are less competent or powerful. This small number of respondents believed in a separatist relationship between citizens and professional stakeholders (the quote from Respondent Q in Section 6.1.1. is broadly representative of this view). Within the majority of respondents believing in a highly interactive relationship, a smaller number argued that efforts should be made to ensure that the relationship between citizens and experts is symmetrical or appropriate. As Respondent F states,

> "I think giving - there's a really nice word - giving appropriate weight to the lay and expert participation in the process" (Respondent F: 1818-1821).

Given these differences, most respondents agreed that, in addition to being interactive, the relationship between participants and specialists has to be critical. Efforts should be made when designing PRA processes to ensure that all participants within the deliberation, both expert and non-expert, have the opportunity to question, challenge, and debate. In this regard, it is particularly important to enhance the ability of participants to challenge specialists in order to open up science, expose underlying uncertainties and prevent technical expertise from being reified in deliberation. As Respondent H argues,

> "it means making the science or the technical issues transparent and open to challenge - as opposed to science which in classic risk assessment discussion is driven as a technical process which produces a set of results. And those results are then handed on to someone to make a decision engaging the science. I think engaging the people in the science itself during a decision process [is better] as opposed to just providing the science for a decision process. And importantly opening the science to challenge by people who are participating" (Respondent H: 105-120).

This process demands an interactive relationship shaped to overcome epistemic inequalities or structural differences that exist between participants and experts. In offering these perspectives, respondents were conscious that many existing participatory methodologies do not pay sufficient attention to such issues. Nor do they ensure that relationships are sufficiently interactive and critical. There is a danger in post-normal decision situations that the possible epistemological integration of citizen and expert knowledge does not occur, and modernist dichotomies such as fact/value are upheld. The following respondents from Stage 1 and 2 interviews express these concerns,

> "Now at the minute there's no - I mean in the ones I've done, there's no - it's not so much a debate as a presentation. And then you wander off, and then the next person comes along and gives their presentation and wanders off. I don't know whether there's a chance of having a system whereby you know a person, as in a public enquiry, they'd be cross examined" (Respondent Z: 518-524).

> "I regard engaging with science as having some sort of dialogic, deconstructive, critical, thing at the core of it... being collegial and co-operating to understand each other and trying to empathise [is very desirable]. But if you push that too strongly then you are actually pushing a hegemonic sort of model. So I think some element of contestation, dissent, challenge, even antagonism, within the process is quite a healthy thing. And sometimes these participatory processes don't actually have that sufficiently" (Respondent I: 2801-2808; 2897-2909).

In addition to emphasising the need for critical interaction, the latter quote from Respondent I also points to the second aspect of effective deliberation in PRA identified by respondents. Some note that in contentious environmental risk decision contexts, there is a need for collaborative and consensual processes that go beyond the problems of adversarial science and counter-expertise, perpetuated by a technocratic approach to decision-making. However, far from overcoming the technocratic mode, an overemphasis on consensual deliberation might actually uphold modernist dichotomies rather than break them down. If consensus is pushed too strongly, it not only undermines critical interaction, but also inhibits exploration of difference. Most respondents considering this aspect of deliberation in PRA emphasise the need to explore difference rather than ensure consensus. The majority of respondents therefore hold the belief that *although recognising the role of consensus the deliberative process should emphasise diversity and difference through representing alternative viewpoints, exploring uncertainties and exposing underlying assumptions (13).*

The importance of exploring diversity and difference is borne out of the significant divergence that exists between people's epistemic (knowledge) and value (ethical) claims in post-normal decision contexts. For most respondents, one means of ensuring difference is the representation and exposure of alternative views in deliberation,

> "the principle of the exposure of alternative views, and if we're saying that science is particularly open to alternative and counter views, that principle has to be there - *i.e.* the challenging of alternative views" (Respondent H: 2724-2730).

> "And then we've got to be able to engage very early on in the process the people who are on the fringe of sound science if you like, who - again looking at the waste analogy - are going to say that you should not breast feed your baby if you live within thirty miles of an incinerator and so on" (Respondent B: 557-568)

> "we should make every effort to bring in the outliners. The mavericks. That is actually extremely difficult because they often don't want to come in" (Respondent C: 486-490).

While the participatory literature focuses on the representativeness of participants, it appears that in the contentious and uncertain contexts within which PRA operates, similar emphasis is needed on the representativeness (diversity) of specialists and experts engaged in deliberative processes. The second important aspect of diversity and difference is the need to explore uncertainties and expose underlying assumptions within the deliberative process. Again this is fundamental, given the high levels of knowledge and value conflict that exists in complex and uncertain environmental risk decisions. As Respondent D reasons, an over-emphasis on consensus can undermine the potential to explore such differences,

> "a clear premise of these workshops is saying that if we sit around and discuss it long enough we will all be happy with the conclusions, when there are actually fundamental values that are at dissidence (...) Is there something that we could look at that would take things forward? Take things forward in the sense of enhanced understanding, not trying to say that everybody has got to come to the same conclusion. Then find an agenda on which participants can sort of broadly agree" (Respondent D: 143-204).

The explicit acknowledgement of fundamental knowledge and value differences enhances the potential for epistemic transformations and learning to occur between participants. Overly consensual deliberation undermines this possibility. Most respondents shared the belief that exploring uncertainties and exposing underlying assumptions with the deliberative process is fundamental to effective PRA. As Respondents Q and V note, these two aspects are often inherently linked, "The reason why uncertainty is part of that problem is because you will be making certain assumptions about economic futures or what is moral and just, what people expect of you. And I will be making similar judgements. And we're both very intelligent people, but we're coming at it from different perspectives, so we're probably making different assumptions. So unless you have a process which enables a deeper exploration of the subject, you're not going anywhere" (Respondent Q: 592-603).

"Reducing uncertainties where you can is important I think, as is getting absolute clarity about what the remaining uncertainties are. And helping people to understand that they are - generally in these things - fighting with each other because they have made different assumptions about what's true, not because they necessarily want a different quality of result but because they are basing their assessment on completely different assumptions" (Respondent V: 1187-1192).

An overemphasis on consensual deliberation in post-normal decision situations could lead to an illusory mutual understanding when, in fact, substantive differences still remain between participants. The clear view of respondents then is that the development of mutual understanding between participants requires a deeper exploration of difference.

A third aspect of effective deliberation identified by a number of respondents is the belief that *the deliberative process should allow enough time to for participants to become informed and develop competent understandings (14).* This principle particularly applies to situations where citizens and local stakeholders are involved in the PRA process. Respondents felt that for such participants to be effectively engaged in science-intensive policy processes, they need time to digest information, express desired information needs, and ultimately become familiar with, and informed about, the issues in question. This depends on creating learning processes where participants are supported in building their confidence and competence, and allowed the space and time to do this. Respondents P and B represent this view, "once you give people the time, they can actually engage and come up with pretty sensible suggestions very rapidly, amazingly rapidly, but it is about time and about finding space for discussion and dialogue" (Respondent P: 550-554)

"you can do these kinds of things in under a 4 month process. I mean we have done citizens juries and so on, but even those are very phoney and you don't get the opportunity to do what you are talking about unless you spread them out over time. Because basically it's a journey, it's a personal journey" (Respondent B: 740-748).

It is only fair that citizens have this opportunity to become informed before they can be expected to interact with experts in a fair way. As noted by Respondent P, and outlined in Section 6.1.1 above, once informed, participants are more than capable of handling and making sensible judgements about complex and uncertain environmental risk issues. Some respondents noted, however, that participants involved in this way have to be committed to the process. 'Stakeholder fatigue' and the fact that citizens are uninterested in certain environmental risk issues are possible barriers to this principle being realised in PRA processes.

The final aspect of effective deliberation emphasised by most respondents is the belief that *those facilitating/mediating the deliberative process should have adequate substantive understanding of the issues being discussed while remaining independent and impartial as to the outcomes of the process (15).* This principle was seen to be particularly important in complex and uncertain environmental risk contexts where significant structural differences in understanding often exist between participants. In such situations it may be necessary for the facilitator to intervene in the deliberative process to ensure fairness. To do this effectively, the facilitator should have at least some substantive understanding of the issue being discussed. This principle was deemed to be a key characteristic in determining the competence and expertise of members of the epistemic community, as noted in Section 4.1 (Chapter 4).

"if you come as an organiser of one of these, or a facilitator, you have to know something about the subject. And there's absolutely no doubt, that if you have a consultant who knows absolutely nothing about the topic that's about to be discussed they are in real trouble (...) You don't have to be a technical expert yourself but you need to be able to understand how to pull pictures together" (Respondent H: 1801-1826).

"It's better to be independent - for them to be relatively independent you know in terms of the process. But that having been said, they need to have the professional competence to grasp the scientific issues. It's not just a case of getting the discussion moving, they do need to have some basic ability to understand the issues that they are dealing with" (Respondent F: 1867-1876).

As in the case of the need for consensus and difference, respondents identify a clear tension between the facilitator intervening based on their substantive understanding and their independence from the issues being discussed. While most respondents believed some substantive understanding of the issue to be important, a few felt that handling the process and content at the same time was inappropriate or unattainable,

"the independent facilitator... must be seen to be above all bias and above reproach" (Respondent N: 521-523).

"You need to be an extraordinarily amazing person. I couldn't do it and most of our facilitators - we know how difficult it is to be with content and be with the process at the same time. And it's basically impossible!" (Respondent G: 2151-2159).

The level of shared understanding within the epistemic community on the nature of deliberation is equal to the first theme considered in this Chapter (Section 6.1.1) whilst less than the second and third (Sections 6.1.2 and 6.1.3). Although most participants agree on the four principles of effective deliberation identified, minority views exist around the degree of critical interaction that should occur between specialist and non-specialist participants, and the degree to which the facilitator should remain independent or intervene in discussion based on their substantive understanding of the issues being discussed.

In environmental risk decision contexts where technical issues and scientific discourses tend to dominate the agenda, there is a very real danger that deliberation and participation simply reverts back to, or upholds, the deficiencies of the technocratic approach. It is all too easy in such contexts for instrumental forms of rationality to be privileged, and asymmetrical, unequal and separatist communicative relationships between citizens and experts to be upheld. The mere presence of a deliberative process does not automatically mean it is democratic, nor can it be assumed that knowledge transformations and learning automatically occurs within participatory processes. The four principles identified by respondents all attempt to prevent participation reverting back to a technocracy. They emphasise the need to ensure an equitable interactive relationship between citizens and experts, uphold cultural rationality, and prevent technical expertise from being reified in deliberation.

Although perhaps less comprehensive than ideas of competent deliberation expressed in the literature, once again there is overlap between the principles identified by respondents and criteria identified by Webler (1995) and Stern & Fineberg (1996). The second principle identified by respondents relates to Webler's criteria that deliberation should provide a means for uncertainties to be considered (theoretical discourse), the development of mutual understanding through the discovery of values, and the need to ensure the unbiased representation of interests and knowledges (practical discourse). Respondents' principle of allowing enough time in deliberation converges with similar criteria suggested by Webler in relation to explicative, theoretical and therapeutic discourses. With regard to the US National Research Council, the four principles identified by respondents directly relate to the need to 'get the right participation' (Stern & Fineberg, 1996). Similarities exist around the notions that the PRA process should: be inclusive of and represent the full range of perspectives held by participants and specialists (relates to respondents' second principle); and synthesise knowledge and understanding relating to the decision through negotiating the limitations, uncertainties and assumptions in expert and lay knowledge (relates to respondents first and second principles).

Box 6.1. A summary Stage 1 and 2 respondents' principles of effective PRA practice.

In *the analytic-deliberative process* citizens/stakeholders should be actively engaged:

- as early as possible in the framing/scoping stage to define the problem, policy options and criteria of acceptability (1)
- in the framing stage to shape and guide scientific analysis conducted in further stages of assessing and evaluation (2)
- in assessing environmental risks and evaluating environmental risk management options in situations where they demand to do so or where science supporting the decision process is particularly contentious or uncertain (3)

Science/analysis relating to the PRA process should:

- support deliberation and be accessible, relevant, and useable to participants within the process (4).
- respond to the needs, issues and concerns expressed by participants in an iterative way (5).
- be transparent to participants within the process and make underlying uncertainties and assumptions explicit (6).

In relation to *access to information and specialist expertise*:

- information provided should be appropriate, meaningful and understandable from the perspective of those participating (7).
- information provided within the process should faithfully represent the range/diversity of views that exist on the issue being considered (8).
- where appropriate process experts should assist specialist experts in developing their capacity and ability to effectively communicate with participants deliberative fora (9).
- information provided within the PRA process should be responsive to the needs of participants (10).
- participants within the process should have access to specialist expertise and have control over who provides this assistance (11).

Deliberation conducted within the PRA process should:

- ensure a highly interactive and critical relationship between participants and specialists (12).
- emphasise diversity and difference through representing alternative viewpoints, exploring uncertainties and exposing underlying assumptions (13).
- allow enough time to for participants to become informed and develop a competent understandings (14).
- ensure that those facilitating/mediating deliberative processes have adequate substantive understanding of the issues being discussed while remaining independent and impartial as to the outcomes of the process (15).

In summary then, the analysis presented so far in this Chapter has shown a high level of consensus between most interview respondents' perspectives on effective participatory risk appraisal, with small areas of difference existing around the themes of deliberation and the overall shape of the PRA process. This indicates that beliefs of the epistemic community in relation to effective participatory risk appraisal are broadly consensual. The other key insight emerging so far is the consistency between respondents' beliefs of effective PRA practice and those developed in the literature to underpin a democratic/contextual mode of environmental risk decision-making. A summary of the fifteen principles around which shared understandings exist between interview respondents is given in Box 6.1. As has been noted throughout this section, these overlap significantly with criteria of competent participation developed by Webler (1995) (see Box 2.1, Chapter 2) and effective PRA practice developed by the US National Research Council (Stern & Fineberg, 1996) (see Box 2.3, Chapter 2).

6.2 MRWS Workshop participants' perspectives on effective practice

This Section provides further insight into the epistemic community's beliefs of effective PRA through briefly reflecting on the results of community members' deliberations in the *Managing Radioactive Waste Safely* (MRWS) Participatory Methods Workshop held in Manchester, 10-11 March 2003. The objective of the Participatory Methods Workshop was to "bring together process experts and participatory practitioners from within and beyond the area of radioactive waste, along with other interested and affected parties, to consider how public and stakeholder engagement can best support the development of policy during the policy options review stage of the MRWS process and provide advice to the new Committee on Radioactive Waste Management (CoRWM) in the form of a report" (Chilvers *et al.* 2003a: 16).

The MRWS workshop included the same actor types as Stage 1 and 2 interviews, while the 43 Workshop participants (See Appendix 5 for a list of participants) included 7 respondents from in-depth interviews and 25 actors identified in the network mapping exercise presented in Chapter 4. In the workshop, participants were invited to discuss how citizens and stakeholders could be most effectively engaged in a national level, radioactive waste management, participatory appraisal process. The second of these points is particularly important. Participants' discussion centred on how citizens and stakeholders should be engaged in the policy options review stage of the MRWS process. The process framework for this policy options review, around which the workshop discussion was framed, bears a close resemblance to the ideal type PRA model outlined in Chapter 2. The framework outlined by Government, as shown in Box 6.2, involved a *framing/scoping* phase (define the waste inventory, scope radioactive waste management options and assessment criteria); an *assessing* phase (conduct options assessment); and a *decision* phase where final recommendations are made on the option(s) to be used for the long-term management of the UK's radioactive waste.

Box 6.2. The three phase 'policy options review' stage of the *Managing Radioactive Waste Safely* process as outlined by Government (from Chilvers *et al.* 2003b: 4).

Phase 1: Framing the review, through engaging the public and stakeholder groups in:

- defining the inventory of wastes to be managed;
- developing an appropriate set of criteria against which all potential waste management options should be assessed;
- identifying the range of options available for the long-term management of the wastes;
- identifying as early as possible the management options which have no realistic prospect of being implemented in the reasonably foreseeable future, so as to focus assessment on those that do.

Phase 2: Options assessment, through engaging the public and stakeholder groups in:

- deciding how the remaining waste options should be assessed;
- arranging for the assembly of supporting information necessary for the assessment (e.g. research, reviews, "expert" events and inputs);
- carrying out an initial draft assessment;
- compiling a final options assessment report

Phase 3: Recommendations to Ministers, where CoRWM will draw on the final option assessment report to produce recommendations on:

- the option(s) to be used for the long-term management of the UK's radioactive waste;
- any views regarding implementation of the recommended policy.

Workshop discussion centred on effective citizen and stakeholder engagement in the MRWS options assessment more generally, rather than specifically focusing on questions of competence as was the case in Stage 1 and 2 interviews. Despite this, two aspects of the workshop results offer insights into epistemic community beliefs of effective PRA and will be considered in turn in the following discussion. These are:

1. criteria developed by workshop participants to define the effectiveness of citizen and stakeholder engagement in the MRWS policy options assessment process;
2. engagement programme designs developed by three working groups that provide a vision of how citizens and stakeholders should be engaged in the MRWS policy options assessment process.

Eight overall effectiveness criteria developed by workshop participants are shown in Box 6.3. They were derived through participants working in small groups to develop a total of 193 sub-criteria before collectively merging sub-criteria and agreeing on eight criteria. As noted above, in considering effectiveness participants did not specifically focus on competence. The criteria listed in Box 6.3 therefore represent principles of effective participation more generally. It appears significant that a high level of consistency exists between these general principles suggested by workshop participants, the generic principles suggested by Stage 1 and 2 interview respondents (as stated in Section 6.1), and those identified in a review of the UK practitioner literature (see Box 2.2, Chapter 2). A comparison between interview respondents and workshop participants shows that they independently identified five of the same criteria (*i.e. representativeness, inclusive, clarity, transparency,* and *learning*). The high level of similarity between criteria provides further evidence to support the assertion that there is broad agreement and a high level of shared understanding between actors within the epistemic community on generic principles (notions of validity) that define effective participation. The significance of this is supported by the fact that 6 of the 8 criteria developed by workshop participants match those identified in the review of the UK practitioner literature (i.e. *clarity, representativeness, inclusivity, transparency, learning, efficiency*).

Although the eight criteria developed by workshop participants did not focus on the integration of deliberation and analysis, more detailed aspects of competence are inherently related to these wider principles. For example, the criteria of openness and transparency identified by participants (see Box 6.3) includes the need to provide participants with sufficient access to balanced information, knowledge and expertise (this relates to the theme of access to information and expertise, Section 6.1.3). In addition, the learning criterion emphasises the need to build the capacity of people to take part in the process, as well as forming constructive and interactive relationships between participants (this relates to the theme of deliberation, Section 6.1.4). A brief summary of the 193 sub-criteria developed in small groups is provided in Chilvers *et al.* (2003a).

Box 6.3. Criteria developed by workshop participants to define the effectiveness of citizen and stakeholder engagement in the MRWS policy options assessment process (adapted from Chilvers *et al.* 2003a: 20-25)

- *Representativeness*. The engagement process should include a representative section of the public and stakeholders and promote integration between them.
- *Inclusivity.* The engagement process should represent the public and stakeholder spectrum and account for non-participants (including future generations).
- *Clarity.* The engagement process should provide clarity in terms of its scope, objectives, boundaries, decision points, outputs and underlying principles.
- *Legitimacy.* The engagement process should be legitimate, credible and accountable; influence decision-making; and demonstrate how views are taken into account.
- *Openness & Transparency.* The engagement process be open, transparent, and provide sufficient access to balanced information, knowledge and expertise.
- *Reflexivity & Adaptability.* The engagement process should be flexible, appropriate and adaptive to participants' needs and unforeseen consequences.
- *Learning*. The engagement process should provide learning opportunities for all participants; enable constructive deliberation and understanding between them; and enhance institutional learning.
- *Efficiency.* The engagement process should be efficient in its use of resources; be realistic and enhance co-ordination between different process elements.

The derivation of these criteria was not recorded in sufficient depth within the workshop process to allow further formal analysis of workshop participants' views on competence. A closer inspection of the range of sub-criteria suggested by respondents indicates that some directly relate to ideas of competence including the need: for information provision to be relevant, accessible, balanced, clear and digestible; to allow participants the opportunity to identify information needs and have access to specialist and lay expertise; and for analysis and expertise to enable rather than constrain the deliberative process. It appears that, even though this was not the focus of their discussions, ideas of competence were deemed to be important by workshop participants. The nature of the data collected in the workshop, however, does not allow a formal comparison to be made with the principles of effective PRA identified from Stage 1 and 2 interviews in Section 6.1.

Engagement programme designs developed by the MRWS workshop participants allow a closer comparison with the analysis of Stage 1 and 2 interviews. In developing a vision of how citizens and stakeholders should be engaged in the MRWS policy options assessment process (see Box 6.2), workshop participants considered the extent and nature of participant engagement in the framing and assessing/evaluation stages of a PRA process. It is not the intention here to describe the three engagement programme designs developed by the three working groups in any detail (see Chilvers *et al.* 2003a). The emphasis is on identifying principles suggested by workshop participants on how the overall PRA process should be shaped. It is important to note that each of the three working groups had to adhere to budgetary constraints which means that their programme designs do not represent ideal visions of citizen and stakeholder engagement at different stages of the PRA process. In addition, these budgetary constraints were different for each of the three working groups. Although this affected the specific engagement techniques used in each programme design, the general principles emerging from participants in the three working groups about how PRA process should be shaped were similar.

Once again, in terms of the overall shape of the PRA process, all workshop participants stressed the importance of involving citizens and stakeholders early on, and throughout the framing/scoping stage. In the framing phase of the MRWS policy options assessment (see Box 6.2), the programme designs of all three working groups emphasised the need for high levels of citizen and stakeholder engagement through deliberation and dialogue in defining the wastes to be managed, defining radioactive waste management options to be considered, and the criteria by which to assess them. The level of importance placed on broad involvement in framing/scoping by participants was indicated by the feeling of all three working groups that there should be a pre-framing stage ('step 0') to involve citizens and stakeholders prior to the actual framing phase of the framework proposed by Government (Phase 1, Box 6.2). Participants argued that this was important in order to ensure that feelings, understandings, and concerns of citizens and stakeholders are adequately incorporated into defining the problem and questions to be addressed in the MRWS decision process before it got underway. Interestingly, although all groups expressed a need for such pre-framing, only one of the working groups managed effectively to incorporate it into their programme design.

Further indication of the importance of framing was the view of most workshop participants that the MRWS policy options assessment should make explicit efforts to explore wider framings that might be considered outside the scope of the process (e.g. the link between radioactive waste management and the future of nuclear power, or the exclusion of certain waste types from the decision process). Participants felt that failure to comprehensively explore and respond to citizen and stakeholder concerns about these and other issues early on in the process would undermine its effectiveness in the long term.

Compared to the views of Stage 1 and 2 interview respondents (Section 6.1.1), there was a higher degree of consensus between workshop participants of the need to involve stakeholders *and citizens* in the assessing and evaluation stages of participatory risk appraisal processes. All three programme designs developed by working groups emphasised the need for citizens (as well as stakeholders) to be actively engaged in assessing radioactive waste management options against criteria in Phase 2 of the MRWS policy options assessment (see Box 6.2). They saw the need for this to be facilitated through various deliberative processes such as interactive workshops (with citizens, stakeholders and specialists) and citizens' panels through to longer-term engagement over six months that involves citizens in a decision analysis process. Working groups also saw a role for citizens in contributing to the choice of assessment methodology and defining the information needed to conduct options assessment. So although it appears that interview respondents (Section 6.1.1) and workshop participants agree on how the framing stage of the PRA process should be shaped, there is less convergence between them on the role of broad deliberation in assessing/evaluation. Not all interviewees agree that citizens should play an active role in the assessing and evaluation stages, whereas in the specific context of the UK Government's MRWS policy options assessment process there is a high degree of consensus between workshop participants that they do.

One final observation on the beliefs of workshop participants regarding the overall shape of the PRA process relates to their criticism of the Government's proposed framework for the options assessment process (Box 6.2) for being too linear and sequential. Participants advised that the process should be more iterative in nature, both in terms of iterations between the different Phases and Steps of the framework proposed by Government, and integration and feedback between deliberation and analysis conducted within the MRWS process. Workshop participants' beliefs about the desired nature of the PRA process significantly converge with the ideal type model previously discussed.

6.3 Conclusions

The analysis presented in this Chapter has shown that shared understanding in relation to effective participatory risk appraisal exists within the epistemic community. The analysis confirms initial views of interviewees, presented in Chapter 4, that there is a very high degree of consensus within the community about generic principles that define effective participation. Although not subject to in-depth analysis, it has been shown that there is a high level of similarity between generic criteria suggested by Stage 1 and Stage 2 interviewees, and those suggested by participants in the MRWS workshop. The significance of this is further supported by the convergence between both of these sets of generic principles and those identified in a review of the UK practitioner literature in Chapter 2.

The focus of analysis throughout this Chapter, however, has been on community beliefs about effective participatory risk appraisal more specifically. Indications are that shared understandings between actors are perhaps not as well developed in relation to effective PRA. But the beliefs of the epistemic community are broadly consensual in relation to certain key principles. General consensus has been shown to exist within the community around two of the four themes of effective PRA considered in analysis, namely the *nature and role of science/analysis within the process*, and *access to information and expertise*. In relation to the other two themes although the beliefs of most interview respondents are consensual, areas of difference appear to exist within the community around the themes of *deliberation* and the *overall shape of the PRA process*. With regard to the latter theme, while there is a very high level of consensus that effective PRA depends on broadly based citizen and stakeholder involvement early on in the framing/scoping stage, the area of difference in relation to this theme lies with a significant minority of interviewees who saw the assessing and evaluation stages as the exclusive domain of specialist experts.

So even though areas of difference are shown to exist within the community, the analysis throughout this Chapter indicates that shared understandings are developing around specific principles of effective PRA. This is intriguing given the findings of Chapter 4, which showed the highly fragmented epistemic community not to be learning as effectively as it might. The perceptions of individual respondents, noted in Chapter 4 and at the beginning of this Chapter, are that principles (shared notions of validity) of effective participatory risk appraisal are not well developed between community members. At the beginning of the present Chapter, we also saw how difficult most respondents find the actual practice of integrating science and participation. Through drawing together the experiences and beliefs of actors within the community, this Chapter has shown that respondents appear to know more about effective PRA than they actually think they do. It also seems that there is a higher degree of consensus around certain key principles than respondents think there is. Although differences exist, the principled beliefs of the community are similar and, in some cases, shared. This possibility was noted in Chapter 4 where two different actors in the area of radioactive waste were conscious that they belonged to different networks and subscribed to different practices but felt they shared the same overall beliefs. Despite learning by doing PRA, often in isolation and using different methods or practices, members of the community are independently developing principled beliefs that are similar. This learning has yet to be formalised, however, and is not currently visible across the community.

The other key insight emerging from this Chapter is the consistency between the fifteen principles of effective PRA around which shared understanding exists between respondents and those that have been developed in the literature. Principles relating to all four themes coincide with criteria of effective participatory risk appraisal developed by the US National Research Council in their *Understanding Risk* Report. In addition, the themes of *deliberation* and *access to information and specialist expertise* contain principles that closely relate to criteria of competent participation developed by Webler (1995). It appears, then, that the content of the learning that has occurred within the community, which has happened over a relatively short space of time in the case of radioactive waste for instance, has been appropriated to the specific challenges of complex and uncertain environmental risk decision contexts.

The content of this learning is more closely associated with a democratic, as opposed to a technocratic, mode of decision-making that emphasises a constructivist or socio-cultural view of risk and science. Respondents' beliefs about the overall shape of the analytic-deliberative process are closely aligned with the ideal type model of PRA. They emphasise the need to open up the framing and (to an extent) the assessing/evaluation stages of technical policy process to broadly based deliberation. They view science/analysis as being accessible, relevant, responsive, and open about its inherent social assumptions and uncertainties. In terms of information provision respondents beliefs are based on an interactive model of PUS and emphasise deliberative risk communication. Finally, the principles identified by respondents in relation to deliberation emphasise the need to ensure an equitable interactive relationship between citizens and experts, uphold cultural rationality, and prevent technical expertise from being reified.

7 Participatory environmental risk policy-making in an age of uncertainty: concluding thoughts

This thesis has sought to develop perspectives on the democratisation of science in the UK through the eyes of actors in networks building up around participatory risk appraisal practice. In following actors through these networks the idea of epistemic communities has remained central throughout, providing the link between theoretical arguments developed in Chapters 2 and 3 and the analysis of what counts as effective democratisation in this context (Chapter 6), the extent to which science is being democratised within the area of radioactive waste (Chapter 5), and the potentials that currently exist for such democratisation within the community (Chapter 4).

This final Chapter aims to synthesise emerging findings from across the thesis to reflect on the three research themes and questions outlined in Chapter 1 and offer concluding perspectives. The first part reflects on methodological themes emerging from the thesis, in particular the specific challenges that have arisen through closely studying a network that is currently emerging and some of the possible benefits of this. We then turn to the epistemic community itself drawing together final conclusions on its nature and character from across the three empirical chapters and consider how it might develop in the future. Finally, perspectives on the democratisation of science in the UK are considered through reflecting on participatory risk appraisal practice. This reflection considers the extent to which science has been democratised in terms of current practice in the area of radioactive waste, before considering community beliefs on effective participatory risk appraisal and prospects for future practice.

7.1 On studying epistemic communities in the making

A core part of the methodological approach employed in thesis (outlined in Chapter 3) has centred on the concept of epistemic communities. The use of these ideas appears to have departed from the ways that they have been employed by others, particularly the early work of Haas and others (e.g. Haas, 1989, 1990, 1992; Adler, 1992; Adler & Haas, 1992; Sebenius, 1992). The main distinction is that while most studies of epistemic communities are based on longitudinal or historical approaches that analyse networks 'after the event', the focus of this thesis has been on contemporary networks that are currently emerging. In studying networks that are already made, the choice of case study or research location can be based on the ending of a particular story that is already known. The researcher can perhaps use what is known in this sense and fit it to one's stated theoretical or methodological framework. In addition the network is bounded, an artefact, and all the relevant actors are known. Early studies on epistemic communities have relied heavily on documentary or historical evidence, and have supplemented this with interview techniques.

As outlined in Chapter 3, the study of epistemic communities 'in the making' depends on alternative methodological resources. Importantly the nature, extent and membership of the network is not known *a priori*. The methodological approach used in this thesis has therefore drawn on techniques from social network analysis (SNA) (Scott, 2000) to support established methods for studying epistemic communities. SNA has assisted in mapping the UK PRA network, and identifying possible interviewees through a snowballing process. The other main distinction form established approaches to studying epistemic communities is that, in this thesis, documentary evidence has only played a supporting role (in Chapter 5), with in-depth interviews being the main method of data collection.

Studying contemporary epistemic communities that are currently evolving has raised two methodological issues that it is important to reflect on at this stage. The first is my positionality in relation to the networks that I have studied. Rather than studying networks 'out there' from which the researcher is removed, this thesis has been about studying networks that are 'here and now'. It appears that it would be difficult to study any emergent network using a method such as in-depth interviews and remain entirely independent of, and 'objective' in relation to, the subjects being studied. In the specific context of this thesis, however, I have been, in many senses, actually part of the network that I am studying. As has been shown through network analysis in

Chapter 4, my place of work (The Environment and Society Research Unit) and colleagues within it, are key actors within the UK PRA network and are identified as members of the epistemic community. The network can be seen to run straight through the offices at University College London. It has to be acknowledged then that this will impact on my view of the network, my positionality and independence in relation to it, and ultimately my perspective on the phenomena being studied. It might be expected that being part of ESRU affected in-depth interviews and the mapping exercise carried out, although there was no evidence of this. In fact being part of the network appeared to have a positive effect in terms of gaining access to elites who, given the highly competitive nature of the network (illustrated in Chapter 4), have precious little time to spare.

The second important methodological issue that has emerged through studying an emerging network, which directly relates to my positionality, is that the research approach adopted has involved working closely with policy professionals (elites) in an interactive and action-oriented way. Whether or not I was part of the network at the start by virtue of my association with ESRU, it is clear that I have become part of the network as my research progressed. This is partly because of the practical relevance of the research conducted to those that I was studying. It is also because through the course of the research, and independently of it, I have taken an active role in the field that I am studying and contributed to practice through work carried out with colleagues at ESRU. Obviously the two points are not unrelated but it is the former that is most important in terms of methodology. The action-oriented nature of the work means that I have actually contributed to the epistemic community and interview respondents in various ways. One way has been through in-depth interviews, and contact maintained with certain respondents after they ended. The other, which clearly illustrated the action oriented nature if the thesis, is the association build up with Defra that resulted from a Stage 2 interview. These possible contributions to, and impacts on, the community will be considered in more depth below.

In reflecting on the methodological issues noted above, it appears that studying networks in the making, in such an action-oriented way, is very much a double-edged sword. It has brought with it number of challenges and difficulties as well as benefits and opportunities, both during fieldwork and analysis. Each will be taken in turn in the present discussion. At a more general level, however, it is clear that the lack of historical perspective when studying emergent networks means that the thesis only really offers a snap shot of the network and practice at the time of interview, and arguably limits the power of the analysis to make definitive conclusions. On the other hand, as implied above, interaction with the emerging network increases the practical relevance of the conclusions in actually contributing to the development of the community and PRA practice in the UK.

With regard to methodological difficulties and challenges, it is important to note the insight from Chapter 5 that has shown, in the area of radioactive waste at least, PRA practice and networks emerging around it to be developing very rapidly. This poses obvious research challenges and has demanded a research approach that is agnostic and iterative. As described in Chapter 3, prior to this thesis the area of participatory risk appraisal in the UK had not been subject to previous study and was scarcely documented. The network approach employed, then, was essential in gaining an overview of the area in Stage 1 of the research. As described in Chapter 3, the three-stage research approach then proceeded in an iterative and reflexive way with analysis after each stage allowing research subjects and locations to be found in a rigorous way that was both empirically and theoretically robust. This was an emergent process and although further actors were identified that could have been interviewed, all interview respondents were identified in the network mapping exercise and most were seen to be key actors. No further details will be provided here for reasons of anonymity, which brings us on to one of the major challenges of the research.

As shown in Chapter 4, the core members of the epistemic community form a relatively small group, with a broader range of actors around this group who were not deemed to have the competence or expertise in PRA. The relatively small size of the network coupled with the nature of the network mapping exercise used in interview has raised serious issues of confidentiality and research ethics which I have taken very seriously. In mapping the network respondents talked, often at a very personal level, about other actors within the network and about their relationships with them as competitors, colleagues, even friends. As noted in Chapter 3 some respondents expressed concern when conducting the exercise that they might be saying things that would offend people or divulging too much. Although not all respondents demanded anonymity some did. In presenting the analysis significant consideration has been made, therefore, not to expose the identity of respondents. This has created difficulties in explaining and presenting the analysis and arguably limits the practical relevance of its insights.

In following actors through networks building up around PRA in the UK there is considerable evidence that I have contributed to the learning that is occurring within it. This is perhaps the major benefit and opportunity offered by the methodological approach taken. Considerable evidence of my contribution to learning in the network is provided through in-depth interviews. An element of this immediately apparent in interview was that by providing space and time for respondents to reflect on practice I had a learning effect. Some respondents actually directly noted the value of this stating that they rarely have time to reflect on their work on a day to day basis. The interview, then, represented an important learning space in itself given the highly competitive nature of the area. Further evidence of this was indicated through interactions between myself and respondents within the interview. Parts of the interview involved open discussion within which ideas about PRA were negotiated through this interaction. This was clearly a mutual learning experience, with a number of respondents expressing that they realised things in discussion that they had not considered before.

An important example of my contribution to learning within the community is provided through a Stage 2 interview conducted with a respondent from Defra. Through recognising the relevance of the discussion to ongoing work at Defra the respondent asked about initial results emerging from Stage 1 and 2 of the research immediately after the interview and sought advice on the MRWS policy process within which they were involved. As explained in Chapter 3, this lead to myself and two colleagues from ESRU undertaking the MRWS Participatory Methods Workshop for Defra (see Burgess *et al.* 2003; Chilvers *et al.* 2003a,b). The initial discussion after the interview meant that ideas coming out of research Stages 1 and 2 fed into and partly framed the workshop concept. As noted in Chapter 3, and reflected on in

Chapter 6, the workshop drew a number of members of the epistemic community together in a learning process to discuss effective practice. The interview and subsequent workshop provides clear evidence that through working in an action oriented way I have contributed to learning within the PRA network and the policy-making process at Defra.

A final point in reflecting on the methodology adopted in the thesis is that many respondents, as with Defra in Stage 2, were intrigued to know what I had found and asked about initial findings in interviews. Most requested feedback of the final findings, some suggesting that the results of the thesis should be published in a practical way that is relevant to practitioners and decision-makers. With these methodological reflections in mind we now turn to the epistemic community itself drawing together final conclusions on its nature and character from across the three empirical chapters and considering how it might develop in the future.

7.2 The PRA epistemic community in the UK: present and future

Reflecting on the findings across the three empirical Chapters allows a more comprehensive consideration of the question posed in Chapter 1, and addressed in Chapter 4, of the extent to which the actor-network developing around PRA in the UK represents an epistemic community? This thesis has provided conclusive evidence that it does represent an epistemic community that is in the early stages of development. As we saw in Chapter 4, the membership of the community is made up of a core group of process experts (researchers and participatory practitioners) that are operating across a range of environmental risk issue-areas, including radioactive waste, municipal waste, GMOs, and chemicals. This core group is highly visible, or actively operating, across these issue-areas, potentially enhancing the diffusion of ideas, knowledge and practices between them. A sign of the community's relative immaturity is its highly fragmented nature, with members being divided between tightly defined groupings based around actor types (e.g. researchers and practitioners), disciplines/professions, types of participatory practice, organisations, and sectors or issue-areas.

The tracing of community evolution in the area of radioactive waste in Chapter 5 provided further confirmation that the community exists and is at an early stage of development. It showed that the community has evolved rapidly within the area over the past half decade and provided considerable evidence that this was induced by the shock of the RCF inquiry, which prompted key decision-makers to turn to community members for help and assistance. In comparison to Adler and Haas's (1992) model of community development (explained in Chapter 3) the epistemic community was seen to be longer standing and most developed around the private sector decision-making institutions of Nirex (stage 2) and BNFL (stage 1-2), while the network of community actors forming around Defra (stage 1) was more inclusive though less developed. The analysis confirmed Chapter 4 findings in that decision makers have not yet developed competence in PRA, with the exception of Nirex where key actors have gained expertise and are actively promoting the community's beliefs.

So although below stage 3 in all cases, Chapter 5 provided clear proof of community development. This included significant evidence that members of the epistemic community are influencing the beliefs of all three decision-making institutions, and enhancing scientific reflexivity, in geographically localised and institutionally specific instances. Final confirmation that the PRA network represents an epistemic community had been provided in Chapter 6 through showing understanding of effective participatory practice (*i.e.* a shared principled beliefs and notions of validity) to be broadly shared between actors within the network. As explained in Chapter 3, the possession of such shared understanding is a defining characteristic of epistemic communities (Haas, 1992).

As noted in the conclusion to Chapter 6, this existence of shared understandings about effective practice within the community is very intriguing given the findings of Chapter 4 in relation to the other main research question in Research Theme 1 – *i.e.* what is the nature and effectiveness of social learning between actors within the community? In directly answering this question Chapter 4 provided conclusive evidence that although there is evidence of learning within the epistemic community it is currently highly ineffective. It showed that inherent fragmentation and intense competition between different actor-groupings to be a fundamental constraint on learning which is breaking down the learning cycle across the wider community. It appears that the existing nature of social learning is unable to overcome these constraints. The main type of learning currently occurring is localised, informal, and anecdotal, while formal learning remains sporadic, with the general lack of mechanisms to facilitate learning and systematically evaluate current practice. As a result knowledge is rarely formalised and communicated beyond isolated groupings and made accessible to the wider community. A main recommendation of Chapter 4, then, was that unless the epistemic community makes concerted efforts to become a learning community its potential to democratise science in the UK will remain limited.

The finding in Chapter 6 that, although there are differences, shared understandings are actually developing around specific principles of effective PRA, appears to go against actors' own perceptions (shown in Chapters 4 and 6) that principles are not well developed and that practice is inherently difficult. Through drawing together the experiences and beliefs from across fragmented groupings the analysis in Chapter 6 showed that community members are actually more consensual than they think. Given the nature of learning shown in Chapter 4 it appears that actors are independently developing principled beliefs, which are quite similar, through informal and experiential learning processes based around isolated instances of practice. In a sense then the analysis in Chapter 6 formalised and drew together these isolated cases of learning, but this is not currently being carried out within the community itself, meaning such learning is not visible to actors within it.

In one sense, then, a key insight of Chapter 4 that the lack of shared principles (notions of validity) within the community is limiting its ability to influence policy processes appears to be contradicted by the finding of Chapter 6 that shared principles do, to some extent, exist. However, the ability of the community to influence policy processes is still compromised as they are not acting upon their shared principles in a coherent and coordinated way. The ideas and practices of the community remain competing and divided. As Haas and Adler (1992) note, without the communication and socialisation processes that help the community promote new ideas, policy innovations remain confined to fragmented groupings thus undermining its structural effects in influencing policy. The fact that understandings are shared but the epistemic community has not collectively realised this yet makes the conclusions of Chapter 4 all the more apparent. Its potential to democratise science in contentious and uncertain environmental risk policy processes in the UK depend on it becoming a more effective learning community.

Chapter 4 provided two key recommendations on how such a learning community could be brought about. The first, centred on the various groupings that exist within the community forging collaborative working relationships and learning together through practice. The second, related to developing mechanisms to capture and formalise experiences of PRA practice and share this knowledge within the wider community. A key component of this would have to be systematic evaluations of existing participatory risk appraisal processes based on agreed evaluative criteria. Given the findings of Chapter 6 it appears that the principles that are emerging within the community could be further developed and used for this purpose. Beyond this it would appear that a more coordinated action that promotes learning across the community is required. As noted in Chapter 4 a number of respondents mentioned the possibility of a professional institute or body that could serve such a function. Although this goes against the ethos of participatory ways of working which emphasises flexibility and creativity, most respondents viewed such a development as an inevitable possibility as the PRA field develops. So too does Adler and Haas' (1992) model of epistemic community development, with the setting up of an institution such as this occurring as the community moves into Stage 3.

In reflecting on the findings of the thesis it would appear that one further recommendation is necessary. This takes the form of further action research that would attempt to foster the development of the epistemic community into a more effective learning community. One of the key roles of the research would be to facilitate networking and learning between actors across currently fragmented groupings within the community. In addition to developing and managing remote means of communication and exchange, and developing mechanisms to formalise learning within the community, it would depend on the creation of spaces where community actors can come together in more interactive learning processes. These spaces would allow community members to negotiate ideas, beliefs and practices, and further develop shared understandings of effective participatory risk appraisal. The *Managing Radioactive Waste Safely* Participatory Methods Workshop, outlined in Chapter 3 and drawn on in Chapter 6, offers a possible model for such a process.

7.3 The democratisation of science in the UK: reflections on participatory risk appraisal practice

This final section offers concluding perspectives on the democratisation of science in the UK through drawing together the main findings on participatory risk appraisal practice from across the thesis. First we reflect on the analysis of current practice in the area of radioactive waste which provides an insight into the extent to which science is being democratised, before considering the reasons underlying the apparent 'gap' that exists between actual practice within the area and community beliefs of effective practice. To end we consider the importance of community beliefs about effective participatory risk appraisal and prospects for future practice.

The analysis of current participatory risk appraisal practice in the area of radioactive waste in Chapter 5 has shown the epistemic community to have brought about a rapid shift away from a technocratic mode of decision-making prior to 1997, but that current practice is falling short of the ideal type model of PRA. The key indication that science is being democratised within the area was the evidence across six cases that citizens and stakeholders are being involved to a significant degree in processes of extended peer (p)review and possibly contributing extended facts in the framing stage of decision-making processes. Their active role in defining the issues to be addressed and discussing acceptability criteria was shown to be expanding the range of perspectives and knowledges that frame policy processes and, in specific instances, shape and influence scientific assessment processes. This represents a significant shift towards a more democratic mode of decision-making.

The analysis showed, however, the degree of democratisation to be currently limited by the complete exclusion of citizens from the assessing and evaluation stages of decision-making processes, thus preventing the 'active' incorporation of lay/local knowledge and extended facts, along with the negotiation of scientific uncertainties and indeterminacies, at these stages of the process. The only existing processes that allow participation in assessing and evaluation have exclusively involved professional stakeholders, indicating that the privileging the specialist knowledges over lay/experiential knowledges of citizens remains embedded in certain aspects of decision-making on radioactive waste. So although there has been a shift, the analysis of current practice provided in Chapter 5 suggests that there is still a way to go before science can be considered democratised in the area of radioactive waste in the UK.

In an attempt to put the analysis offered in Chapter 5 into historical context it is useful to reflect on two perspectives from the literature, made just under a decade ago, which considered the extent to which science was being democratised in the UK at the time. In a brief review of the literature and documentary evidence, mainly relating to public inquiries and consultation processes, Irwin (1995: 65, 71-72) provides the following perspective on the nature of practice in Britain,

> "[D]espite the presentation of 'participatory' modes as an alternative means of achieving policy legitimation, in practice technical advice has been at the very centre of this approach to environmental decision-making... In Britain only a limited form of representation has occurred... these 'participatory' modes have been highly reliant on technical expertise in the identification, construction and framing of issues".

In other words, Irwin argues, practice at the time paid little consideration to the expertise and understanding of citizens. A year later, in a comprehensive review of the academic literature as well as policy documents that made reference to, but was not solely focused on, the UK, Eden (1996: 195) states,

> "Environmental science is clearly being expanded, involving an 'extended peer community', but there are still many left outside that expansion. Inclusion

> requires some level of technical competence which may be complemented by 'extended facts' but not replaced by them. We have not yet seen the full democratisation of science – there are still privileged groups and excluded groups".

For Eden, the peer community is not extended beyond experts, with extended facts being limited to rational or counter-scientific contributions. Those left outside, the excluded groups, are citizens and their extended facts that are non-scientific. The dependence on scientific construction militates against the legitimate inclusion of lay/experiential knowledges.

Although the analysis of current practice in Chapter 5 described above cannot be taken to represent UK practice, nor necessarily can both of these accounts, a comparison clearly shows that that practice has moved on considerably over the past decade, and a fuller democratisation of science has occurred. In relation to Irwin's account, the current situation in radioactive waste sees much less reliance on technical expertise in constructing and framing the issues, and considerably more attention paid to the representation and expertise of citizens in this stage of the policy process. Similarly with regard to Eden's account, the significant involvement of citizens in the framing of radioactive waste decisions has seen them brought in from outside the extended peer community, with the possible inclusion of their extended facts that are non-scientific and go beyond the rational or counter-scientific. Referring back to Chapter 2 (Section 2.1), and with specific regard to the involvement of citizens and local stakeholders in framing, it is clear that current practice of certain cases in radioactive waste management goes beyond Beck's (1992) rationalist account of scientific reflexivity and is more in line with Wynne's (1996a) account that emphasises the cultural truths of lay actors and their role in framing knowledge commitments. With regard to current participation the assessing and evaluation stages of radioactive waste decision processes, however, the existing situation is closer to Beck's (1992) analysis, and those of Eden and Irwin given above.

It seems then that, in terms of framing at least, significant advances in the democratisation of science have been made in the area of radioactive waste management. Given that the epistemic community has been shown to be active across issue-areas there is a distinct possibility that a similar shift has occurred in other areas of environmental risk decision-making in the UK. This, however, is beyond the scope of this thesis and will have to remain the subject of further study. In drawing conclusions on current practice in radioactive waste it is important to consider possible limitations of these findings. As noted in Chapter 5, caution is necessary when considering that the analysis actively sought to focus on innovative deliberative cases. The picture of current practice given in Chapter 5 is therefore somewhat distorted and should not be taken to be in any way representative of all practice within the area of radioactive waste. As the inclusion of the Magnox consultation in the analysis showed, practices characteristic of a technocratic mode are still prevalent within the area. Furthermore, the very nature of the methodology employed, which involved looking across multiple cases, means that examples of practice have not been assessed in-depth. It has only really considered indicators of democratisation based on the ideal type model of PRA. While respondents did provide evaluative perspectives on the mutual influence of analysis and deliberation, more detailed study would be required to further substantiate processes of social learning and performative aspects in relation to the cases considered. This would demand a systematic evaluation of the analytic-deliberative process and its outcomes, which attempts to capture the views of process participants in addition to professional actors. Finally, although attempts have been made to triangulate evidence in analysis, through the use of documentary evidence and drawing on perspectives from multiple respondents, the analysis of certain cases draws on a limited number of respondents (only one respondent discussed the ISOLUS case for instance).

Although Chapter 5 has shown PRA practice to have developed rapidly in the area of radioactive waste over the past half decade, a comparison with findings from Chapter 6 shows that current practice appears to be lagging behind the principled beliefs of actors within the epistemic community. This raises some important questions, most notably: what is holding back the translation of epistemic community beliefs into practice? First of all it is important to note the evidence provided in Chapter 5 that the epistemic community is having a significant influence on the beliefs and behaviours of decision-making institutions within the area, and have played a key role in initiating a shift away from the technocratic mode of operation that existed prior to 1997, including the rapid development of citizen and stakeholder engagement practice. In the case of Nirex, Chapter 5 has provided evidence that community members have engendered learning (about the legitimacy of citizen's lay/experiential knowledge) and enhanced scientific reflexivity (through changing its scientific concept for radioactive waste management from a closed repository to one that is monitored and retrievable in response to the NCCRW).

Chapter 5 provides clear evidence that the epistemic community has brought about the introduction of front-end framing practice. In terms of the early and active involvement of citizens in the framing stage current practice and community members' beliefs on effective practice are broadly in line. The main discrepancy centres on active citizen involvement in the assessing and evaluation stages. As noted above, Chapter 5 has shown that practice is currently privileging specialist knowledges and excluding citizen expertise in these stages. Contrary to this, Chapter 6 has provided evidence that the shared belief of most community members is that citizens should have a legitimate voice and actively contribute extended facts in the stages of assessing and evaluation. Most interview respondents and workshop participants deemed this to be a fundamental component of environmental risk decision-making under uncertainty. It appears in this instance, then, that the influence of community actors on decision-makers, and the adoption of certain aspects of PRA practice, is subject to a series of barriers and constraints.

As outlined in Chapter 2, the technocratic worldview poses a number of such constraints through privileging scientific rationality and assuming citizens to be ignorant or irrational, thus deligitimising lay/experiential knowledge. This limits citizen access to information and resources, and acts a fundamental barrier to their participation in science-intensive policy processes. This worldview can be seen to permeate the cultures, practices and decision-making procedures of institutions, and undermines their ability to learn and be reflexive in the face of mounting environmental risk problems (Wynne, 1992b,c). In Chapter 5 we saw how members of the epistemic community have built relationships with, and attempted to influence the technocratic beliefs of, decision-making institutions through processes of negotiation. It was shown that community actors have been largely successful in enrolling certain key actors within decision-making institutions in radioactive waste and imposing definitions of the problem and beliefs based on their democratic/socio-cultural worldview. Chapter 5 indicated, however, that these negotiations have not yet succeeded in diffusing such beliefs throughout these institutions and parts of the wider nuclear industry, areas of which were seen to remain wedded to a technocratic worldview.

The barriers facing members of the epistemic community in these negotiations have been well documented in the literature. Actors holding a technocratic worldview put up significant resistance through alternately viewing participation as a waste of precious resources (in terms of cost, time, effort, and expertise) that takes away their control over policy processes and produces unpredictable outcomes (Burns and Ueberhorst, 1988; Stern & Fineberg, 1996; Petts, 1999). It is seen as a cause of unnecessary delay or disruption that increases rather than decreases conflict (Webler & Renn, 1995). Scientific experts believe participation is a threat to their identity and livelihood, while in public policy contexts elected officials often take the view that it is they who will ultimately be held accountable and therefore should not be forced to make a decision based on the recommendations of others (Petts & Leach, 2000). The fact that participation is not a legislative requirement in most environmental risk contexts can lead to a culture of minimum compliance within government and industry (Renn *et al.* 1995; Stern & Fineberg, 1996; Petts, 1999), while progress made in legislation on access to information is often undermined by a remaining culture of secrecy within industry (Petts & Leach, 2000).

The context of environmental risk and the nature of participatory risk appraisal poses a number of challenges and difficulties which may deter decision-makers from taking up such practices. As we have seen in Chapter 6, epistemic inequalities and structural differences in understanding between participants demand structured processes that occur over longer time scales and build the capacity of participants. Such processes tend to be very demanding, and depend on high levels of effort and resource, which can put people off undertaking them in the first place. As was shown to be the case in all three empirical Chapters, decision-making institutions often lack the necessary process expertise, science communication skills, or technical specialists in areas that allow them to respond to wider questions framed by participants (Stern & Fineberg, 1996). Analytic-deliberative practice can be hampered in certain environmental risk contexts simply because of the limited number of 'independent' specialists available, as was shown in Chapter 5 in relation to the ISOLUS case (see also Renn *et al.* 1993; Stern & Fineberg, 1996; Petts, 1997).

Viewed in the light of these seemingly impenetrable barriers to participation posed by the technocratic worldview, and the inherent practical challenges associated with participatory risk appraisal, the influence that the epistemic community has had in changing decision-making practices from a technocratic to a more democratic mode of operation appears considerable. It is unlikely that the degree of democratisation that Chapter 5 has shown in the area would have occurred without the shock of the RCF inquiry. It is clear, however, that in highly technical areas of the decision-making process, where environmental risks are assessed and evaluated, these barriers and (perhaps more importantly) challenges mean that citizens have as yet been excluded from these stages within the area of radioactive waste management in the UK.

The final aspect of participatory risk appraisal practice that it is important to reflect on in conclusion relates to research questions posed in Research Theme 3, which centred on the degree to which shared understanding of effective participatory risk appraisal is developing between actors within the epistemic community and whether principles can be identified from their grounded perspectives based on their own experiences?

Chapter 6 has provided highly conclusive evidence that shared understanding of effective participatory risk appraisal exists within the epistemic community. It has been argued that such consensual beliefs have developed on two levels. First, it was shown that there is a very high degree of consensus within the community around generic principles that define effective participation. This was confirmed by the high level of similarity between generic criteria suggested by interview respondents and workshop participants, and supported by the convergence between both of these sets of generic principles and those in the UK practitioner literature. Second, in relation to the main focus of analysis within Chapter 6 on community beliefs about effective participatory risk appraisal more specifically, it was shown that shared understandings between actors were less developed but broadly consensual in relation to certain key principles. These principles were based around four key themes of effective PRA. It was indicated that consensual beliefs exist within the community around two of these themes, namely the *nature and role of science/analysis within the process*, and *access to information and expertise*. It was shown that community beliefs around the other two themes of *deliberation* and the *overall shape of the PRA process* were broadly consensual, but that areas of difference did exist.

It is these latter principles that form the focus in reflecting on effective PRA practice. In total fifteen principles of effective PRA were identified in Chapter 6 (see Box 6.1), around which shared understanding exists. Not only were these principles shown to closely coincide with the main frameworks from the literature that have attempted to define criteria of effective participatory risk appraisal (Stern & Fineburg, 1996) and competent participation (Webler, 1995). It was also argued that all fifteen principles emphasised, either explicitly or implicitly, a socio-cultural or constructivist perspective on environmental knowledge. Principles relating to the overall shape of *the analytic-deliberative process* emphasised the need to open up the framing and assessing/evaluation stages of technical policy process to broadly based deliberation. In terms of *science/analysis* principles stressed the need for science to be accessible, relevant, responsive, and open about its inherent social assumptions and uncertainties. The five principles relating to *access to information and specialist expertise* were based on an interactive model of PUS and emphasised elements of deliberative risk communication. While the four principles relating to *deliberation* emphasised the need to ensure an equitable interactive relationship between citizens and experts, uphold cultural rationality, and prevent technical expertise from being reified.

This emphasis on a socio-cultural or constructivist perspective in emerging principles within the community has to be regarded as a highly encouraging finding. This is based on a belief that many existing participatory approaches haven't sufficiently considered constructivist perspectives and hold on to distinctly modernist assumptions, potentially reifying technical expertise. This is a perspective that resonates with Burgess *et al.*, who state that such tendencies have proven extremely difficult to overcome,

> "Despite their commitment to giving voice to the concerns of ordinary people, [many] case studies reveal how easy it is to assert the communicative styles of instrumental rationality of most experts and professionals even in... innovative [participatory] fora" (Burgess *et al.* 1998: 1448).

In complex and uncertain environmental risk decision contexts, characterised by highly technical framings where scientific discourses have traditionally dominated the agenda, there is a very real danger that participation simply upholds the deficiencies of the technocratic approach. It is all to easy in such contexts for participation to revert back to modernist dichotomies (such as fact/value, nature/culture, science/society) leading to the reification of instrumental forms of rationality and asymmetrical, unequal and separatist communicative relationships between citizens and experts. The mere presence of a participatory process does not automatically mean it is democratic, nor can it be assumed that knowledge transformations and social learning automatically occurs within participatory processes. A key recommendation, then, emerging from the principled beliefs of the epistemic community is that when engaging citizens and stakeholders in post-normal environmental risk contexts a number of specific measures have to be in place to guard against what could be termed 'the technocracy of participation'.

This recommendation converges with an increasing number of authors who argue that critical questions of knowledge in relation to participatory processes have received insufficient attention (e.g. Fischer, 1990, 2000; Limoges, 1993; Irwin, 1995; Charney, 2000). As Irwin (1995) states,

> "[Q]estions of 'expertise' and 'democracy' are not separate but interlinked. Any attempt at democratising the policy process which leaves concepts of 'knowledge' unchallenged will inevitably prove highly limited" (Irwin, 1995: 79).

A particularly important theme, relating to this need to focus on knowledge, that has emerged from the beliefs of the epistemic community is the idea of diversity or difference. This can be seen to be born out of the significant divergence (or incommensurability) that exists between people's epistemic (knowledge) and value (ethical) claims in post-normal decision contexts. The principles described in Chapter 6 that explicitly emphasise the importance of difference include those relating to: the need ensure range and diversity in information provision; the need to maintain a highly interactive communicative relationship that is critical; and the need to expose alternative views, assumptions and uncertainties. The over emphasis of consensus and fairness/equity in many existing participatory approaches, and the resultant need to ensure diversity and difference is also an emerging theme in the literature. Webler (1995) notes the overemphasis of consensual beliefs in Habermasian ideals of communicative rationality as a major reason for developing his evaluative framework for competence in participation. He notes the distinct need for competence in environmental decision-making where knowledge is routinely problematised. This theme has received comprehensive treatment more recently by Pellizzioni (2001, 2003) who questions the applicability of ideas of the 'best argument', promoted by consensual theorists such as Habermas, to post-normal decision contexts. As Pellizzioni (2003) notes,

> "Incommensurability often seems to be concealed under a problem of inequality of resources. Equalising them may entail denying incommensurability: for example, by translating discordant knowledge, concepts and expressions into dominant ones. Thus, the principle of equal stance is at odds with the acknowledgement of differences that cannot be settled. The quest for more equality may lead to a disregard for diversity, or vice versa" (Pellizzioni, 2003: 209).

It is clear that Pellizzioni's main argument here resonates very closely with the epistemic community's principles relating to difference. Far from overcoming the technocratic mode, an overemphasis on consensual deliberation might actually uphold modernist dichotomies rather than break them down. If consensus is pushed too strongly, it inhibits exploration of the underlying differences that exist, creating an illusion of mutual understanding that only benefits the powerful actors. But as shown in Chapter 6, some members of the epistemic community hold the belief that there is a need for collaborative and consensual processes that go beyond the problems of adversarial science and counter-expertise perpetuated by a technocratic approach to decision-making. With regard to this point the main recommendation emerging from the beliefs of the epistemic community, and implied by Pellizzioni, is that it is not a case of either consensus *or* difference. It seems that effective environmental risk decision-making under uncertainty depends on participatory processes which have the appropriate inclusion of consensual *and* divergent elements at different stages of the process. Given the predominance of consensual approaches to participation, however, there remains a pressing need to emphasise difference.

In reflecting on the epistemic community's beliefs of effective practice, and the fact that many existing participatory approaches do not sufficiently account for these beliefs, two key recommendations are emerging about PRA practice in post-normal environmental risk decision contexts. The first is that there appears to be an urgent need for systematic evaluation of analytic-deliberative practice to guard against 'the technocracy of participation'. Such evaluations should draw on criteria, such as the principles emerging within the community, and those proposed by Webler (1995) and Stern and Fineburg (1996), that are underpinned by socio-cultural or constructivist perspectives on knowledge. The second recommendation, which also draws on conclusions from Chapter 5, is the need to develop analytic-deliberative methodologies that take serious account of constructivist perspectives on knowledge and ensure the exploration of difference within the process. Such participatory processes will also depend on a commitment to involve citizens of over longer time periods and develop necessary understandings to enable their active engagement in the assessment and evaluation of environmental risks and impacts.

Appendix 1. Competing conceptualisations of the environmental risk policy process

Figure A1.1. The US National Research Council's 1983 conceptualisation of the risk decision process (NRC, 1983: 28).

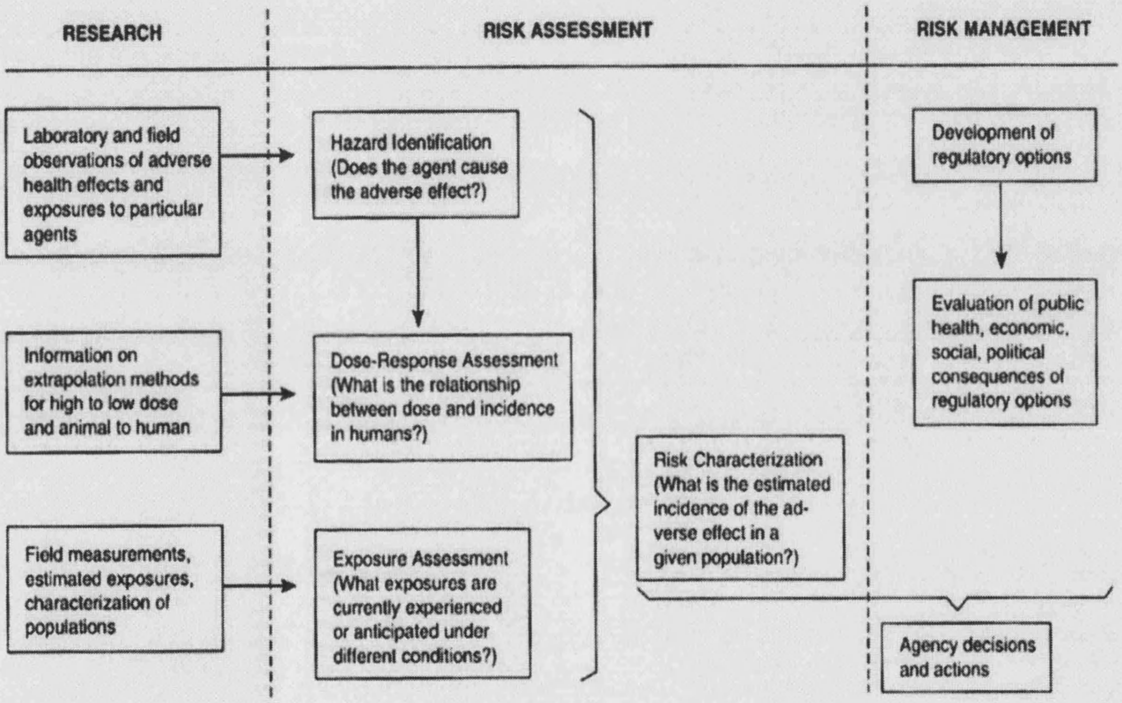


Figure A1.2. The US National Research Council's 1996 conceptualisation of the risk decision process (Stern & Fineberg, 1996: 28).

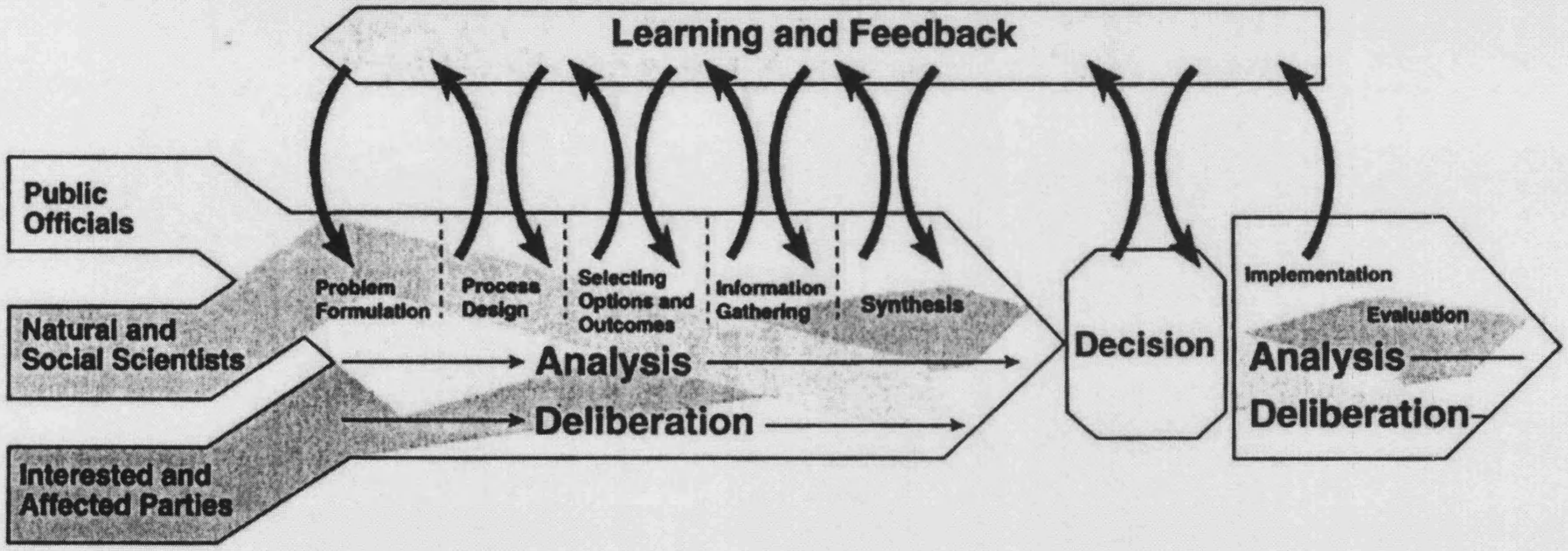
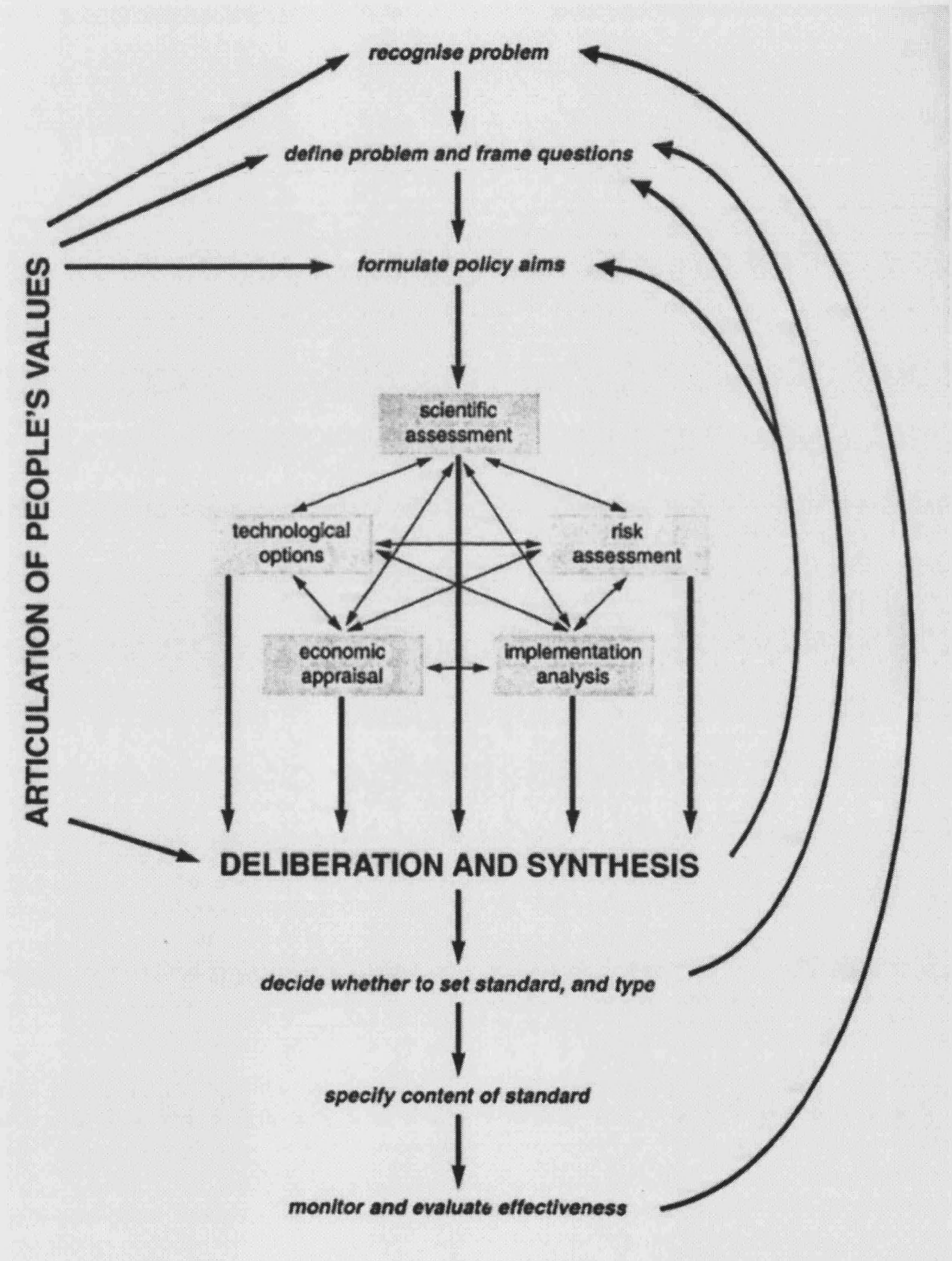


Figure A1.3. The Royal Commission on Environmental Pollution's conceptualisation of the environmental policy process (RCEP, 1998: 118).



Appendix 2. Approaches for involving citizens and stakeholders in environmental risk

Renn *et al.* (1995a: 2) define public participation as "forums for exchange that are organised for the purpose of facilitating communication between government, citizens, stakeholders and interest groups, and businesses regarding a specific decision or problem". A considerable literature on participatory approaches in environmental decision-making has developed over the past three decades providing an seemingly endless range of models and techniques for citizen and stakeholder involvement (comprehensive reviews have been provided by Renn *et al.* 1995; Warburton, 1998; Democracy Network, 1998; Lowndes *et al.* 1998; NEF, 1998; Audit Commission, 1999; Petts & Leach, 2000; IEMA, 2000). The main established approaches, along with those directly applicable to the area of environmental risk, are summarised in Table A2.2 below.

The most common means of making sense of this large array of practice has been to explain or classify participatory forms in terms of power – *i.e.* the degree to which decision makers share/devolve power or, similarly, the extent to which participants are empowered. The most influential work in this regard is Arnstein's classic ladder of participation (Arnstein, 1969). More recently, a number of authors have simplified Arnstein's ladder (e.g. Wilcox, 1994; Petts & Leach, 2000; IEMA, 2000) to identify four levels of participation, including:

- *Education and information provision:* where communicative materials are produced and disseminated through different media with no specific mechanism for response in order to: inform people about what is going to happen, is happening, or has happened; and create awareness of activities or issues.

- *Information provision and feedback:* where the public and stakeholders are invited by the decision-maker to comment on information, pre-formed proposals and related questions.

- *Involvement and consultation:* involving communicative action operating over different temporal and spatial scales, which tends to occur in one-off or discrete situations. Processes may involve face-to-face interaction between participants to identify issues of concern.

- *Extended involvement:* involving deliberative processes that occur over an extended period where the public and stakeholders may play a more active role in policy formulation and influence decisions.

These four levels of communicative activity effectively map onto three different behavioral styles adopted by decision-makers: that of *informing* people about decisions already made; *listening and learning* to people's input into a decision to be made; and *exchanging* ideas and views to make the decision in partnership (DETR, 1998). Taken together these categorisations define three levels of engagement[23]:

1. *Education and information provision (informing)*;

2. *Consultation (listening and learning)*, where participants consider proposals, options, or evaluations already developed by a decision-maker;

3. *Deliberation / dialogue (exchanging views)*, where participants actively develop and contribute to proposals, options, or evaluations during periods of extended involvement.

These three levels of citizen and stakeholder engagement have been integrated with the classification of who/what participants represent and the knowledges they hold (*i.e.* professional stakeholders, local stakeholders or publics/citizens), to develop a typology (see Table A2.1) that highlights the key distinctions between the various available engagement methods. This typology of approaches for citizen and

[23] All three levels can be defined as citizen and stakeholder 'engagement', whereas the definition of 'participation' does not encompass education and information provision and is therefore confined to levels 2 and 3 where participants have an input into the decision process.

stakeholder involvement in the environmental risk policy process, adapted from a classification produced by Chilvers *et al.* (2003b), groups methods into six engagement strategies based on the key distinguishing features of *power* and *representation* (knowledge). The typology also relates indirectly to geographic scale or the level of policy at which participatory approaches operate at (*i.e.* national, regional, local), amongst other features.[24] Table A2.1 provides a description of each engagement strategy and identifies the range of participatory approaches relating to it. A brief description of each participatory approach is then provided in Table A2.2.

'Deliberation', as defined under the model of participatory risk assessment in Section 2.3.2.1, equates with higher-level strategies of deliberation and dialogue (strategies 4, 5, and 6), but may also encompass a limited number of approaches under strategies 2 (e.g. consultation workshops) and 3 (e.g. focus groups). It is important to note however specific participatory approaches are rarely carried out in isolation. Higher-level approaches of deliberation and dialogue are often situated within a wider programme of engagement in a participatory risk appraisal process, and depend to a large extent on the support of lower level strategies described in Table A2.1. For instance education and information provision (strategy 1) is routinely used in support of all other strategies, and will vary in form depending on nature of the specific approaches it supports.

It is important to note that this is a highly simplified picture that only describes the major structural differences between methods that are already established. There exist a massive variety of structural designs both within and between the methods described in Table A2.2 (for instance some would list over 20 different types of community

[24] Other important generic characteristics that underlie the typology but are not central to its organisation include: the *nature of interaction – i.e.* whether engagement is *at distance* (remote) or *in-person* (face-to-face); the *type of deliberation*: *i.e.* whether engagement is with *individuals* or *groups* of individuals; *duration*: *i.e.* whether engagement is a *one-off* activity or occurs over an *extended* period; *decision making link*: *i.e.* whether the link to decision making is *indirect* through the researcher/facilitator reporting findings (various forms of social intelligence), or whether participants provide a *direct* link to experts or decision makers; *information provision and communication:* a key distinction being between *one-way* communication and *two-way* ('deliberative risk communication'), although the degree and type of information provision can sometimes vary as much within method as between methods; the degree of *interaction or contestation* between knowledges or worldviews; the degree to which processes aim for *consensus* or *divergence* (explore difference); the degree to which processes are *analytic/evaluative*, allowing participants to contest existing knowledge, contribute their own knowledges, and play an 'active' role in evaluation and assessment.

advisory committee alone). In reality no matter what method is used no two participatory processes are likely to be the same when applied in specific contexts, given wide differences in the process and performance (including factors such as who participates, the range of contextual factors in operation, information provision throughout the process, the competence of those designing and facilitating the process).

All participatory models listed in Table A2.2 are open to individual interpretation, in order to fit individual circumstances or individual preferences. Many hybridization's or variations on the models described above can be identified in the literature. It seems possible that such hybrids, or combinations of the above methods, will prove to be the most effective mechanisms of participation (Renn *et al.* 1995b; Rowe and Frewer, 2000).

Table A2.1. A typology of approaches for citizen and stakeholder involvement in the environmental risk policy process in relation to six engagement strategies (adapted from Chilvers *et al.* 2003b).

Engagement Strategy	Description	Participatory approaches
6. Deliberation / Dialogue (Groups of citizens & specialists)	Innovative deliberative approaches that engage citizens, often recruited to be representative of the wider public, in panels over extended periods of responsive information provision, considering issues, and providing recommendations to decision-makers. Citizens interact with specialists (or experts) at various points throughout the process – available methods differ in the degree and nature of this interaction and thus the extent of mutual learning and capacity building between panellists and specialists. Some methods have been developed for national level policy, while others are only established at local geographic scales (but have the potential to be scaled up).	• Consensus Conference (e.g. Joss & Durrant, 1995; Guston, 1999; Andersen, 1999) • Citizens' Juries (e.g. Crosby, 1995; Coote & Lanaghan, 1996; Kuper, 1997) • Planning Cells (e.g. Dienel & Renn, 1995) • Interactive Panels • Research Panels
5. Deliberation / Dialogue (Groups of predominantly local stakeholders)	Methods that seek to engage (predominantly) local stakeholders, selected to represent the interests of others or as surrogates of the 'general public' or citizens, over extended periods in group deliberation and dialogue. Participants identify local issues and concerns, set priorities and agree on recommendations for action. Some approaches involve stakeholders in framing and actively engaging in technical-analytic aspects of decision processes (e.g. Participatory Research), while others involve local stakeholders in the evaluation and prioritisation of policy options. In most cases participants form interactive relationships with decision-makers and specialists.	• Community Advisory Committees (CACs) (e.g. Lynn & Busenberg, 1995; Vari, 1995; Petts 1997, 2001) • Planning for Real • Visioning • Participatory Research / Inquiry (e.g. Brown, 1990; Fischer, 1993, 2000) • Consensus building and Mediation (e.g. Baughman, 1995) • Stakeholder Decision Analysis (e.g. Clark *et al.* 1998) • Workshops • Internet Dialogue
4. Deliberation / Dialogue (Groups of predominantly professional stakeholders)	Approaches that seek to engage (predominantly) professional stakeholders, selected to represent the interests of others, over extended periods in group deliberation and dialogue. The most common approaches for this strategy are Stakeholder Workshops and Stakeholder Dialogue. This strategy also includes approaches that involve stakeholders in framing and actively engaging in technical-analytic aspects of decision processes, and/or the evaluation and prioritisation of policy options. Participants predominantly draw on their own	• Regulatory negotiation (e.g. Fiorino, 1995) • Multi-criteria mapping (e.g. Stirling and Mayer, 1999, 2001) • Consensus building • Mediation (e.g. Baughman, 1995) • Stakeholder Decision Analysis (e.g. Clark et al. 1998) • Internet Dialogue

	information and specialist knowledges. In most approaches participants form interactive relationships with decision-makers and specialists. This strategy might also include techniques that seek to identify areas of consensus and difference on issues or proposals between groups of professional stakeholders at distance.	• Workshops
3. Consultation (targeting the public / citizens)	Citizens are targeted through statistically representative samples to take part in quantitative surveys to test 'public opinion', or are recruited to participate in qualitative approaches based on shared demographic features. Quantitative surveys can be at distance allowing wide national coverage, but lack in-depth reasoned responses. In-depth qualitative approaches allow face-face individual or group deliberation and thus tend to be locally situated (but can reach national coverage through multiple processes throughout the country). These methods can be used in front-end framing to benchmark public opinion and underlying values, issues and concerns; or employed to gauge responses to developments or proposals as the decision process evolves. The researcher provides the link to the decision-maker in the form of a report.	• Focus Groups (e.g. Morgan & Kruger, 1998) • In-depth groups (e.g. Burgess *et al.* 1988a,b) • Deliberative Opinion Poll • Referenda (e.g. Buchmann, 1995) • Interview Survey – face-face, telephone • Questionnaire Survey – postal, web based, telephone (e.g. Davison *et al.* 1997)
2. Consultation (predominantly open to all)	Various approaches to providing information and receiving feedback that are potentially open to all types of participant (*i.e.* professional and local stakeholders, and the public). Engagement can either be at distance or face-face (with individuals or groups) and tends to be in the form of one-off events or initiatives. Face-to-face approaches are limited to the local scale (but can be reach national coverage if repeated), where as at distance approaches can cover all scales from national through to local.	• Public meetings • Public inquiry (e.g. Fiorino, 1990; Renn *et al.* 1995a) • Site visits (e.g. Renn *et al.* 1993; Webler, 1995) • Staffed exhibitions/displays • Open House • Consultation Document • Internet (information/feedback) (e.g. Finney, 1999) • Free telephone line (automated or staffed) • Teleconferencing
1. Education & Information Provision	At distance communication of information and educational material to individual members of the public and stakeholders with no feedback mechanism. Main purpose is to raise awareness and increase understanding. Equally applicable to local through to national scale levels. On its own informing is a form of engagement but not participation. Information provision often provides essential support to other forms of consultation and participation however.	• Leaflets, brochures, information pack, video, newsletters • Unstaffed exhibitions/displays • Advertising • Media (TV, Radio, Newspapers) • Internet (information provision)

Table A2.2. Approaches for involving citizens and stakeholders in environmental risk (engagement strategies to which each approach relates are listed in the far left column).

	Form of engagement	Description
6	**Regulatory negotiation**	Facilitates participation of representatives from organised interest groups in national-level policy debates. Relations are largely adversarial. Excludes publics, citizens and disorganised groups from the process (e.g. Fiorino, 1995).
6	**Multi-criteria mapping**	Professional stakeholders, representing different interests, take part in individual in-depth interviews where they review the range of policy options relating to an issue, define criteria with which to evaluate options, and assess the effectiveness of options (highlighting any uncertainties). The researcher feeds back analysis of results to the group of individuals who provide feedback. The individuals are then brought together to discuss results in a group discussion. A report is then produced by the researcher (Stirling & Mayer, 1999, 2001).
6/5	**Mediation**	A voluntary process in which those involved in a dispute jointly explore and reconcile their differences. The mediator has no authority to impose a settlement, but assists parties in settling their own differences. The mediated dispute is settled when the parties themselves reach what they consider to be a workable solution (e.g. Baughman, 1995).
6/5	**Stakeholder Dialogue**	A process where stakeholders (professional or local) are brought together in repeat meetings by a third party in facilitated dialogue in order to find common ground between them, uncover what lies behind their different positions, and develop consensus on proposed actions. Allows stakeholders to build highly interactive relationships with decision-makers and sponsors, and directly influence decision-making. Employs a range of methods, tools and techniques including consensus building approaches, surveys, workshops, panel formats, joint fact-finding, and so on.
6/5	**Stakeholder Decision Analysis**	Between 10-15 professional stakeholders come together in a 4-5 repeat deliberative workshop processes to discuss issues and come up with planning, management or decision priorities. Participants go through a structured qualitative multi-criteria analysis process that identifies issues/options, develops evaluation criteria, assesses options, and reaches agreement on priorities. Participants draw on their own information or responsive information provision throughout the process. Can be used with local stakeholder groups also (Clark *et al.* 1998).
6/5	**Internet dialogue**	Geographically separated group of individuals engage in written, verbal or visual communication and interaction that is mediated by a facilitator over the internet and structured to replicate a face-to-face dialogue process.
6/5, 4,2	**Workshops (ongoing or part of a wider programme of participation)**	Highly flexible group process that is often tailored to the specific needs or purpose of the exercise. Tend to be task driven and work towards specific outcomes. Can be used to provide information, discuss issues and solve problems for a small group of professional and local stakeholders. Can also bring together citizens, to consider issues with the potential to develop highly interactive relationships with specialists / experts.

5	**Community Advisory Committees (CACs)**	Small groups of 8-12 local stakeholders, representing particular interests or knowledges, who meet regularly (for 2-3 hours) over an extended period. The group discusses issues of concern (usually relating to a specific local project or plan), reflects on, and refines, their views from meeting to meeting. CACs are highly flexible as the group: discusses issues as they arise; responsively receives and accesses information appropriate to their needs; interacts with experts; and provides informed and timely input into decision-making (e.g. Lynn & Busenberg, 1995; Vari, 1995; Petts 1997, 2001).
5	**Planning for Real**	A means of engaging local stakeholders in groups to identify local problems and issues through a community model (3D model or map) which is reviewed to identify what should be done to address them. Options can then be prioritised using visual hands-on techniques, and developed into an Action Plan.
5	**Visioning**	Engages local stakeholders in workshops or meetings to consider the question 'what sort of future do we want?' Identifies issues and needs and develops a shared vision of a desirable future for a local community.
4	**Consensus Conference**	Involves a panel of 10-20 lay publics, usually recruited through advertisements, who select and ask questions of experts on a particular subject, assess responses, discuss issues, and produce report. The panel attends preparatory weekends where they receive information, select specialist witnesses and formulate questions. The conference lasts for 3-4 days and is mediated by a facilitator. A key feature of consensus conferences is that they take place in public and the audience has the opportunity to question and discuss issues (e.g. Joss & Durant, 1995; Guston, 1999).
4	**Citizens' juries**	A panel of 12-16 citizens, recruited to be broadly representative of their local area, meet for 4 days to consider a particular issue. The process is independently facilitated and panel members receive evidence from selected specialist witnesses, and may have the opportunity to question and cross examine them. The jury produces a report (setting out their views, recommendations, decisions and any differences of opinion between them) which is then submitted to the commissioning body (e.g. Crosby, 1995; Coote & Lanaghan, 1996; Kuper, 1997).
4	**Planning Cells**	Composed of randomly selected directly/indirectly affected citizens. Involves the evaluation of different decision options in accordance with individual values and preferences. Continuous process, lasting several days. (e.g Dienel & Renn, 1995).
4	**Interactive panels**	Standing panels of 12 citizens that meet 3-4 times a year to deliberate on issues set by a commissioning body. Panel members are recruited by quota sampling to cover a range of demographic characteristics, with regular turnover to prevent stagnation. Participants receive information prior to panels, discussion is tape recorded and transcribed, and participants record views on a decision sheet. Panels are facilitated by an independent researcher, who prepares a report for the commissioning body.
3/4	**Research Panels**	Large sample of 500-5000 members of the public, which can be used flexibly to track changes in opinion over time using a number of techniques. The panel, recruited by post or telephone, is representative of the wider population and replaced periodically to avoid stagnation. The same panel can be subject to a range of participatory methods including: questionnaire surveys, focus groups, workshops, citizens' juries, or consensus conferences.

3	**Focus Groups (or Discussion Groups)**	6-8 people, usually chosen to represent certain demographic characteristics, come together in a group (usually one off) mediated by a facilitator / researcher to discuss attitudes, opinions, needs and concerns in relation to an issue or proposal. Usually involve information provision or the introduction materials that serve as of discussion prompts. Can also be used to encourage deliberation and reflection with minimal prior framings or prompts. Groups are usually taped transcribed, analysed, leading to the production of a report by the facilitator (e.g. Morgan & Kruger, 1998).
3	**Deliberative opinion poll**	A type of opinion poll that seeks the views of informed citizens. 250-600 participants are surveyed for opinions and demographics. Smaller groups recruited randomly (representative of larger group in terms of attitude and demographics) are provided with information and under go 2-4 days of group deliberation and expert questioning in plenary sessions. Views are measured before and after the process, and changes in opinion are represented in a report to the commissioning body. Mainly used in research applications until now.
3	**Referenda**	Similar in nature to traditional electoral voting. Votes are cast at single point in time. All participants have an equal influence on decision-making (e.g. Buchmann, 1995).
3	**Interview survey**	Face to face structured or semi-structured interviews, usually undertaken with a sample designed to be representative of the wider public, that allow values, attitudes, opinions and beliefs of interviewees to be explored more deeply. Open questions allow for in-depth responses that explore underlying values and reasonings. May involve information provision.
3	**Questionnaire survey**	Used to gauge public opinion about a specific issue. Administered remotely by post, web or e-mail to a random or quota selected sample designed to be representative of the wider public. Limited to closed questions or predefined categories. May involve very limited information provision (e.g. Davison *et al.* 1997).
2	**Public meetings**	Local meetings which are open to any member of the public. Usually take on a question and answer format where the relevant authority or decision-making body provides information and members of the public have the opportunity to ask questions.
2	**Public inquiries / hearings**	Formalised, judicial style proceedings where projects and issues are subject to rigorous scrutiny from interested parties (e.g. Fiorino, 1990; Renn *et al.* 1995a).
2	**Site visits**	Organised meetings of individuals or groups who have the opportunity to look around a site and see activities and issues in real life (e.g. Renn *et al.* 1993; Webler, 1995).
2	**Staffed exhibitions/displays**	Exhibitions or displays set up in public areas or at conferences to convey information about a specific decision process. Staffed by specialists who can provide information, answer questions and receive comments.
2	**Open house**	Spaces where the public can view displayed information on relevant issues and ask questions of representatives from the relevant authority. Those participating are encouraged to provide written comments and take further information way with them.
2	**Consultation Document**	The traditional mode of consultation where a consultation document is published and sent out (by post, electronic mail) or made available to stakeholders and members of the public (designated location, website). Comment and feedback is invited, usually in a written form.
2	**Internet (information/feedback)**	Website used to provide information and also as a means for providing written feedback, for those who have access to the Internet (e.g. Finney, 1999).

2	**Free telephone lines (Automated or Staffed)**	A free telephone number for people to call in order to receive information, ask questions or provide comments/feedback about a specific decision process.
2	**Teleconferencing**	Individuals that are geographically separated use digital cameras and the Internet to see and talk to each other (as if face-to-face), ask questions and deliberate on issues.
1	**Leaflets, brochures, information pack, video, newsletters**	Various mediums through which information can be communicated in written or visual formats to a given target audience.
1	**Unstaffed exhibitions / displays**	Non-staffed exhibitions or displays set up in public areas or at conferences to convey information about a specific decision process.
1	**Advertising**	Advertisement placed in local or national media to convey information and raise awareness about a specific decision process.
1	**Media (TV, Radio, Newspapers, other printed media)**	The publishing of an article in a local or national newspaper (or other publications such magazines), or the production of a TV or radio programme, to convey information and raise awareness about a specific decision process.
1	**Internet (information provision)**	Use of website to provide information only, either in written or visual form, to those who have access to the Internet.

Appendix 3. Webler's (1995) fairness and competence evaluation framework

FAIRNESS		NEEDS			
		ATTEND	INITIATE	DEBATE	DECIDE
ACTIVITIES	AGENDA AND RULE MAKING	• equal chance to *shape, debate & decide* agenda/ground rules	• equal chance to *shape* agenda/ground rules	• equal chance to *debate & critique* agenda/ ground rules	• equal chance to influence final decision on agenda/ground rules
	MODERATION AND RULE ENFORCEMENT	• equal chance to *chose* moderator & facilitation method	• equal chance to *chose* moderator & facilitation method	• equal chance *challenge* choice of moderator & facilitation method	• equal chance to *influence selection* of moderator & facilitation method
	DISCUSSION	• all stakeholders equal chance to be *present & represented*	• equal chance to contest *validity claims about language, facts, norms & expressions*	• equal chance to contest *validity claims about language, facts, norms & expressions*	• *method to resolve validity claim dispute should be consentually chosen*

COMPETENCE		NEEDS	
		ACCESS TO KNOWLEDGE	BEST PROCEEDURES[♦]
ACTIVITIES	EXPLICATIVE DISCOURCE	• equal access to sources of common *standards and definitions*	• *mutual understanding* of terms, conditions, and concepts • disputes should *refer to pre-established reference standards*
	THEORETICAL DISCOURCE	• equal assess to relevant *expert-scientific knowledge* • equal assess to relevant *contextual/experiential knowledge* • *uncertainty* of factual information should be considered and made explicit	• the model should *separate cognitive claims from normative* • participants should be able to *delegate* determinations of factual evidence to *(chosen) external experts* • *cognitive legal claims* must be examined by legal experts
	PRACTICAL DISCOURCE	• avoid biased distribution of participating interests • *stakeholders* are *selected* by objective criteria – subjective determinations of others from should also be allowed • the model should promote *mutual understanding* • factual implications of normative discourse are considered	• procedures should resolve conflict & develop mutual understandings in order to identify a *generalised will* • *normative choices* must be consistent, and compatible with laws and current expectations
	THERAPUTIC DISCOURCE	• *authenticity of a speaker's expressive claims* should be contested • *examination of the speaker's sincerity* should be promoted	• the model should *examine the qualities of the situation* • participants should have *time to state & defend their claims* • the *translation scheme* used should be mutually acceptable

[♦] Two criteria, applicable to all discourse types, are that (i) the participatory model should reduce misunderstanding before reaching agreement; and (ii) the technique used to decide between validity claims must be consensually pre-approved by the group.

Appendix 4. Interview material

Appendix 4.1 Stage 1 interview material

Appendix 4.1.1 Stage 1 recruitment letter *(see over page)*

Appendix 4.1.2 Stage 1 research outline *(see over two pages)*

Jason D. Chilvers
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July 2001

Engaging science with participatory processes – the UK experience

Dear ,

I am a doctoral researcher at the Environment and Society Research Unit (ESRU), University College London, currently in the second year of a interdisciplinary studentship funded by both the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC). The project focuses on emerging practices that make an explicit attempt to engage science within stakeholder participation processes. I am writing to introduce my work and ask if you would be willing to take part in an interview sometime during the next two months.

Please find enclosed a two page summary that explains the research. I am currently conducting Stage One interviews. In a recent workshop held at ESRU - attended by Judith Petts, John Murlis and Jerry Ravetz along with Carolyn Harrison, Jacquie Burgess, Judy Clark and others from UCL - you were identified as one of ten key people that I should approach to participate in this Stage of the work. As explained in the summary, the purpose of the interview is to map your actual and perceived network relating to UK participatory assessment practice, while also providing important material for research questions 1 and 3.

The interview will be in-depth in nature and I expect it to take one hour, give or take little depending on how it pans out. I very much hope you will be willing and able to participate. I will contact you in a week's time to see whether you can take part, and if so to arrange a time and place that suits you. I will then send you a schedule to give you a feel for the types of questions I would like to explore in the interview.

I look forward to speaking with you soon.

Yours sincerely,

Jason Chilvers

Engaging science in participatory processes – the UK experience

Focusing on science in the participatory process

This ESRC/NERC funded Doctoral Research Project, based in the Environment & Society Research Unit at University College London, focuses on practices that make an explicit attempt to engage science within participatory processes. The study seeks to provide a comprehensive baseline review of current UK experiences of using 'analytic-deliberative' approaches in environmental decision-making, to increase understandings of practices that facilitate the integration, engagement, contestation and development of scientific understandings within such forms of stakeholder participation, and to begin to define principles that might guide the development of such practices.

Overview

Even though questions of how best to combine technical expertise with public values were a driving force behind some of the earliest environmental participation initiatives more than three decades ago, most innovative attempts at integrating stakeholder participation with technical environmental assessments have occurred outside the UK in Europe and North America. This has begun to change in the past five years or so. We are increasingly seeing initiatives that attempt to involve stakeholders in analytical/technical areas of environmental decision processes, either through performing a reactive or quality control function, or through actively contributing to the understanding of environmental risks and impacts. Such approaches, based around group deliberation – usually in the form of a workshop or panel, have been alternately termed '*analytic-deliberative*' (mainly in the context of risk management), and '*participatory assessment*'.

Although practices that engage science within stakeholder processes might be seen as a highly specialist area, it is also highly contentious area that impacts on a range of different actors. Most importantly we don't really know what works best. For *decision-makers and funders* such practice is not a legislatory requirement, so why go beyond minimal compliance? Are the risks posed - by unprecedented demands on access to information, issues of confidentiality, extra costs, and possible delays - simply too high given that outcomes are so unpredictable? Does the 'open' expression of uncertainties mean a loss in credibility and trust, or enhancement? Despite these risks, such practice might be the only means to deal with contentious, intractable problems where scientific uncertainties are exposed and contested. It might improve analytical rigor, or the quality of a scientific assessment (and thus the decision it supports)? For *facilitators and participatory practitioners* how can processes be managed in a fair and competent way given large differences in understandings between expert and non-expert participants, and associated difficulties in identifying strategic posturing? Should they play a stronger substantive role, and/or enforce suitable structures to compensate for cognitive inequalities? For *technical experts*, participating in such fora can be a harsh experience that can question their very existence. How, then, do you get experts to be involved, and how can they integrate their expertise in a more constructive and collaborative matter? For *participants*, do they even want to engage with science, and if so where and when? What's in it for them?

This study attempts to embrace the complexity of this situation, and believes that bringing a diverse range of actors together is fundamental to the development of more explicit, robust, and co-ordinated approaches to engaging science in stakeholder processes. Realising such a goal is severely limited by the patchy and sporadic nature of current practice, which for the most part is research driven and highly experimental. What we know is often limited to isolated anecdotal accounts or applies only within institutional, procedural, professional or disciplinary boundaries. Professional affiliations may be limited to a specific participatory approach (citizen juries/panels, consensus conferences, community advisory groups, various forms of stakeholder dialogue, integrated assessment groups), decision support tool (risk assessment, risk communication, impact assessment (EIA, SEA, SIA), technology assessment, integrated environmental assessment, multi-criteria analysis), or the issue/decision situation (radioactive waste, contaminated land, generically modifed organisms, and so on). This study attempts to overcome such compartmentalisation by synthesising current understandings, knowledges and notions of good practice across what can be seen as distinct 'assessment communities'.

Research Questions

It is this context that frames the three core research questions of the study:

1. What are current UK experiences and understandings of using analytic-deliberative approaches in environmental decision-making? Where, when, how, why, (and why not) are explicit attempts being made to engage stakeholders in the questioning, contestation and development of scientific/analytic areas of environmental decision processes?

2. Can a UK participatory assessment network be identified? Within this network how do practices vary, and what is the nature and degree of social learning that occurs within, and between, distinct assessment communities?
3. How do different actors in the network evaluate the effectiveness of specific practices that seek to engage science in participatory processes? Is it possible to define principles of good practice?

Research Approach

Stage 1 - Mapping a UK participatory assessment network

In order to map a UK participatory assessment network and attempt to identify distinct assessment communities within it, face-to-face in-depth interviews will be conducted with a small group of 'key gatekeepers'. Gatekeepers are selected on the basis of their comprehensive overview, and holistic understanding, of current UK analytic-deliberative practice. This does not necessarily mean direct practical experience, more a broad reach into the UK participatory assessment network that cuts across distinct communities. Diversity is a key criterion, with participants providing a fair representation of UK public, private, voluntary and research sectors. In addition to facilitating a network analysis, interviews will provide important material to address research questions 1 and 3.

Stage 2 - Assessment communities

Three to four assessment communities identified through network analysis in Stage 1 will each be subject to a more detailed assessment of practices, experiences and understandings. In the first instance in-depth interviews will be conducted with 2-3 key actors in each community. This will further describe the local networks in each community, and lead the way for a more extensive survey that employs the Delphi technique in the form of postal questionnaires and telephone interviews. This will explore direct experiences of practices that engage science in participatory processes, and identify areas of difference and consensus, between diverse actors.

Stage 3 - Case Study

In order to verify findings of the network analysis, and to provide a more fine-grained treatment of research questions 1 and 3, a single case study will be developed. Whereas Stages 1 and 2 interact with professional/experts exclusively, this stage provides the opportunity to include stakeholders participating within the case study process. Inclusion of these actors is seen as fundamental if the study is to effectively evaluate of the performance of practices that engage science in participation. Methods at this Stage will again be dominated by in-depth interviews but will also include case study development (informal interviews, collation of documents and other texts) and observation.

Practical outputs

The above Stages are due to be completed by March 2002, and the research project will end in November 2002. In addition too academic outputs, this work will:

- *Provide a comprehensive baseline review* of current UK practice and experiences in using analytic-deliberative approaches in environmental decision-making.
- *Contribute to understanding the factors that control the extent to which science is engaged* in 'policy for real' participatory situations.
- *Establish the extent to which practices are developing and learning is occurring* within and between distinct assessment communities in the UK participatory assessment network, and assess whether this might be more effectively facilitated.
- *Generate principles of good practice* relating to the integration, engagement, management and development of science within participatory processes through drawing together views of leading UK professionals and experts in the field. It is hoped that such principles might be used to inform the design and evaluation of future initiatives.
- *Review existing evaluation frameworks for stakeholder participation* processes, and assess their relevance to situations where explicit attempts are made to engage science, in the light of the principles developed.

If you would like further information, or have any comments, please contact Jason at the below address.

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Appendix 4.2 Stage 2 interview material

Appendix 4.2.1 Stage 2 recruitment letter *(see over page)*

Appendix 4.2.2 Stage 2 research outline *(see over two pages)*

Jason D. Chilvers
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Phone: 020 7679 5527 Fax: 020 7679 7565 e-mail: j.chilvers@ucl.ac.uk

March 2002

Stakeholders engaging science in environmentai risk decision processes

Dear ,

I am a doctoral researcher at the Environment and Society Research Unit (ESRU), University College London, currently working on research funded by both the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC), under the supervision of Carolyn Harrison and John Murlis. The project focuses on emerging practices that seek to critically engage stakeholders in scientific areas of environmental risk decision processes. I am writing to introduce my work and ask if you would be willing to take part in an interview sometime during the next two months.

Please find enclosed a two-page summary that explains the research. I am currently conducting Stage 2 interviews, the aim of which is to explore how stakeholders are being engaged in risk science in the areas of nuclear waste and waste. As explained in the summary the decision to focus on the nuclear waste and waste has been made on the basis of prior work. This has provided an overview of current UK situation as seen by national and international level actors. It is on the basis of this overview that you have been identified as one of ten key persons that I should approach in the waste/nuclear waste area to participate in this stage of the work.

The interview will be in-depth in nature and I expect it to take one hour, give or take little depending on how it pans out. I very much hope you will be willing and able to participate. I will contact you in a week's time to see whether you can take part, and if so to arrange a time and place that suits you. I will then send you a schedule to give you a feel for the types of questions I would like to explore in the interview.

I look forward to speaking with you soon.

Yours sincerely,

Jason Chilvers

Stakeholders engaging science in environmental risk decision processes

This ESRC/NERC funded Doctoral Research Project, based in the Environment & Society Research Unit at University College London, seeks to provide a comprehensive baseline review of emerging UK practices which attempt to engage stakeholders in environmental risk decision processes. Such practice might be termed 'participatory risk appraisal', emphasising the role of deliberation through stakeholder participation, as well as the technical analysis of environmental risks and impacts. Within this broader context the core focus is on *how stakeholders are most effectively engaged with highly technical information and scientific assessments, inherent to environmental risk decision processes*. The research aims to explore four themes relating to this focus:

1. The *current UK situation*, in terms of who is engaging stakeholders in environmental risk decisions, what are they doing, where, when, why (and why not)? The focus here is on identifying the networks building up around this practice, the key actors within them, and the decision areas in which it is occurring.
2. The degree to which participatory risk appraisal networks are *learning* to engage stakeholders with science, the nature of learning that occurs within and between these networks, and how future development might be facilitated.
3. The *practices* being used to engage stakeholders in highly technical risk assessments/information, and the impact of such practice on the quality of science, effectiveness of decisions, and wider social learning.
4. *Principles of good practice* in engaging stakeholders in highly scientific areas of environmental risk decision processes.

Overview

The practice of engaging stakeholders in risk science has been confusingly described as an analytic-deliberative approach, participatory assessment, participatory research, and citizen science, amongst other terms. It usually occurs in the form of (but is not exclusive to) deliberative and inclusive exercises where stakeholders are brought together in workshops, panels, or other group forms to discuss aspects of a decision and critically engage with (question, debate, contribute to, or actively develop) risk science. In the context of this study, engaging stakeholders in risk science is taken to mean:

- The relative roles of participation/deliberation and science/analysis at different stages of risk decision process. The role of participation in 'framing' or defining the problem, contributing to assessments, and deciding on action to be taken.
- The design and management of participatory processes, especially aspects relating to the management, handling and communication of technical information within them.
- The relation of science to the participatory process including effective communication of science, and the form(s) of science or the scientific agenda needed to be responsive and relevant to stakeholders needs.

Although such practice is highly limited in the UK, one area where it is emerging is environmental risk. A major driver, in addition to normative democratic (participation invigorates democracy and is good in itself) and instrumental reasons (such as enhanced acceptance of, trust in, and implementation of risk decisions), is that involving stakeholders might improve the substantive quality of decisions. This is especially important given high profile examples of failures where quantitative/expert risk science is used in isolation, such as the Brent Spar issue or the BSE crisis. Could involving stakeholders in extended peer review and active knowledge generation actually improve the quality of technical risk assessments? Further pressures to engage stakeholders in science relates to the inherent uncertainty of risk science and high levels of concern, contention, and conflict that surrounds environmental risk decisions – meaning science is exposed through counter argument and debate.

Despite what could be described as a wider 'stakeholder revolution' in the UK over the past decade, the specific area of engaging stakeholders in science has been somewhat neglected. Although the current flood of guidelines and principles on effective participation might be applicable in an abstract sense, they provide little or no practical understanding of how stakeholders should be engaged with risk science in differing decision contexts. Situations that engage stakeholders in science place specific difficulties, challenges and demands on the participatory process and it's participants. For instance, how can fairness and competence of the process be ensured given a predominance of highly technical subject matter and the large differences in understandings between expert and non-expert participants? What does this mean for the way processes are structured? What prevents science being reified and dominating the process, and ensures the inclusion of other values, knowledges and interpretations? Should facilitators remain independent or adopt a substantive position? Do they intervene to overcome cognitive inequalities between participants? How can science be responsive and relevant to the deliberative process, and remain accountable and transparent? How is technical information communicated effectively? To what extent should the process be driven by an aim for consensus or an aim to explore differences, uncertainties and underlying assumptions?

It seems clear that we don't really know (or can't agree) how stakeholders fit into highly technical policy processes, or what it means to effectively engage stakeholders in science. The importance of recent 'participatory experiments' in contributing to this understanding has to be acknowledged; though this study emphasises the artificial nature and limited practical value of such research exercises. It attempts to go beyond these experiences and analyse the extent to which stakeholders engage science in 'policy for real' situations, given the practical barriers and constraints that exist. This study also highlights the fact that what we know tends to be limited to anecdotal accounts of individual case examples. Given that practice is patchy and sporadic, and networks building up around it are highly fragmented and compartmentalised, learning is often limited to individual organisations, or isolated within specific professional, disciplinary, institutional, sectoral or issue based networks/groupings. It seems clear that the development of more explicit, robust, and co-ordinated approaches to engaging stakeholders in risk science depends on drawing together the views of a diverse range of actors, to find out how learning is occurring across distinct networks/groupings, and what the content of this learning is.

Research Approach

This study attempts to achieve this through adopting a network approach, designed to capture the experiences, understandings and knowledges, of a diverse range of key professionals currently pushing forward analytic-deliberative practice, and stakeholders with experiences of participating in processes where they engage with risk science.

Stage 1 - Overview of current situation

In-depth interviews have been conducted with a number of national and international level actors or 'gatekeepers' capable of providing overviews of current UK situation (theme 1) and learning that is occurring within and between networks (theme 2). Participants were selected to ensure diversity in terms of the different types of roles important to the research (decision-makers/sponsors, participatory practitioners, and environmental risk scientists), and spanned government, research, consultancy and NGO/voluntary sectors.

Stage 2 - Focusing on the areas of Nuclear Waste and Waste.

As intended, findings from Stage 1 are extensive and work at a high level of abstraction. It is important to verify information derived and gain further resolution on practice and it's impact (Theme 3) by focusing on two individual areas or decision contexts. This will also facilitate a more in-depth analysis of the nature and degree of learning within and between these areas (Theme 2). On the basis of Stage 1 analysis, it seems that the areas of Nuclear Waste and Waste are currently the most important in terms of engaging stakeholders with risk science in the UK. Both practice, and the networks of actors based around it, are most developed in these areas. In-depth interviews are to be conducted with up to ten participants from each area, primarily to explore Themes 2 and 3, and gain information relating to Theme 4. The participants chosen are those actors that the Stage 1 panel deemed to be most significant and important. Selection has also ensured variation across role and sector (as in Stage 1).

Stage 3 - Case Study

In order to effectively evaluate the impacts of practices (Theme 3) and develop principles of good practice (Theme 4) it is essential to study networks relating to an innovative case example where stakeholders have been engaged with science in an environmental risk decision process. Whereas Stages 1 and 2 interact with professional/experts exclusively, this stage provides the opportunity to include stakeholders participating within an individual case process. Inclusion of these actors is fundamental to the effective evaluation of practices that engage stakeholders in risk science. Methods at this stage will again be dominated by in-depth interviews but will also include case study development (informal interviews, collation of documents and other texts) and observation.

Practical outputs

The above Stages are due to be completed by July 2002, and the research project will end in January 2003. Practical outputs of the work will closely relate to the four themes listed above.

- Provide a *comprehensive baseline review of current UK practice* in using analytic-deliberative approaches for environmental risk decision-making, and contribute to the understanding of contextual factors that control this practice.
- *Establish the extent to which practices are developing and learning is occurring* within and between participatory risk appraisal networks, and identify ways in which this might be more effectively facilitated.
- *Generate principles of good practice* on engaging stakeholder with science in environmental risk decision processes through drawing together views of leading UK professionals and experts in the field. It is hoped that such principles might be used to inform the design and evaluation of future initiatives.
- *Review existing evaluation frameworks for stakeholder participation* processes and assess their relevance to situations where explicit attempts are made to engage stakeholders in science, in the light of the principles developed.

If you would like further information, or have any comments, please contact Jason at the below address.

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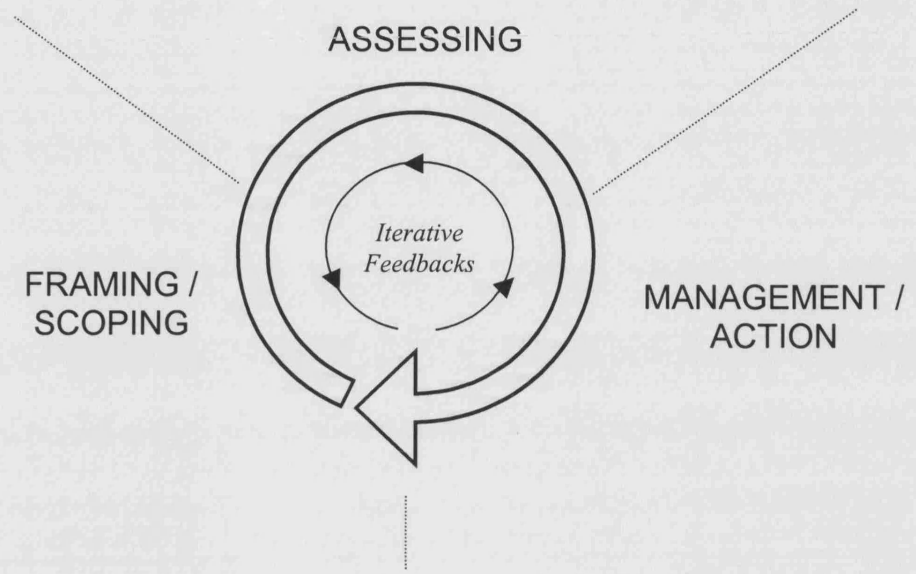
Appendix 4.2.3. Model of the environmental risk decision process used in Stage 2 interviews



FRAMING / SCOPING

- Defining the problem
- Framing questions to be addressed
- Agree aspects of process design
- Define options, possible outcomes, and criteria of acceptability

ASSESSING

- Data collection & information gathering
- Interpretation
- Synthesis

MANAGEMENT / ACTION

- Evaluate options & actions to be taken
- Decision
- Implementation, monitoring & evaluation

Appendix 5. MRWS Participatory Methods Workshop participants

Workshop Participants

Helen Ashley	The Environment Council
Elizabeth Atherton	UK Nirex Ltd.
Fred Barker	Independent Nuclear Policy Analyst
Andy Blowers	Open University
Judith Brooke	COI Communications
George Brownless	Health and Safety Laboratory
Gregg Butler	Sustainable Environment Policy Project
David Collier	Greenstreet Berman Ltd
Nuala Gormley	Social Research Unit, Scottish Executive
Elizabeth Gray	SEERAD Radioactive Waste Team, Scottish Executive
Robin Grove-White	IEPPP, University of Lancaster
Richard Harris	RJH Associates
Alan Hedges	Social Research Consultant
Bill Hepburn	Highland Council
John Hetherington	Cumbria County Council
Brain Hooper	Ministry of Defence
Melanie Howard	The Future Foundation
Jane Hunt	IEPPP, University of Lancaster
Robert Jackson	Department of Environment Food and Rural Affairs
Gary Kass	Parliamentary Office of Science and Technology
Matthew Keep	Scottish Environmental Protection Agency
John Kelly	Market Research Services
Ken Ledgerwood	Department of Environment, Northern Ireland
Lorraine Mann	Scotland Against Nuclear Dumping
Grace McGlynn	British Nuclear Fuels Ltd.
Carolyn Nesbitt	Department of Environment Food and Rural Affairs
Paula Orr	Environment Agency
Nick Patrick	Home Planet, BBC Radio 4
Judith Petts	University of Birmingham
David Plater	David Plater & Co
Phil Richardson	Enviros Consulting
Pete Roche	Greenpeace
Adam Scott	Department of Environment Food and Rural Affairs
Terry Selby	Liabilities Management Unit, Department of Trade & Industry
Nicole Hough	Liabilities Management Unit, Department of Trade & Industry
Jonathan Selwyn	UKCEED
Peter Simmons	Centre for Environmental Risk, University of East Anglia
Beth Taylor	UK Atomic Energy Authority
Robert Templar	Welsh Assembly Government
Thomas Webler	Antioch New England Graduate School
Rachel Western	Friends of the Earth
Brian White	Copeland Borough Council
Pete Wilkinson	Wilkinson Environmental Consulting

Independent Assessor

Jim Skea	Policy Studies Institute

Facilitation Team

Lead facilitator

Jacquie Burgess	Environment and Society Research Unit, UCL

Facilitators

Darren Bhattachary	Office for Public Management
Jason Chilvers	Environment and Society Research Unit, UCL
Judy Clark	Environment and Society Research Unit, UCL
John Murlis	Environment and Society Research Unit, UCL
Kate Studd	Environment and Society Research Unit, UCL

Appendix 6. Network Analysis

Appendix 6.1. Stage 1 Analysis

Appendix 6.1.1. Stage 1: Issue-areas

	Stage 1 Respondent											
Issue-Area Codes	**A**	**C**	**J**	**F**	**I**	**H**	**B**	**E**	**G**	**D**	**Count**	**Quotes**
Radioactive Waste	8	2	2		4	7			2	3	7	28
Waste	6				3	11	6	5	1		6	32
GMOs		6	3		1		2		3	11	6	26
Chemicals		1	2	2	1				2	4	6	12
Health		2	5		1	2	4				5	14
Water	1					4	4		1		4	10
Nuclear (licensing/decommissioning)	1		1	2		2					4	6
Transport		2			1	2			1		4	6
Climate Change		2					4		1		3	7
Biotechnology			1	2	3						3	6
Sea Defence	3						2				2	5
Flood Defence	2					2					2	4
Contaminated Land						3		1			2	4
Biomass						1	1				2	2
Decommissioning of Oil Platforms			1						1		2	2
Wind Energy							1		1		2	2
Health Effects of Air Travel		4									1	4
Selected Licence Applications	4										1	4
Renewable Energy				3							1	3
Medical Biotechnology				2							1	2
Cement Kilns	2										1	2
Diabetic Drivers		2									1	2
Planning Issues					2						1	2
Biodiversity									1		1	1
Energy					1						1	1
Pharmaceuticals									1		1	1
Xenotransplantation									1		1	1
Count	**8**	**8**	**7**	**6**	**9**	**9**	**8**	**2**	**12**	**3**	**71**	**188**
Quotes	**27**	**21**	**15**	**12**	**17**	**32**	**24**	**6**	**16**	**18**		

Appendix 6.1.2 Stage 1: Cases

	Stage 1 Respondent											
Case Codes	**A**	**C**	**J**	**F**	**I**	**H**	**B**	**E**	**G**	**D**	**Count**	**Quotes**
Radioactive Waste Consensus Conference (UKCEED)			1		6	2				1	4	10
Cricklewood Dialogue (BNFL / Environment Council)		1							5	1	3	7
Brent Spar Dialogue (Shell / Environment Council)			1		2				4		3	7
EA Public Participation Project (PDA & Univ. of Birm.)	2					3	2				3	7
Hampshire Waste Strategy (PDA)						2	1	1			3	4
Chemicals Industry Study (ESRC-GEC)			1		1					1	3	3
Foresight Environment Appraisal						4		3			2	7
Gernomics Dialogue (Environment Council)		2								2	2	4
Chemical Stakeholder Forum (DETR)					1	1					2	2
Hinkley Point Public Inquiry				6							1	6
Lancashire CC Waste Citizens Jury				6							1	6
GMO Dialogue (Sainsburys/Monsanto/TEC)										5	1	5
GMO Stakeholder Round Table (Unilever)			5								1	5
UK Consensus Conf. on Plant Biotech. (Sci. Museum)				4							1	4
Bexley Incinerator										4	1	4
GM Crops Multi-criteria mapping (Unilever/SPRU)								3			1	3
Health effects of Air Travel (DTLR)					3						1	3
Citizen Foresight Panel Food/Agriculture (UEL)		2									1	2
Decommissioning Nuclear Submarines (MOD/CSEC)					2						1	2
IPCC Process		2									1	2
Swansea Incinerator	2										1	2
Ulysses Project					2						1	2
Wiltshire Waste Local Plan						2					1	2
Bedfordshire, Waste Scenario Planning						1					1	1
Biotechnology Conference 1997			1								1	1
Biotechnology Consultation (CSEC)					1						1	1
Castle Cement	1										1	1
Composting Dialogue (Env. Council)									1		1	1
Environmental Dimensions of Automotive Ind. (DTLR)				1							1	1
Transport Strategy Consultation (DTLR)		1									1	1
Dublin Waste Incinerator							1				1	1
Essex CC Waste Strategy						1					1	1
Expert Panel on Air Quality Standards		1									1	1
GMO field Trials – Oxford		1									1	1
Guilford Incinerator	1										1	1
Hampshire consultation coodination project							1				1	1
Integrated Transport strategy (DTLR)		1									1	1
LEAPS Stakeholder Decision Analysis (ESRU / EA)				1							1	1
Oil Industry Drill Cuttings Dialogue (Env. Council)									1		1	1
Pathfinder Waste project (Environment Agency)	1										1	1
Selafield Relicensing	1										1	1
Rolls Royce Radioactive Waste Consultation	1										1	1
Count	**7**	**8**	**5**	**5**	**8**	**8**	**4**	**3**	**4**	**6**	**58**	**118**
Quotes	**9**	**11**	**9**	**18**	**18**	**16**	**5**	**7**	**12**	**14**		

Appendix 6.1.3. Stage 1: Actors

	Stage 1 Respondent											
Actor Codes	**A**	**C**	**J**	**F**	**I**	**H**	**B**	**E**	**G**	**D**	**Count**	**Quotes**
The Environment Council	1	3	0	0	3	3	1	0	1	10	7	22
Environment Agency	0	0	0	6	1	11	2	0	2	1	6	23
POST	0	2	1	1	1	0	0	0	1	1	6	7
Judith Petts (CERT, Univ. of Birmingham)	6	0	0	2	3	0	4	2	0	0	5	17
CSEC (Lancaster Univ.)	1	0	3	0	6	2	1	0	0	0	5	13
Jacquie Burgess (ESRU, UCL)	0	2	0	4	1	2	0	0	0	1	5	10
Environmental Resources Management	0	0	0	1	1	1	1	0	1	0	5	5
ESRU (University College London)	1	0	0	1	10	1	0	0	0	0	4	13
Friends of the Earth	1	0	0	0	2	0	3	0	3	0	4	9
Andy Stirling (SPRU, Univ. of Sussex)	0	0	0	1	5	1	0	0	0	2	4	9
Greenpeace	0	0	2	0	2	0	1	0	3	0	4	8
Pat Delbridge (PDA Associates)	1	0	0	0	0	10	0	2	0	0	3	13
Jerry Ravetz (Research Methods Consultancy)	0	7	0	0	1	0	0	0	0	1	3	9
UK Nirex Ltd.	3	0	0	0	1	1	0	0	0	0	3	5
British Nuclear Fuels Ltd.	1	0	0	0	0	0	0	0	2	1	3	4
Health & Safety Executive	1	0	0	0	1	2	0	0	0	0	3	4
DEFRA	0	2	0	1	0	0	0	0	1	0	3	4
Clare Twigger-Ross (Environment Agency)	1	0	0	0	0	2	1	0	0	0	3	4
Enviros	0	0	0	0	0	2	1	0	1	0	3	4
School of Environmental Sciences (UEA)	0	0	0	0	1	2	1	0	0	0	3	4
ETSU	0	0	0	0	0	1	1	1	0	0	3	3
CSERGE (UEA)	0	0	0	0	2	0	1	0	0	0	2	3
Silvio Funtowicz (JRC, Ispra, Italy)	0	4	0	0	4	0	0	0	0	0	2	8
Unilever	0	0	0	0	4	0	0	0	0	4	2	8
Monsanto	0	0	0	0	0	0	0	0	2	3	2	5
CAG Consultants	0	0	0	0	2	0	0	0	2	0	2	4
John Colvin (Environment Agency)	1	0	0	0	0	3	0	0	0	0	2	4
Bob May (Royal Society)	0	2	0	0	0	0	0	0	0	1	2	3
DTLR	0	1	0	2	0	0	0	0	0	0	2	3
ESRC GEC Programme	0	2	0	1	0	0	0	0	0	0	2	3
Robin Grove-White (CSEC, Lanc. Univ.)	0	0	1	0	2	0	0	0	0	0	2	3
Pippa Hyam (Dialogue by Design)	0	0	0	0	0	0	1	0	2	0	2	3
Garry Kass (POST)	0	0	0	0	0	0	0	0	1	2	2	3
RCEP	0	0	2	0	1	0	0	0	0	0	2	3
Royal Society	2	1	0	0	0	0	0	0	0	0	2	3
Sainsburys	0	0	0	0	0	0	0	0	2	1	2	3
Sue Mayer (Genewatch)	0	0	0	1	2	0	0	0	0	0	2	3
UKCEED	0	0	0	0	2	1	0	0	0	0	2	3
Chemical Industries Association	0	0	0	0	0	1	0	0	1	0	2	2
European Commission	0	1	0	0	0	0	0	1	0	0	2	2
Peter Hinchcliffe (DEFRA)	0	1	0	0	1	0	0	0	0	0	2	2
Department of Health	0	1	0	0	0	1	0	0	0	0	2	2
Department of Trade & Industry	0	0	0	0	0	0	0	1	1	0	2	2
Simon Pollard (Environment Agency)	0	0	0	0	0	1	0	1	0	0	2	2
Bob Lisney (Hampshire County Council)	0	0	0	0	0	1	1	0	0	0	2	2
Lord Selborne	0	0	1	0	0	0	0	0	0	1	2	2
Ministry of Defence	0	0	0	0	1	1	0	0	0	0	2	2
David Pearce (CSERGE, UCL)	0	0	0	0	1	0	1	0	0	0	2	2
Vivian Howard (Univ. of Liverpool)	0	0	0	0	0	0	1	1	0	0	2	2
Brian Wynne (CSEC, Lancaster Univ.)	0	0	1	0	1	0	0	0	0	0	2	2
Welcome Foundation	0	0	0	1	1	0	0	0	0	0	2	2
World Wildlife Fund	0	0	0	0	1	0	1	0	0	0	2	2
Christine Drury (Unilever)	0	0	0	0	1	0	0	0	0	1	2	2
IEMA	0	0	0	4	0	0	0	0	0	0	1	4
IPPR	0	0	0	0	4	0	0	0	0	0	1	4

IVEM (NERC Institute, Oxford)	0	4	0	0	0	0	0	0	0	0	1	4
Chief Scientist (POST)	0	4	0	0	0	0	0	0	0	0	1	4
Richard Sandbrook	0	0	0	0	0	0	4	0	0	0	1	4
Roger Levitt (CAG Consultants)	0	0	0	3	0	0	0	0	0	0	1	3
Angela Liberatore (European Commission)	0	3	0	0	0	0	0	0	0	0	1	3
Hampshire County Council	0	0	0	0	0	3	0	0	0	0	1	3
Ilene Rubury (Judge Institute)	0	3	0	0	0	0	0	0	0	0	1	3
Ortwin Renn (Center of Tech Assess, Stuttgart)	0	0	0	0	3	0	0	0	0	0	1	3
Patsy Healy (Newcaste Univ.)	0	0	0	0	3	0	0	0	0	0	1	3
Jim Skea (Policy Studies Institute)	0	0	0	0	0	0	3	0	0	0	1	3
Tim O'Riordan (UEA)	0	0	0	0	0	0	3	0	0	0	1	3
Alan Hickling (Independent Facilitator)	0	0	0	0	0	0	0	0	2	0	1	2
Alison Millward (Independent Facilitator)	0	0	0	0	0	2	0	0	0	0	1	2
Andrew Acland (Dialogue by Design)	0	0	0	0	0	0	0	0	2	0	1	2
Chris Woods (Univ. of Manchester)	0	0	0	2	0	0	0	0	0	0	1	2
Arvin Davis (DEFRA)	0	2	0	0	0	0	0	0	0	0	1	2
Alan Apling (DTLR)	2	0	0	0	0	0	0	0	0	0	1	2
NCRAOA (Environment Agency)	0	0	0	2	0	0	0	0	0	0	1	2
Alison Crowther (The Environment Council)	0	2	0	0	0	0	0	0	0	0	1	2
Steve Robinson (The Environment Council)	0	0	0	0	0	0	0	0	2	0	1	2
Glaxo Smithcline	0	0	0	0	0	0	0	0	2	0	1	2
Ian Avery (Hampshire County Council)	0	0	0	0	0	2	0	0	0	0	1	2
InterAct	0	0	0	0	0	0	0	0	2	0	1	2
John Durrant (Science Museum)	0	0	2	0	0	0	0	0	0	0	1	2
Jane Hunt (CSEC, Lancaster Univ)	0	0	0	0	0	2	0	0	0	0	1	2
Larry Phillips (LSE)	0	0	0	0	2	0	0	0	0	0	1	2
Kate Fish (Monsanto)	0	0	0	0	0	0	0	0	0	2	1	2
Ed Quilty (POST)	0	2	0	0	0	0	0	0	0	0	1	2
Projects in Partnership	0	0	0	0	0	0	0	0	2	0	1	2
Simon Joss (PSI)	0	0	0	2	0	0	0	0	0	0	1	2
Tom Horlick-Jones (Cardiff University)	0	0	0	0	2	0	0	0	0	0	1	2
Ian Langford (CSERGE, UEA)	0	0	0	0	2	0	0	0	0	0	1	2
Nick Pidgeon (UEA)	0	0	0	0	2	0	0	0	0	0	1	2
Tom Wakeford (Univ. of East London)	0	0	0	0	2	0	0	0	0	0	1	2
AEA Technology	0	0	0	0	0	0	0	0	1	0	1	1
Alan Irwin (Brunel Univ.)	0	0	0	1	0	0	0	0	0	0	1	1
Andrew Fortius	0	0	0	0	0	0	0	1	0	0	1	1
Astro Zenica	0	0	0	0	0	0	0	0	1	0	1	1
Bedfordshire County Council	0	0	0	0	0	1	0	0	0	0	1	1
Bernie Gouldstone	0	0	0	0	0	0	1	0	0	0	1	1
Marian Barnes (Univ. of Birmingham)	0	0	0	0	0	1	0	0	0	0	1	1
Roy Harrison (Univ. of Birmingham)	0	0	0	0	0	0	0	1	0	0	1	1
BP	0	0	0	0	0	0	0	0	1	0	1	1
Bruna De Marchi (ISIG, Gorizia, Italy)	0	0	0	0	1	0	0	0	0	0	1	1
Cabinet Office	0	0	0	0	0	0	1	0	0	0	1	1
Lewis Herbert (Cambridge County Council)	0	0	0	0	0	1	0	0	0	0	1	1
Communities Against Toxics (CATs)	0	0	0	0	0	0	1	0	0	0	1	1
Clive Spash (Macaulay Institute, Aberdeen)	0	0	0	0	1	0	0	0	0	0	1	1
CND	0	0	0	0	0	0	0	0	1	0	1	1
COPUS	0	0	0	0	0	0	0	0	1	0	1	1
CPRE	0	0	0	0	0	0	0	0	1	0	1	1
David Collingridge	0	0	0	0	1	0	0	0	0	0	1	1
David Fisk	0	0	0	0	1	0	0	0	0	0	1	1
Dave Sirman (DEFRA)	1	0	0	0	0	0	0	0	0	0	1	1
David King (DEFRA)	1	0	0	0	0	0	0	0	0	0	1	1
DETR	0	0	0	0	1	0	0	0	0	0	1	1
Dialogue by Design	0	0	0	0	1	0	0	0	0	0	1	1
Angela Patel (DoH)	0	0	0	0	0	1	0	0	0	0	1	1
Robert Maynard (DoH)	0	0	0	0	0	1	0	0	0	0	1	1
Dow Agrosciences	0	0	0	0	0	0	1	0	0	0	1	1
ECOTEC	0	0	0	0	1	0	0	0	0	0	1	1
ENTEC	0	0	0	0	0	0	0	0	1	0	1	1
Jackie MaGlade (EEA)	1	0	0	0	0	0	0	0	0	0	1	1

Jim Grey (Envionment Agency)	1	0	0	0	0	0	0	0	0	0	1	1
Ted Cantel (Environment Agency)	1	0	0	0	0	0	0	0	0	0	1	1
Andrew Brookes (Environment Agency)	0	0	0	1	0	0	0	0	0	0	1	1
Brian Utterage (Environment Agency)	1	0	0	0	0	0	0	0	0	0	1	1
Chris Newton (Environment Agency)	0	0	0	1	0	0	0	0	0	0	1	1
Geoff Manse (Environment Agency)	1	0	0	0	0	0	0	0	0	0	1	1
John Murlis (Environment Agency)	0	0	1	0	0	0	0	0	0	0	1	1
Jonathan Fisher (Environment Agency)	0	0	0	0	0	1	0	0	0	0	1	1
Environmental Law Association	0	0	1	0	0	0	0	0	0	0	1	1
Environmental Law Foundation	0	0	1	0	0	0	0	0	0	0	1	1
Hugh Carl-Harris (Enviros)	0	0	0	0	0	0	0	0	1	0	1	1
Rod Aspinwall (Enviros)	0	0	0	0	0	0	1	0	0	0	1	1
Gev Eduljee (ERM)	0	0	0	0	0	0	1	0	0	0	1	1
Karen Raymond (ERM)	0	0	0	1	0	0	0	0	0	0	1	1
Forward Studies Unit (European Commission)	0	0	0	0	1	0	0	0	0	0	1	1
Foresight	0	0	0	0	1	0	0	0	0	0	1	1
Michael Warburton (Friends of the Earth)	0	0	0	0	1	0	0	0	0	0	1	1
Mike Warhurst (Friends of the Earth)	0	0	0	0	0	0	0	0	0	1	1	1
Quinn Lyons (Friends of the Earth)	0	0	0	0	0	0	0	0	0	1	1	1
Green Alliance	0	0	0	0	1	0	0	0	0	0	1	1
Doug Parr (Greenpeace)	0	0	0	0	1	0	0	0	0	0	1	1
Helen Wallace (Greenpeace)	0	0	0	0	1	0	0	0	0	0	1	1
Groundwork	0	0	0	0	0	0	1	0	0	0	1	1
House of Lords, Science & Tech. Committee	0	0	1	0	0	0	0	0	0	0	1	1
Robin Foster (HSE)	0	0	0	0	1	0	0	0	0	0	1	1
IAIA	0	0	0	0	0	1	0	0	0	0	1	1
Barry Sadler (IEMA)	0	0	0	1	0	0	0	0	0	0	1	1
Bill Sheate (Imperial)	0	0	1	0	0	0	0	0	0	0	1	1
Jeremy Seldon (West Sussex CC)	0	0	0	0	0	1	0	0	0	0	1	1
Jim Bridges	0	0	0	0	0	0	0	1	0	0	1	1
Jim McQuaid (IIGRA)	0	0	0	0	1	0	0	0	0	0	1	1
John Barton (Univ. of Sheffield)	0	0	0	0	0	0	1	0	0	0	1	1
John Laing	0	0	0	1	0	0	0	0	0	0	1	1
Johnathan Porritt (Forum for the Future)	0	0	0	0	0	0	1	0	0	0	1	1
Kings Fund	0	0	0	0	1	0	0	0	0	0	1	1
Barbara Vaughn (Kings Fund)	0	0	1	0	0	0	0	0	0	0	1	1
John O'Neil (Lancaster Univ.)	0	0	0	0	1	0	0	0	0	0	1	1
Local Government Association	0	0	0	0	0	0	0	0	1	0	1	1
Phil Macnaghten (Lancaster Univ.)	0	0	1	0	0	0	0	0	0	0	1	1
London School Hygiene & Tropical Medicine	0	0	0	0	0	1	0	0	0	0	1	1
MAFF	0	0	1	0	0	0	0	0	0	0	1	1
Malcolm Grant	0	0	1	0	0	0	0	0	0	0	1	1
Brian Hooper (MOD)	0	0	0	0	0	1	0	0	0	0	1	1
National Grid	0	0	0	0	0	0	0	0	1	0	1	1
Nuclear Industries Inspectorate	0	0	0	0	0	1	0	0	0	0	1	1
Robbie Grey (Nuclear Industries Inspectorate)	0	0	0	0	0	1	0	0	0	0	1	1
The Nuffield Trust	0	0	0	1	0	0	0	0	0	0	1	1
Patricia Nuttell (Ex IVEM Director)	0	1	0	0	0	0	0	0	0	0	1	1
Paul Connets	0	0	0	0	0	0	1	0	0	0	1	1
Paul Scott (Environmental Reporter)	0	0	0	0	0	0	0	0	1	0	1	1
David Cope (POST)	0	0	1	0	0	0	0	0	0	0	1	1
Retail Association	0	0	0	0	0	0	0	0	1	0	1	1
Richard Harris (Independent Facilitator)	0	0	0	0	0	0	0	0	1	0	1	1
RTZ	0	0	0	1	0	0	0	0	0	0	1	1
Shell	0	0	1	0	0	0	0	0	0	0	1	1
Society for Risk Analysis	0	0	0	0	0	1	0	0	0	0	1	1
Soil Association	0	0	0	0	0	0	0	0	1	0	1	1
Sustainable Futures	0	0	0	0	0	1	0	0	0	0	1	1
Syngenta	0	0	0	0	0	0	0	0	0	1	1	1
Terry Coleman (Environment Agency)	0	0	0	0	0	0	0	1	0	0	1	1
The Royal Institute of Town Planners	1	0	0	0	0	0	0	0	0	0	1	1
The Royal Society	1	0	0	0	0	0	0	0	0	0	1	1
Tim Regis (University of Surrey)	0	0	0	0	0	0	0	1	0	0	1	1
Tom Mann (North West Area Health Authority)	0	0	0	0	0	0	1	0	0	0	1	1

Tony Damm	0	0	0	0	0	0	0	1	0	0	1	1
Trade Association	0	0	0	0	0	0	0	0	1	0	1	1
TXU	0	0	0	0	0	0	0	0	1	0	1	1
UCL	1	0	0	0	0	0	0	0	0	0	1	1
Claire Dulap (UCL)	0	0	0	0	1	0	0	0	0	0	1	1
Kerry Turner (UEA)	0	0	0	0	0	0	1	0	0	0	1	1
Water UK	0	0	0	0	0	1	0	0	0	0	1	1
WBCSD	0	0	0	0	0	0	0	0	1	0	1	1
Wildlife trust	0	0	0	0	0	0	0	0	1	0	1	1
World Bank	0	0	0	0	0	0	0	1	0	0	1	1
WRc	0	0	0	0	0	1	0	0	0	0	1	1
WS Atkins	0	0	0	0	0	0	0	0	1	0	1	1
Gwynne Lyons (WWF)	0	0	0	0	1	0	0	0	0	0	1	1
Count	**23**	**20**	**17**	**24**	**57**	**42**	**33**	**14**	**41**	**18**	**310**	**514**
Quotes	**32**	**48**	**22**	**42**	**104**	**76**	**46**	**16**	**57**	**35**		

Appendix 6.2 Stage 2 Analysis

Appendix 6.2.1 Stage 2: Cases

	Stage 2 Respondent																	
Case Codes	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**Count**	**Quotes**
BNFL National Stakeholder Dialogue (Env. Council / BNFL)	1		1	3	4		6	7				1					7	23
Rad Waste Consensus Conference (UKCEED)		3	2	7	3	2											5	17
Partitioning & Transmutation Citizens' Panel (CSEC / Nirex)	6	3		2	2	4											5	17
Cricklewood Dialogue (Env. Council / BNFL)							2	3		7	5	2					5	16
Monitoring & Retrievability Workshops (CSEC / Nirex)		5		2	1	4											4	12
ISOLUS Project (CSEC / MOD)	9	1		2													3	12
EA Magnox Consultation	1		6		1												3	8
Public Atitudes of Radioactive Waste (MRS / DEFRA)				1	1				6								3	8
NRWCC – Reconvened (UKCEED/ DEFRA)	1			2					5								3	8
Front-end Radioactive Waste Consultation (CSEC / Nirex)	2	1		2													3	5
Nirex Social Science Workshop (Manor Resourses / Nirex)				1	1	1											3	3
Magnox Decommissioning Dialogue (Env. Council / BNFL)								1				2					2	3
Riscom Processes (RISCOM II Project)	2					1											2	3
Nirex Science Pre-view (CSEC / Nirex)	1	2															2	3
Doonray (UKAEA)	1					1											2	2
Sellafield Authorisations	1		1														2	2
Phase Disposal Concept Focus Groups (Nirex)						4											1	4
RADIALe Project (CSEC / DEFRA)									2								1	2
Safegrounds Project	1																1	1
Scottish Executive processes	1																1	1
Radioactive Waste Seminar (DEFRA)									1								1	1
National Waste Dialogue (Env. Council)												2			4		2	4
Hampshire Waste Strategy (PDA)														7			1	7
Bedfordshire Waste Strategy (Sustainable Futures / Enviros)													5				1	5
Lancashire CC Waste Citizens Jury																5	1	5
Hertfordshire Waste Citizens Jury (Hertfordshire CC)																5	1	5
Dorset Waste strategy (Env. Council / Dorset CC)												4					1	4
South Wales Landfill Process												4					1	4
Pathfinder Project (Environment Agency)													3				1	3
Count	**12**	**6**	**4**	**9**	**7**	**7**	**2**	**3**	**4**	**1**	**1**	**6**	**2**	**1**	**1**	**2**	**68**	**188**
Quotes	**26**	**15**	**10**	**22**	**13**	**17**	**8**	**11**	**14**	**7**	**5**	**15**	**7**	**7**	**4**	**10**		

Appendix 6.2.2 Stage 2: Actors

	Stage 2 Respondent															
Actor Codes	K	L	M	N	O	P	Q	R	S	V	W	X	Y	Z	Count	Quotes
The Environment Council	4	0	1	0	2	1	8	5	3	3	1	1	1	0	11	30
DEFRA	3	0	2	4	3	3	1	1	0	0	0	2	8	0	9	27
Jane Hunt (CSEC, Lancaster Univ)	2	2	0	1	3	7	2	1	4	0	0	0	0	0	8	22
Judith Petts (CERT, Univ. of Birmingham)	1	0	0	1	1	2	0	1	1	0	6	2	0	0	8	15
British Nuclear Fuels Ltd.	1	0	4	2	2	3	7	0	1	0	0	0	0	0	7	20
Environment Agency	1	0	3	0	0	3	2	0	0	3	1	0	6	0	7	19
Department of Trade & Industry	0	0	1	1	0	1	0	1	0	0	0	1	3	0	6	8
UK Nirex Ltd.	5	0	0	4	4	0	0	1	4	0	0	0	0	0	5	18
CSEC (Lancaster Univ.)	0	7	0	0	2	1	0	0	1	0	3	0	0	0	5	14
UKCEED	1	4	0	2	0	1	0	0	2	0	0	0	0	0	5	10
Ministry of Defence	3	2	0	2	0	1	0	0	0	0	0	0	0	0	4	8
Environmental Resources Management	0	1	0	0	0	0	0	2	0	0	1	1	0	0	4	5
Jacquie Burgess (ESRU, UCL)	3	0	0	0	0	3	0	0	0	0	2	0	0	0	3	8
Garry Kass (POST)	1	0	0	4	0	0	0	0	2	0	0	0	0	0	3	7
Elizabeth Atherton (Nirex)	2	2	0	0	1	0	0	0	0	0	0	0	0	0	3	5
David Collier (Green Street Burman)	0	0	0	1	2	0	0	0	2	0	0	0	0	0	3	5
Greenpeace	0	0	0	1	0	0	0	0	0	0	0	0	2	2	3	5
Anna Littleboy (Nirex)	1	2	0	0	2	0	0	0	0	0	0	0	0	0	3	5
David Wild (Nirex)	1	0	0	1	3	0	0	0	0	0	0	0	0	0	3	5
ESRU (University College London)	0	0	0	1	0	1	0	0	0	0	2	0	0	0	3	4
Dialogue by Design	0	0	0	1	0	0	0	1	0	0	0	1	0	0	3	3
SPRU	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3	3
Pat Delbridge (PDA)	0	0	0	0	0	0	0	0	0	0	0	7	0	2	2	9
Friends of the Earth	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	5
Jonathan Selwyn (UKCEED)	0	2	0	0	0	0	0	0	3	0	0	0	0	0	2	5
InterAct	0	0	0	1	0	0	3	0	0	0	0	0	0	0	2	4
Simon Pollard (Environment Agency)	0	0	1	0	0	0	0	0	0	0	3	0	0	0	2	4
The Future Foundation	0	2	0	0	0	2	0	0	0	0	0	0	0	0	2	4
Andrew Acland (Dialogue by Design)	0	0	0	0	0	0	2	0	0	0	0	1	0	0	2	3
Enviros	0	0	0	0	0	0	0	0	0	0	2	1	0	0	2	3
Robin Grove-White (CSEC, Lancaster Univ.)	0	0	0	0	0	1	0	0	0	0	2	0	0	0	2	3
Paula Orr (Environment Agency)	0	0	0	0	0	1	0	0	0	0	2	0	0	0	2	3
Claire Twigger-Ross (Environment Agency)	0	0	0	0	0	1	0	0	0	0	2	0	0	0	2	3
UKAEA	1	0	0	0	0	2	0	0	0	0	0	0	0	0	2	3
Margaret Beckett (DEFRA)	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2
Goulson Science	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Hampshire Local Facilitation Network	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	2
IPPR	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2
John Large	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2

Chris Murray (Nirex)	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	2
Scottish Executive	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	2
SEPA	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	2
Rachel Western (FoE)	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2
Brian Wynne (CSEC, Lancaster Univ.)	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	2
AEA Technology	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1
Andy Blowers (RWMAC)	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	1
COI Communications	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	1
Fred Barker (RWMAC)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
Sustainable Futures	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1	4
UEA	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	3
Bedfordshire County Council	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	2
Guy Dean (Public Concern at Work)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Food Standards Agency	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	2
Forth Road	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Lynn Frewer (IFR, Norwich)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Richard Harris (Independent facilitator)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	2
Market Research Services	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	2
David Plater (Independent facilitator)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2
Catherine Reynolds (IFR, Norwich)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	2
Ralph Ryder (CATS)	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2
Lynda Warren (Univ. of Aberystwyth)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Alan Watson (Public Interest Consultants)	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2
Andrew Blazer (Imperial College London)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Geoff Bishop (Bdor)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Cambridgeshire County Council	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Judy Clark (ESRU, UCL)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Lindsey Colbourne (Independent facilitator)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Keith Collins	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Countryside Agency	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Dorset County Council	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
DTLR	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Environmental Industries Commission	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Essex County Council	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
European Commission	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Ian Fairleigh (DEFRA)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Ian Fell (Newcastle Univ.)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Green Alliance	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Malcolm Grimstone (Imperial)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Hansard Society	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Health & Safety Executive	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Alan Hedges (Social Research Consultant)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
House of Lords, Science & Tech Committee	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Pippa Hyam (Dialogue by Design)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
International Atomic Energy Agency	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Ken Jackson (RWMAC)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Lord Jenkins	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1

Simon Joss (PSI)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Sam King (Nirex)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Lancashire County Council	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Manor Resources	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Michael Meacher (DEFRA)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Alison Millward (Independent Facilitator)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
National Radiological Protection Board	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
New Economics Foundation	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Nuclear Energy Agency	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Oxfordshire County Council	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Nick Pigeon (UEA)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
RWMAC	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Peter Reason (University of Bath)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Steve Robinson (The Environment Council)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Science Museum	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Adam Scott (DEFRA)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Mike Sedenski	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
David Slater (Oxera)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Royal Society	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
David Sumner	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Surrey Local Facilitation Network	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Perry Walker (NEF)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Alison Warburg (Warwick Univ.)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Waste Watch	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Welsh National Assembly	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Lynne Wetherall	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Count	**25**	**14**	**8**	**34**	**18**	**26**	**15**	**9**	**17**	**4**	**21**	**17**	**10**	**6**	**224**	**403**
Quotes	**43**	**32**	**14**	**47**	**32**	**44**	**34**	**14**	**33**	**8**	**42**	**25**	**26**	**12**		

Appendix 7. Descriptions of radioactive waste cases nominated by Stage 2 Respondents

	Case	Objective / Purpose	Description of process
6/5, 4,3, 2,1	ISOLUS, February 2001-July 2001 (CSEC, Lancaster University; for MOD). (see CSEC, 2001)	To engage stakeholders at the front-end of a process to find a way to manage and decommission nuclear submarines. (National policy level; Framing)	Multi-method programme of engagement including: 8 *discussion groups* representing a range of demographic characteristics held in areas both near to and distant from existing nuclear sites; 4 *stakeholder workshops* to discuss Project ISOLUS and articulate the concerns of participants who represented the interest of specific groups (MoD, contractors, regulators, local authorities, local environmental groups), held in London, Plymouth, Manchester and Edinburgh; a *citizens' panel* where 12 citizens met for four days over two weekends to receive information, examine the issue, question expert witnesses and produce a report; and a *web consultation* providing information, an open ended questionnaire, and discussion space for feedback. A steering group was convened to oversee the conduct of the process.
6	National Radioactive Waste Consensus Conference, 1999 (UKCEED; funded by POST, NERC, Nirex). (see UKCEED, 1999)	To contribute the views of informed citizens to the national policy process; identifying issues of public concern; and generate better-informed public debate on the radioactive waste issue. (National policy level)	Standard Consensus Conference design where a panel of 15 citizens were recruited using random selection techniques; received background information material; attended two preparatory weekends with further information provision where panel selected expert witnesses and formed questions to ask of them. Main two day conference involved 5 minute presentations from experts; expert questioning, discussion and debate. The panel produced a report outlining their recommendations and discussed these with the public audience. A steering group representing various interests provided overseeing role.
6	Citizens' panel on partitioning & transmutation, 2001 (CSEC, Lancaster University; for Nirex) (see Hunt & Thompson, 2001)	To discuss/explore P&T as a waste management option and consider Nirex's review of the P&T technique, (while experimenting with new innovative deliberative approaches to consultation on highly technical issues). (Organisational level; Framing/Assessing)	Citizens' panel where 12 members of the general public discussed issues relating to partitioning and transmutation over two weekends. During the second weekend the panel questioned 4 expert witnesses. A report was produced that described the process and key themes discussed by the panel and their conclusions.

5/4	Monitoring and Retrievability Workshops, 2000 (CSEC Lancaster; for Nirex) (see UKCEED, 2000; 2001; 2002b)	To preview Nirex's work programme on monitoring and retrievability. (Organisational level; Framing/Assessing)	2 one-day stakeholder workshops held in Manchester to explore technological and social dimensions of the M&R issue. Workshops involved presentations from Nirex; facilitated breakout discussion groups, and plenary sessions. An independent report was produced to summarise workshop outputs. Participants included regulators, academics, NGOs, local authorities and 'informed' publics (original panel members of the National Radioactive Waste Consensus Conference) (Workshop 1); nuclear industry representatives and contractors (Workshop 2). Formal feedback was provided to all participants.
5/4	Cricklewood Stakeholder Dialogue 1998-2000, and JASM working group 2000-ongoing (Environment Council; for BNFL) (see Environment Council, 2001)	To mediate a dispute between BNFL and professional and local stakeholders that arose following the decision by BNFL's rail freight subsidiary to martial trains carrying spent nuclear fuel at Cricklewood in North London, and to bring the various stakeholders together in dialogue to seek a solution to the problem. (Local level; Decision/Action)	The dialogue process involved a mix of mediation and consensus building techniques, stakeholder workshops, joint fact-finding. The front-end of the process was a long mediation phase where stakeholder groups met separately and information was exchanged between them via facilitators. Stakeholders were then brought together in workshops to look at options and make recommendations on a way forward. Participants included professional stakeholders (including CND, Greenpeace, BNFL, Direct Rail Services, Railtrack, local authority officers, councillors, emergency services, MPs) and local stakeholders (including Cricklewood Against Nuclear Trains, local business representatives, residents groups). Technical questions raised in the dialogue over the contamination and health risks at martialing sites resulting from the transport of spent nuclear fuel were addressed by a smaller working group of stakeholders from the main dialogue. The Jointly Agreed Sampling and Monitoring working group (JASM) have undergone a joint fact-finding process where they agreed the scope and methodology of technical work, chose the technical specialists to undertake it, and agreed how the results should be interpreted (see Environment Council, 2001).

4	BNFL National Stakeholder Dialogue 1998-ongoing. Includes: Waste Working Group, 1999-2000, & Spent Fuel Management Options Working Group, 2000-2002 (Environment Council; for BNFL) (see Environment Council, 2003)	To inform BNFL's decision-making process about the improvement of its environmental performance in the context of their overall development. (Organisational level; Decision/Action)	Ongoing stakeholder dialogue process employing multiple engagement methods. Involves a main group of over 70 professional and local stakeholders (including BNFL's customers, UK Government Departments, regulators, advisory bodies, consultants, NGO's, Trade union representatives, local councils) who are brought together in facilitated workshops and meetings intermittently throughout the process. A series of working groups, each composed of around 15 members, feed into and support this main group. The Waste Working Group (WWG) (see Environment Council, 2000) and the Spent Fuel Management Options Working Group (SFMOWG) (Environment Council, 2002) cover radioactive waste issues and are brought together over a defined time period in facilitated workshops and meetings. The SFMOWG has undertaken a form of deliberative multi-criteria analysis through scoping and agreeing on the options/scenarios for spent fuel management, developing criteria, and evaluating these options using multi-attribute decision analysis to prioritise the options to be taken forward. Agreed options were then subject to a strategic action planning approach (SAP) which makes underlying assumptions explicit and plans contingencies based on alternate future possibilities. The SFMOWG was supported by the Socio-Economics subgroup who underwent a facilitated joint fact-finding process, a form of collaborative research where stakeholders scope a piece of technical research/analysis, agree on methodology and forms of analysis, identify and commission technical experts and oversee the work (see ERM, 2001).
3	Benchmarking public opinion, 2002 (Market Research Services; for DEFRA) (see Kelly & Finch, 2002)	To provide the government with a benchmark of the general publics' views, understandings, knowledges, and reactions, in relation to radioactive waste management issues. (National policy level; Framing)	8 focus groups (6-8 per people group) each convened for 2 sessions were undertaken in London, Walsall, Newcastle, Cardiff - each group being representative of different demographic categories (gender, age, and education). The first session imposed minimal prior framings to explore spontaneous attitudes, top-of-mind environmental concerns and levels of awareness and knowledge. The second session (after information provision on radioactive waste and management strategies) explored informed views, the reaction of participants, and perspectives on public involvement in decision-making.

2	BNFL Magnox Authorisation Consultations, 2000-2001 (Environment Agency)[25]	To gain the views of stakeholders and the public for consideration in decision-making on the reauthorisation of 8 Magnox power stations as a result of a change in ownership. (Local level project; Decision / Action)	Consultation included: the publication of consultation documentation for each site with range of ways to access and feedback comments (web, post); a programme of public meetings (attendance varied between 20-600 people depending on site) and face-to-face surgeries with individuals for up to 2 hours (attended by an average of 20 people over a two day period) at each site during an extended consultation period. Participants: professional stakeholders and local stakeholder groups including local authorities, statutory consultees, members of the public, national and local public bodies, interested groups and organisations, the Agency's relevant Advisory Committees and Groups, and Local Community Liaison Councils.

[25] This represents an attempt to advance the traditional 'consultation document' mode of consulting. There are numerous recent examples of such traditional consultations in the area of radioactive waste in the UK, including: the DETR consultation on the UK Strategy for Radioactive Discharges 2001-2020; the DETR consultation on guidance to the Environment Agency on radioactive waste discharges; the DTI/UKAEA consultation on Dounreay spent fuel and the Dounreay Site Restoration Plan; the Environment Agency consultation on Sellafield Discharge Authorisations; the Environment Agency consultation on Sellafield MOX Plant authorisation; the Environment Agency consultation on Technetium-99 discharges from Sellafield.

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