

The Front of the Front End:
Mapping Public Concerns about Radioactive Waste
Management Issues

Report to UK Nirex

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Preface

As part of its commitment to stakeholder dialogue Nirex commissioned the Centre for the Study of Environmental Change (CSEC) at Lancaster University to conduct research into people's concerns about radioactive waste management. The work will be used to develop our approach to consultation mechanisms and to develop information to address people's needs.

The study was undertaken in Summer 2000 by conducting 11 group discussions around the country. The groups met for twice for, two hour sessions and consisted of 6-8 people made up of the general public. Each group represented a different demographic group of the population.

It is generally recognised throughout the world that successful management of radioactive waste requires the consensus of all stakeholders, including the public. The UK Government has the policy role for managing radioactive wastes and we are being supportive of that in commissioning this research, both for our own work and to feed into Government.

The aim of the research was to build on work conducted by the Future Foundation and to enable Nirex to gain a better understanding of the issues and concerns that the general public have about radioactive waste. Previous research has shown that the public need to be given time and space to think about and discuss the issues as they are not usually something that they come across in their daily lives. The research aimed to give people the opportunity to do this.

The report has been reviewed by Nirex, but the views expressed and the conclusions reached are those of the authors.

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The authors would like to acknowledge the co-operation of the people who participated in the group discussions on which this report is based. We cannot claim to speak for them but hope that their views and concerns come through clearly in this report.

Executive Summary

Nirex commissioned this research into public perceptions of radioactive waste management issues to assist in the design of an appropriate consultation process on how future strategy should develop. The broad aim of the research was to elicit and explore as wide a range of responses as possible from members of the public in order to provide a broad-based input into the development of the consultation process. The study involved eleven focus group discussions with a wide range of individuals living in different areas of the British Isles and having varying levels of familiarity with the nuclear industry and radioactive waste issues.

Factors influencing public views

A number of factors were found to influence public views, in particular:

- the level of trust or distrust in institutions and organisations responsible for managing radioactive waste (including government, science and industry);
- the extent to which people feel empowered or powerless in relation to policy developments;
- the negative cultural associations and stigma attached to nuclear and radioactive waste issues;
- the effects of local experience and knowledge; and
- the extent to which there is a perceived social need for the developments being proposed.

Messages for policy-makers

Several key messages recurred across the different groups. Some of these related to the relationships between relevant institutions and the public, some to the way in which the policy development process should proceed, and some to specific policy options.

- Organisations and institutions involved in the development of waste management policy are perceived as being secretive and untrustworthy; they must be open, honest and fair
- The public should be informed, in a clear and comprehensible way
- Information from all sides of the debate should be made available
- The problem should be addressed now, not left for future generations to deal with
- The search for solutions should be adequately resourced
- All possibilities should be considered and a long-term perspective taken on the problems, unconstrained by economic or political short-termism
- More research should be carried out, particularly into longer-term technological solutions such as transmutation rather than simply 'burying' or 'dumping' the waste
- Safety should be the priority, not cost
- Although calling for all possibilities to receive serious consideration, most people were of the view that wastes should be stored on land (not beneath the sea or the sea bed)
- Wastes should be monitored and retrievable, although views were divided on whether this should be on or near the surface or in deeper storage facilities
- Siting considerations should include proximity to centres of population and the availability of compensation, both for loss of property values and to make the option of relocation available to local residents

- Storage at existing nuclear sites was suggested in many groups
- Transportation of radioactive wastes was an issue of general concern
- An independent body should be responsible for overseeing the development and implementation of a waste management strategy
- There should be wide-ranging public consultation throughout the process

Views on specific policy options

This research was intended to identify issues and concerns that should be taken into account in the development of a wider process of public consultation, rather than to reach agreement on specific policy proposals. Some 'headline' observations can, however, be made. In general, participants:

- Rejected solutions involving disposal at or beneath the sea, in the Antarctic or in space as being inherently more risky and ethically less acceptable.
- Favoured *storage*, rather than permanent disposal, of waste *on land*, although views differed on whether this should be on existing sites or in a new facility and whether it should be 'deep', 'shallow' or surface storage.
- Insisted that *monitoring and retrievability* of wastes should be central to any solution that is developed.
- Expressed interest in the longer-term possibilities of nuclear transmutation or some other, as yet unidentified, technology to treat the waste.

Implications for the Nirex consultation

The results of the research clearly have implications for the public and stakeholder consultation process to be carried out by Nirex. To begin with, they strongly support such a process but emphasise the need for it to be carried out in a completely open and transparent way. Independent third party monitoring and evaluation of the process would help to validate the process. Crucially, the perceived legitimacy of consultation is also tied to the visibility of the responses which clearly take expressed views and concerns into account. However, the views expressed in the groups suggest that Nirex not only needs to be more open in its dealings with the public and its activities more transparent but that it may well need to review its governance and funding structures to meet public expectations of independence.

The research also highlights the need for the points of view of all sides of the debate to be heard and for the public to be informed of these different viewpoints and arguments. However, it also presents something of a challenge to those different parties to present their views and address the problem in ways that are perceived by the public to be constructive. The people who participated in these groups took the issue extremely seriously and were critical of political posturing and point scoring by any of the parties involved. At the same time, there is the challenge of finding ways of providing information on this complex and emotive issue that manage to be concise, comprehensible and, above all, credible to the non-expert public.

The results of the research outline the most prominent issues for those members of the public who participated in the study and identify the most recurrently expressed views. Attention of these results in the design of the proposed consultation process will increase the likelihood that the process is seen to address public concerns and enhance its chances of success.

1 Introduction

The need to consult with the public in the very early stages of policy development is now recognised as good practice in a range of environmental risk fields. Leading expert advisory bodies both in Britain and the United States have highlighted the importance of identifying the ways in which issues are understood by the public and of incorporating public values in the policy process in order to develop policies that are both effective and publicly acceptable.¹ These bodies have also emphasised that the process of interaction with stakeholders, including the wider public, should be established at an early stage of the process rather than later when various intellectual and policy commitments may already have been made. In this spirit, Nirex commissioned the research into public perceptions of radioactive waste management issues reported here to assist in the design of an appropriate consultation process on these issues. The broad aim of the research was to elicit and explore as wide a range of responses as possible in order to provide a broad-based input into the development of the consultation process. The research was therefore intended as a first, rather than last, word on the matter and was not intended as a substitute for the more extensive consultation that will follow.²

The research was designed to elicit the underlying issues, concerns and questions (including latent concerns) that inform public views in relation to radioactive waste management. Issues and questions that the research set out to explore included:

- *Information*: what sorts of information, in what forms, and from what sources, do the public want?
- *Decision-making, consultation and participation*: to what extent do the public feel they should be consulted, and at which stages in the decision-making process? How do members of the public feel they should be represented in decision-making?
- *Relationship with the nuclear power industry*: To what extent do people differentiate between radioactive waste management institutions and the nuclear industry, particularly BNFL? What consequences do any associations made have on their attitudes towards radwaste management strategies? Do the public see waste management decisions as inevitably bound up with questions about the continued production of such waste, or can they see radioactive waste as a discrete problem to be solved? Do people differentiate between waste generated by UK energy production and commercial reprocessing activities, particularly those carried out for overseas clients, and what consequences does this have for their views of waste management strategies?
- *Assumptions*: where do the public's assumptions differ from expert assumptions, particularly in relation to the scientific, technological and social domains? How might these divergences be addressed? Conversely, are there any points where

¹ Royal Commission on Environmental Pollution (1998) *Setting Environmental Standards*, Twenty-first Report, Cm. 4053, London: The Stationery Office. Stern PC & Fineberg H (editors) (1996) *Understanding Risk: Informing Decisions in a Democratic Society*, Committee on Risk Characterization, National Research Council, Washington, DC: National Academy Press.

² We use the term 'the public' in this report, for the sake of brevity, to refer to members of the non-expert public. We do not intend to imply that there exists a single, homogeneous 'public'; on the contrary, we are very conscious that there exist many different 'publics' for this issue.

public and expert views *converge* - and might it be possible to build upon these points of convergence?

- *Trust*: how do the public view the various actors and institutions involved in radioactive waste management (most of which they will know nothing about)? What is the basis of any public trust or distrust in different actors and institutions? What arrangements for the management of radioactive waste, if not those currently in operation, would enjoy (greater) public confidence?
- *Uncertainty*: what are public views on the uncertainties surrounding long-term radioactive waste management? Are people looking for guarantees of 'zero risk' and if so, why? What is driving such demands? Are they linked to trust/distrust of the institutions involved or do people accept the inevitability of and need to accommodate uncertainties? If the latter, in what circumstances would they do so?
- *Issues*: Which issues (e.g. retrievability, disposal versus storage) do the public identify as important?
- *Siting*: what considerations do the public feel are important in relation to the selection of potential sites?
- *Time-scale*: what concerns does the public have in relation to the very long time-scales involved in radioactive waste management?

These research questions were based in part on previous research into public responses to nuclear industry and other technological risk issues, in part on known policy issues and they are indicative rather than definitive. The project was designed to facilitate exploration of these questions as well as any further issues raised by members of the public themselves in the course of the research. A number of other studies have addressed some of the same issues. This research project was therefore supplemented by a comparative review (summarised in Appendix 5) of three other recent studies of public views in order to identify recurrent themes, as well as to highlight commonalities or differences in the analysis of factors that shape public concerns.

In the next section, we outline the research design and address some important methodological issues. Then, in Section 4 we discuss the processes by which the participants in our groups reasoned about the issue of radioactive waste. The following sections address firstly the main associations, themes and concerns that emerged in the discussions before moving on to examine participants' views on key issues relating to the process of identifying and deciding upon specific management options, as well as upon the current options themselves. The penultimate section gives a summary of participants' messages to policy-makers and their views on the way forward and the report concludes with a brief discussion of the implications of the research for the development of a public consultation strategy (and, ultimately, a policy) on radioactive waste management. Illustrative quotations from participants in the group discussions are indented and italicised.

2 Research design and methodological issues

2.1 Focus groups

In order to explore these issues and questions a research method was required that would facilitate reflection and deliberation by members of the public. The method used for the study was the focused group discussion. This involved convening groups

of six to eight participants for a discussion facilitated by a member of the research team. Groups met at an informal local venue and were provided with refreshments; incentive fees of £20 per participant were paid. Each group met twice, for two hours on each of two consecutive days, which allowed time for the required depth of discussion to develop.³ During the meetings, after an initial discussion to explore existing views and associations, participants were given some basic information about radioactive waste, followed later in the meetings by some statements made by organisations with different views on the issues and by a list of waste management options. The role of the facilitator was to enable participants, in dialogue with one another, to express and elaborate their views in their own words. Focus groups are not statistically representative of the wider population or of specific social groups, but rather are an effective way to capture the typical range of views on an issue. Recruitment criteria for the groups were therefore designed to ensure that participants came from a range of social backgrounds and situations (see Appendix 1).

2.2 Locations of focus groups

Professional recruiters were used to recruit eleven groups at different locations around the country. Locations for the research were selected to achieve a wide geographical spread and a variety of local experiences with the nuclear industry and with radioactive waste. This enabled an examination of the influence of previous local experience of the industry or of radioactive waste management issues on public views and concerns.

The rationale for recruiting several of the groups in locations where there was previous experience of the nuclear industry was that people in those localities were likely to have a different experience of and feelings about the issues than people for whom the issues were geographically and experientially more remote.⁴ It is important to explore any differences in perception and response to which these might give rise for two reasons. Firstly because it ensures that views and concerns that might otherwise be missed were identified by the research and secondly because, whichever technical option is agreed, location and local perceptions will be a key issue. The 'nuclear' sites included: Berkeley, a village in Gloucestershire where there is a decommissioning nuclear power station; Burnham-on-Crouch, a small town in Essex close to Bradwell nuclear power station, which in the late 1980s was identified as a potential site for a low-level radioactive waste repository; Gosforth, a village in West Cumbria near the Sellafield reprocessing plant, which was until recently identified as the most likely site for a geological repository for intermediate level radioactive waste; Lancaster, a town that is in sight of the Heysham nuclear power station; and Reading, a city with several nuclear establishments in the vicinity, including Aldermaston and Harwell. One of the 'non-nuclear' locations, St. Ives in Cornwall, was chosen because it is in an area with high levels of naturally-occurring radon gas in which house owners have been subject to radon information campaigns. The remaining locations - Birmingham, Bridgend, Cheltenham, Leeds and Fort William -

³ The only exception to this format was the group of retired people that met in Cheltenham. For logistical reasons, this group was convened for four hours on a single day.

⁴ Research into public perceptions of risk associated with industrial major hazard sites has found clear patterns of difference when localities are compared. See Simmons, P. and Walker, G. (1999) 'Tolerating risk: policy principles and public perceptions', *Risk, Decision and Policy*, Vol. 4, No. 3, pp. 179-190.

had no direct associations with the nuclear industry or with radioactive waste issues and were chosen simply to ensure a geographical and socio-demographic spread of participants.

When talking of 'nuclear' localities in relation to public perceptions, it is important to note that perceptions of what constitutes 'near' and 'far' are not defined by a quantified measure of proximity but depend on a number of factors. For example, participants living in Lancaster, some seven miles from Heysham nuclear power station, did not on the whole consider themselves to be 'close' to a nuclear installation, in part at least because Lancaster has a very separate identity from Morecambe and Heysham. In contrast, members of the Fort William group were very concerned about Dounreay, which is over 100 miles away. This may be attributed, in part at least, to the fact that they were SNP activists in the Highlands and Islands Region and tended to think of the whole region as 'local', and in part to the different perceptions of distance where populations are scattered.

2.3 Public views and the deliberative process

A key reason for using focus groups as the research method for a study of this kind is that they allow participants to engage with issues in ways that are meaningful to them. People are free to use their own language and forms of expression and to elaborate or qualify their views in ways that are not possible with more structured forms of inquiry such as questionnaire surveys. Another valuable feature of the focus group is that it is an inherently interactive situation, where participants can pick up themes raised by others, challenge one another's points of view or change the direction of the discussion.

Radioactive waste is clearly not a subject which is part of the daily lives of most of the people who participated in these groups and, with some exceptions, most knew very little about it and had not thought about it previously. This meant that many people did not come to the meetings with an already established position or view on the topic. One consequence of this is that people are very often reasoning as they talk, with the result that there is more trying out and shifting of positions than might be the case with a more familiar topic. Several participants commented that they had been thinking about the issues between the two meetings and that although they had argued for one position earlier, after consideration they had changed that position.

There is a common presumption that reasonable positions must be internally consistent. However, although the understandings and positions expressed in contexts such as focus group discussions may at times be inconsistent, it is arguable that people produce consistent reasoning only in particular social contexts where such consistency is a required norm. Thus, in everyday life it is perfectly reasonable to hold what may appear to be inconsistent beliefs. During the process of deliberation, however, more consistent and coherent positions tend to be produced, as different arguments and considerations are explored within a context of presumed norms that value consistency.

The ability of members of the public to engage with complex issues and move from unreflective reactions to reasoned positions when provided with the opportunity to do so is at the heart of the current trend towards incorporating new consultative processes

into decision making on technological policy issues. This capacity also suggests that, given the appropriate conditions - about which we will comment later - it is perfectly possible to have a reasoned public debate on radioactive waste management options.

3 Radioactive waste - key themes and issues

As other studies have found, radioactive waste is not a subject to which these members of the public gave much thought on a day-to-day basis.

It's only because we're all sitting here and we're actually talking about it and it's making us all think about it. (Reading)

When they did turn their attention to the subject, radioactive waste often came across in the first instance as an undifferentiated part of a somewhat homogenised overall context of largely undesirable nuclear activities.

3.1 Initial associations

The groups began with an invitation to express the images and associations that came to mind in relation to the term 'radioactive waste'. The initial responses were overwhelmingly negative, including associations with danger, risk, fear, pollution, leaks, accidents, disasters, war, bombs, health risks, leukaemia, birth defects, secrecy, illegality, underhandedness, the uncertainties posed by the long time-scale, 'dumping' and lack of safe disposal.⁵ There were several references to Chernobyl, both in this preliminary exercise and later in the discussions. Not only had the accident made an enormous impact on public perceptions of nuclear safety but it had also given people a different perspective on the significance of 'remote' events involving radioactive materials. In a much more immediate way than climate change or ozone depletion, it 'globalised' people's sense of risk.

It's unbelievable that an explosion in Russia can stop a Welsh farmer selling his sheep. That's what it amounted to. (Cheltenham)

Similar negative patterns of response have been found in other studies. Many of the responses do not refer specifically to radioactive waste but to other aspects of the nuclear industry and its operations, including the military use of nuclear technology, although by analogy many of the associated concerns are related to the radioactive waste issue.

3.2 Positive associations

It was, in general, only when asked directly if radioactive waste held any positive associations that a small number of participants mentioned nuclear power, medicine and (in connection with Sellafield and Dounreay) employment as possibly beneficial activities with which it was associated.

⁵ A summary listing of these initial associations is given in Appendix 2.

3.3 Nuclear power

Perhaps the most widely discussed issue associated with radioactive waste was nuclear power. Many people held views that ranged from scepticism towards its claimed benefits to outright rejection of such claims and an insistence that, in the face of the increasing volume of waste and the lack of any means for rendering it safe, the industry should be closed down. Others simply saw it as an inevitability, something that would not go away now that it was there. There were, however, some participants who saw nuclear power as being economically and nationally beneficial or who saw it as preferable to fuel production based on burning fossil fuels.

If we're talking in terms of comparing the risks from storage or radiation-producing materials as compared with global warming we have the situation where, to a greater or lesser extent, global warming is with us. We understand - again it's a question of have we got sufficient knowledge but we understand - that fossil fuels are a major contributor to that. Surely it's more important that we stop the current risks than try to anticipate future risks which will arise, one hopes, if they arise at all, at a stage when the human race is advanced in technology and is better able to cope with it. If, taking the worse case scenario, global warming could lead to the situation where there isn't a future generation to worry about. (Cheltenham)

3.4 Sellafield and Dounreay

Sellafield was a recurring point of reference for many people, although the associations were rarely positive. Across all groups Dounreay was mentioned less often, except in the case of the Fort William group, and again most references were framed in a negative way. It was noted in the report of research conducted recently for the Nuclear Installations Inspectorate that there had been no recent adverse publicity to draw people's attention to the issue of radioactive waste.⁶ However, the situation had changed by the time that we conducted our groups. Significantly, people in ten of the eleven groups conducted for this study referred (either in the initial exercise or in subsequent discussion) to the controversy surrounding irregularities at Sellafield associated with BNFL's merchant reprocessing of Japanese spent fuel.⁷ This episode was a focus for three specific issues of concern. First was the problem of mismanagement of radioactive waste, whether in the short or long term. The second issue was the importation of spent fuel ('waste') from other countries, often perceived in terms of waste being 'dumped' in Britain as most people were unclear that the material was being reprocessed for reuse or else had the impression that residual wastes were retained at Sellafield. Apart from one reference to the potential commercial benefits of the enterprise, most people were critical of or hostile to these commercial reprocessing activities (similar comments were made by the Scottish group in relation to Dounreay - see below). A third issue that concerned some people was the international movement of the waste and the reprocessed fuel (as we shall see below, transport within the United Kingdom was also a concern). Apart from this recent controversy, however, most other references to negative associations with

⁶ Taylor Nelson Sofres Harris, *Nuclear Installations Inspectorate - A Public Opinion Survey: A Research Report*, March 2000.

⁷ The image of 'waste' shipments being shuttled back and forth had a distinct resonance with the Karin B story, involving an unwanted shipment of toxic waste that was sent from country to country, which caught the headlines for several weeks during the summer of 1988.

Sellafield were made by people from West Cumbria, who expressed concern about leukaemia clusters (as well as mentioning one specific, high profile case), the visual impact of the site on the local countryside, and the 1950s fire. The fire was also mentioned in the group of retired middle class group in Cheltenham over-60s group and leukaemia clusters near Sellafield were mentioned in St Ives group. Only in the Gosforth group was the site's role as an employer given any emphasis, although the fact that Sellafield and Dounreay create some employment was also noted in the Cheltenham and Fort William groups respectively but in neither case was this argued as a major benefit.

Various references were also made to Dounreay, although for most of the groups these did not seem to hold the same iconic significance as Sellafield. For example, in Gosforth and Lancaster these references related to abandoned plans for an underground repository or to the decommissioning of the site. In Birmingham, there were references to closing down the site and to an incident where the cap was blown off a shaft containing waste. The post-devolution politics of siting a radioactive waste facility was also raised in the Birmingham group.

Sticking it at Dounreay, you've got the Scottish Parliament to think about as well haven't you. Political minefield isn't it. "You're not dumping English nuclear waste in Scotland". (Birmingham)

The most extensive and critical references to Dounreay came from the Fort William group, for whom it was seen as a significant regional issue.

Well obviously, in the Highlands we have a particular regard to what goes on at Dounreay. (Fort William)

The group was aware of issues associated with Dounreay. There was a perception, in some cases based on first hand contact with the site, that management at the site was poor and that official reassurances of safety were untrustworthy.

It was incredibly bad, and the workers were frightened to talk to you about what they were actually doing and about what the safety record was, and all the safety numbers on the wall say no accidents this year....and to date...and you're speaking to people that would tell you there was actually an accident the week before. [...] It looked very, very old and it just wasn't good, and any questions about anything sticky like the shaft were met with polite looks and shrugs of the shoulders with the words 'no problem exists', when everybody was starting to believe there was a problem...they're not open, they're not honest and the fear factor's there anyway so that just compounds it all. (Fort William)

Another member of the group expressed the resentment felt about the presence of the site in Scotland:

Stop the processing, get rid the transport problem that you have... Anybody else feels it's so safe, let them have it on their doorstep. Keep it there, I'm quite happy for them to have it there, so long as it doesn't involve our country. How much does it cost, not just that, how much does it cost to transport it? Who's paying for that cost? All of us that are working are paying for it, we're paying

for the privilege of having Dounreay on our doorstep, for our children to be poisoned in many years to come, or our grandchildren, or great-grandchildren. It's not fair... (Fort William)

3.5 Transport

Transportation was raised as an issue in all eleven groups. The combination of the known (though widely accepted) risks of transport in general and radioactive materials appears to trigger some of the same sort of responses as the combination of 'radioactive' and 'waste', that is, high levels of concern. One response to the prompt on images and associations of radioactive waste was 'trains in the dark', an image that captured associations of secrecy and threat. Most participants felt that it was desirable to minimise the transportation of radioactive waste.

You want to minimise the risk so you want to transport it as little as possible. (Birmingham)

People pointed to recent rail and other transport accidents to support their concerns that any form of transportation was risky and that 'accidents will happen'. There were four references across all the groups to the televised experiment that involved driving a locomotive into a flask to demonstrate its robustness, which most of the speakers found reassuring. However, for those who advocated a single site for storing the waste (see below), transportation from around the country was a necessary risk. For the majority, as noted above, the transportation of spent fuel and wastes between BNFL and its overseas customers in the course of commercial reprocessing was not seen as either desirable or acceptable. Notwithstanding the safety record of nuclear transport, these concerns have to be taken seriously. Further statements on the historic safety, and the precautions taken, are unlikely to assuage these fears, as they do not address the concern that accidents can – and, eventually, will – happen. This would also need to be considered when reviewing and presenting to the public different siting options.

3.6 Waste and recycling

During the course of the group discussions, it became apparent that people were often drawing on widespread cultural orientations towards *waste* more generally. Over the past decade or more, ideas about recycling and re-use have taken root in the public consciousness and these were applied by analogy to radioactive waste.

We know now that household waste is basically recycled, so why can't a lot of this nuclear waste be recycled? (Berkeley)

The majority of participants with no prior experience of the nuclear industry had little or no idea of the nature of current fuel reprocessing operations, seeing them more often in terms of 'waste' being 'dumped' (as noted earlier in connection with BNFL's international reprocessing business). However, when it became clear in the course of discussion that reprocessing gave rise to other wastes, the notion that this might equate with 'recycling' was seen as problematic. Other participants seemed to have in mind some kind of transformation, whereby the waste could be rendered less harmful (we return to the issue of transmutation below). Applied to radioactive waste

management, the recycling analogy also gave rise to ideas about the potential usefulness of the material.

There must be some way of recycling it and doing something with it. [...] Why can't they be putting this waste to good use as opposed to storing it underground and letting it rot and leak and goodness knows what else. (Birmingham)

This, then, leads to a position that material should be stored until such as time as it can be rendered less harmful and put to good use (again, an argument to which we return below in our discussion of participants' views on different disposal and storage options). Most respondents knew little or nothing about reprocessing or the industry argument that spent fuel, at least, is a resource rather than a waste but were making a general point about the slippage between waste and resource designations and the unknowability of the future uses and value of these materials. Only one participant, speculating on future possibilities, suggested that the waste might later be treated as a resource.

Our waste repositories will be like the new gold mines in the future, "This is wonderful that they've stored this fuel up for us", you can never tell, can you? (Birmingham)

There were many references to the short-sightedness of producing wastes for which there is no disposal method available.

To an extent, public views about radioactive waste were coupled to views of the inevitability or lack of need for the processes that produce the waste, that is, whether or not nuclear power production is necessary. Although some other processes, particularly medical uses, were seen as valuable and needed, many respondents took up the point that the majority of wastes are produced by the nuclear power industry.

3.7 Time-scales

In order to put in perspective the time-scales involved in radioactive waste management, a 10 metre strip of paper was used in the groups to represent the last million years of human history, marked with various milestone events (e.g. the last ice age, the iron age, discovery of radiation). Interestingly, few people responded to this directly: it seemed (and some people stated) that such time-scales were unimaginable. It was apparent that some people initially thought (in so far as they had thought about it at all) that the lifetime of radioactive waste is in the region of hundreds rather than thousands of years. This is likely to be related to the inability to comprehend time-scales longer than this and a corresponding tendency to draw upon more 'knowable' time-spans as a device to aid reasoning about the issues as much as it is to a general lack of knowledge about radioactivity. It seemed that there were no commonly available cultural resources through which to make sense of such periods of time. This came out explicitly in some groups, where people said they could not think beyond, perhaps, their great-great-grandchildren. The reference to grandchildren was clearly a response to the discussion of the long-lived nature of the hazard and the concern expressed by many about the well-being of future generations.

I think that at the end of the day, we're looking at the generation that's to come, our children and our grandchildren. And I think we're all of the same mind on that. I mean we want to make sure that they're safe. (Bridgend)

However, it also indicates a generational yardstick that was commonly used to grapple with the time-scale involved, even where some people clearly recognised that it was not an adequate means of representing it, as this exchange from the Birmingham group illustrates.

- If they just expressed it in terms we understand it means our children and our grandchildren have still got the problem.

- And on and on and on and on and on.

- I don't think we can look much further than them really. I don't think in those terms anyway. [...] You get to a point where your mind just can't take it in. I mean, we've had to use that as an example of the timing, to put it into some sort of context. (Birmingham)

Participants were shown a statement made by the Uranium Institute to the effect that radioactive wastes would, unlike some other toxic wastes, decay and become harmless in time. A surprisingly common response was that it was irrelevant to speak about the materials becoming harmless by a particular time, even if that involved millennia, if we did not stop producing waste now.

It's only a valid statement if you're going to put no more waste down there but if you're putting fresh waste down there all the time you just perpetuate the problem don't you. (Birmingham)

The reasoning here was that the predicted point of safety would be pushed further into the future, despite the fact that the period of continued waste production might be extremely short in relation to the overall period for which some of the materials would remain radioactive. This implied that people were still tacitly thinking in terms of much shorter time-spans, in relation to which an additional period of a few decades would still represent a significant increase. For these people, production of wastes had to stop now if the problem was to be dealt with.

The time-scales involved in the long-term storage and management of radioactive waste dwarf human experience - as well as many of the more meaningful reference points of human chronology - in a way that renders it extremely difficult for members of the public to relate to them. Yet this is a critically important issue and a key factor in any strategy that is proposed. Representing and discussing such time-scales clearly presents a challenge that will have to be addressed in any future consultation process on future options and siting strategies.

3.8 Views of science and expertise

Some of the focus group participants seemed confident in science and scientists to be able to address the problem of radioactive waste. However, many other people in the groups had what might be termed a disenchanted or sceptical view of science and scientists. On the one hand, some felt that scientists are inclined to pursue their own interests and ends, without regard to the 'natural order' or to society's moral codes.

They seem to be messing about with things that they shouldn't be. What's wrong with the natural history of things, just let things go the way they should go. Stop tampering with things. There's no need for it. (Bridgend)

I mean, with the atomic bomb, I don't think the scientists were very interested in what it might be used for, it was the fact that they've managed to discover it that was interesting to them. [...] They were interested in the outcome because that was all part of a scientific experiment if they reduced it to their narrow channel of viewing but that was only because whatever you invented, of course you'd be interested in seeing the outcome of how it was used. I think scientists can be channelled that way. They're not moralists, they're not going to stop in their tracks and say, now, should we go any further with this because they're driven to take the next step. (Cheltenham)

On the other hand, in contrast to all those who expressed confidence in expertise, there was also concern about the adequacy and limits of scientific knowledge as a guide to policy. One aspect of this was the uncertainties arising from the problem of time-scales that has already been mentioned and which are inherent to radioactive waste management:

How can you prove that something is safe in, say, our lifetimes or our children's lifetimes or even our grandchildren's lifetimes when the only experience we have of it is 40 years roughly, 40, 50 years? So therefore, they're talking about materials that are radioactive for a thousand, two thousand, two hundred thousand years. (St Ives)

This perceived inability of science to be able to anticipate processes and events so far removed was a fairly common concern, although there were a few people who saw the link between time-scale and scientific knowledge in a more optimistic way:

Yeah, but the other way to look at it is they say scientific knowledge doubles every ten years or something daft like that, I don't know what it is and that most of the knowledge that's around today has been actually developed in the last twenty-five years and you think to yourself well there's a cause for optimism then because hopefully in the next twenty-five years they might sort the problem out and find a way of... (Birmingham)

Others based their concerns on the past performance of scientific advice to policy-makers, referring to previous issues such as BSE.

*- Ultimately it will be a political decision but they should be very much led and guided by scientific advice, without a doubt.
- But then the government says they were guided by scientific advice over BSE. (Berkeley)*

The thing is with the government though, they set loads of regulations and stuff, and try and regulate things, but they always...a lot of the time they get it wrong don't they, 'cause... You know, you've got the BSE problem, which they thought were dealt with and then it came back to haunt them a few years later. They think they're dealing with things now but they don't really know. They're

not 100% certain the low level waste is gonna be...you know that it won't harm anyone at all, so they shouldn't be dumping it anywhere that it's dangerous unless they are 100% certain that it's not going to cause problems. But obviously I don't think they do know that. (Leeds)

Other participants in the groups were less concerned about the adequacy of knowledge and rather more about whether scientists and those responsible for managing radioactive waste would manage it safely.

I think there's a lot of understanding about how to handle radioactive waste and products and so on, the question is not so much do they know how to do it but whether they follow the rules. And when cost cutting is involved...and I think that was something to do with this BNFL thing...wasn't there, cover ups and so on? Usually, I think there's two reasons why things get covered up or corners get cut. One is to do with money and the other one is to do with power, perhaps trying to take advantage over a competitor or something like that and trying to get a move ahead of some other part of the nuclear industry, I'm not sure but... I think there's a lot of technological understanding around, but that doesn't necessarily get as high a priority when decisions are made as it ought to have. I think money's the bottom line. (Lancaster)

Although people recognised the value of science to society, scientists were widely perceived as being fallible, potentially self-interested and subject to external pressures that were likely to run counter to the public interest. At the same time, in the light of the perceived limits to scientific knowledge and of limited institutional resources, regulatory science was seen as being, at best, imperfect. These concerns about knowledge and expertise need to be borne in mind when communicating with the public as part of the planned consultation process, if the credibility of the process is not to be undermined by in-built and perhaps unrecognised assumptions about the authority of science.

4 Information and openness

Most people in the groups displayed a strong self-awareness of their own lack of knowledge about radioactive waste and the industry that produces most of it.

I think it comes down to what we all keep on going back to as well, is how much information we all know. You know, we're just thinking of things from Star Trek and stuff. We don't know the nuclear industry, we don't know how bad the waste is, how big the containers are, you know... We don't really know enough, it's just gut feelings. (Birmingham)

Alongside this was the awareness that media coverage tends to highlight things going wrong and does not necessarily tell the whole story.

Well, I don't know. I think one of the problems with the whole issue is that, well, it's human nature generally, it's a lot easier to spin negative news and what have you than it is to put a positive face on it. Everything you ever hear is negative and as that guy said over there you don't sort of, no one ever seems

to explain what the positives are. And I try not to pre-judge but you do get bombarded with negativity on it. (Birmingham)

Despite this scepticism about what some saw as a tendency for scaremongering by the media, there was also recognition just because the media produce alarming headlines was not a reason *not* to be concerned or take action - people all saw this as a very serious issue:

And you'd think "Yes, I realise that we mustn't panic, we mustn't get into our panic stations like with the headlines in the newspapers" but I think that if in fact we can have built-in safe guards or whatever, we can't take this cavalier attitude well, we're gonna be dead and our children are going to be dead [before anything is likely to go wrong] and so it doesn't matter. (Cheltenham)

However, when taken in conjunction with other experience, what people knew - and very often, what they felt that they *didn't* know - seemed to them to be a valid basis for concern. There is a very strong sense of the secrecy of the nuclear industry, in part (but only in part) related to the linkage between nuclear activity and the military. Many people referred to 'cover ups' of accidents or of mismanagement. This secrecy gives rise to a sense of exclusion and alienation that fosters a profound mistrust both of the industry and of official bodies in the nuclear arena.

A recurrent theme of the discussions was that information should be widely and comprehensively available, and that people should be better informed. They also want 'neutral', 'balanced' or 'independent' information, whilst simultaneously recognising that there are no single neutral, balanced or independent sources of information (universities came closest, in their view, to potentially being such a source, but even here it was recognised that much university funding comes from industry or other vested interests).

This, though, has a sense of passivity about it – people want to be informed (i.e. the information comes to them) rather than playing an active role in seeking information. Participants also recognised that they would not be likely to read leaflets, magazine articles etc, or watch television programmes, unless radioactive waste had become directly relevant to them – that is, a site had been proposed in their local area. Hence, for those already living close to an existing nuclear site improved information provision had a more immediate significance.

What I'd like to see is any citizen of the town can go into the library and ask to see the background radiation each month when they take the readings off the road or whatever. So you can go in and check to see if there's any fluctuation, if it's going up or going down. (Berkeley)

Other participants felt that the onus should not be on the individual to seek out the information but that it should be disseminated in ways that are more direct.

Should it be more than available though, because there's a difference between it being in the library and you having to go and look or in the paper where it's coming to you. [...] They publish the tide times, maybe they should publish the radiation levels. (Berkeley)

However, even receiving information about nuclear power face-to-face from people within the industry does not necessarily provide the information that members of the public want, as the following experience makes clear:

I was one of the first visitors when they opened the visitor centre, a) because I lived in the area and also you know, you'd never had the opportunity to go and so, and it had always been, you know, Bradwell power station is there sort of thing, and it gave you the opportunity to go and find out exactly what was on your doorstep and if there were any dangers to your health. I mean I had two children and, as I say, we used to go and swim in the water there. And I took my son with me as well because I thought it would be an education for him. I mean it went completely over his head because he was too young. But I came out of there, and as much as I thought they did a good job of the tour and it did open my eyes because I'd never been inside a nuclear power station before, I actually came out of there with no knowledge. And I still didn't know if it was dangerous and what could happen and what steps they were taking to make sure that things didn't happen. I mean whether or not it's, I mean this was quite a few years ago now because that visitor centre has been open quite a long while hasn't it ... whether they've changed their tour now that they actually tell people more I don't know, I mean they did ask for comments at the end of the tour, you know, we filled in a comments slip, and I did put that I felt that I hadn't gained any knowledge of how the power station ... you know, things I wanted to know. So whether or not they've had more comments like that and they've changed their tour. (Burnham)

Although not everyone wanted to receive detailed information - in some cases it would be too worrying - but would be content to know that it was available and that those inclined to check were able to do so, it was clear that everyone felt that more information should be available. One important conclusion that may be drawn from this is that for some purposes it might be more important to publicise the fact that information is available in the public domain, and thus to challenge the perception of secrecy, than to publicise in detail the content of that information. However, the form and medium employed would have to be tailored to the specific purpose. For example, for the purpose of wide-ranging public consultation, the approach just described may not be seen as sufficiently open and proactive in its involvement of the public, an issue to which we return below. However, the basic message is, provide more information in accessible forms and ways. The cost of not responding to that demand was outlined in very graphic terms by one of the participants:

Keep the public informed, don't keep them in the dark, otherwise they might reap the whirlwind, more public disgust and anger. (St Ives)

5 Deliberating on management and disposal options

It was generally agreed that the 'current generation' has a responsibility to start making progress on this problem; there was no suggestion at all that the problem should be left, but rather a strong sense that 'we' have created the problems (and reaped any perceived benefits) and we have a responsibility to do something about the problems. This did not translate into a demand to find a permanent solution

immediately, given other considerations, but to start moving forward in finding a solution of whatever type, which in turn seemed largely to be seen in terms of investing in research.

We should be definitely looking at doing something within our lifetimes. We can't just say "Right, in six months time this is what we're gonna do" and we're gonna start doing it, 'cause we just haven't got the information and the resources to do it at the minute. But if we start looking at the problem now, in detail, continually, you know, might be ten years before we get a proper solution but at least we've done it. [...] We can't decide immediately let's do this. We're gonna have to take time, look at all the options, and decide which is best. (Leeds)

Focus group participants were presented with a list of possible options, taken from those listed in the House of Lords Select Committee report, for managing radioactive waste (see Appendix 3 below). Discussion of these options allowed us to draw out the sorts of criteria that are important to people when considering what to do with radioactive waste.

As noted above, people felt that they could not comment with authority on scientific and technical aspects of disposal, although they nonetheless freely discussed some elements, with some interesting piecing together of fragments of knowledge, and the inevitable authority claims and counter-claims which are part of the dynamics of a group of this sort. Nonetheless, even without a scientific knowledge base, people made generally sensible comments on the scientific assumptions. The suggestion here is that people do not necessarily need a comprehensive or detailed scientific understanding to engage in legitimate deliberation.

People were, nonetheless, more comfortable discussing the social and ethical aspects of different options. Some very clear ethical responses were articulated in response to siting considerations. The first is that the ocean is in some way regarded as sacrosanct, or as not part of human territory, making it wrong to place waste in the sea and to pollute this part of the biosphere.

I would never have it under the ocean... It's our life isn't it (Berkeley)

They've damaged the oceans enough haven't they (Gosforth)

The suggestion that the waste be disposed of in the Antarctic elicited a similar response from all of the groups.

I think what bothers me is using the Antarctic, full stop, because that is probably the one last place on earth that man hasn't desecrated so far. It does seem to be just from my point of view, just going a little bit too far to start using it as a nuclear dumping ground. (Birmingham)

More surprisingly, while some responded to the suggestion that wastes could be fired into space by identifying the risks of launching radioactive waste aboard rockets (with the Challenger disaster no doubt a background memory for some), other individuals articulated a belief that it is wrong to pollute other planets. It was quite clear that the

majority felt that 'we have messed up this planet and shouldn't mess up others', and that we have no rights over other planets than our own.

Having in general rejected putting the waste anywhere under the sea, in the Antarctic or firing it into space, most participants felt that it had to be kept on land and, as far as possible, isolated from the human environment. There was some discussion of remote regions in other parts of the world, particularly desert regions. It was felt that other developed countries would not be willing to take on the responsibility and risk of 'our' radioactive waste. However, the suggestion put forward by some participants, that the waste be sent to a less industrially developed country was widely rejected for several reasons. It was seen by some to be unethical to foist our waste onto less powerful countries, perhaps even more so if they were persuaded to take in return for economic incentives or development aid. Others counselled against it because of the possible consequences of political and economic instability, whether this resulted in a failure to adequately manage the waste or in subsequent misuse by military or terrorist organisations. Still others were simply concerned that there would be a lack of appropriate expertise and regulatory controls and felt that it would be safer to keep it in the British Isles. A final reason for rejecting the option of exporting the waste for storage in an international, possibly global waste facility came back to the transportation issues discussed earlier. This left participants with land-based disposal or storage as the only remaining options in the near future.

For a few participants, burying the waste in a deep repository seemed to be an attractive option as it kept the radioactive material at a 'safe distance'. Isolation from the human and natural environment was seen as a clear priority by many. However, the more general tendency was to think that this was not fully achievable – that mistakes, accidents and leaks could and would happen. Thus, continuous monitoring – 'keeping an eye on it' – was thought to be necessary. Being able to check that nothing was going wrong, and being able to respond when (not if) something did go wrong, was seen to be extremely important. (This again meant for most people that ocean disposal was out of the question. There was an almost unanimous perception that we have insufficient knowledge about the deep ocean and that we could not monitor it adequately - along with the view that if there were leaks, these would rapidly spread to contaminate all the world's oceans - to make this a viable option.)

The concern that a deep repository would lead to the wastes being 'out of sight, out of mind', and in the longer term to being forgotten or abandoned, was repeatedly articulated. A deep underground repository was particularly thought to run this risk. The dangers of 'forgetting' seemed to be twofold: on the one hand, the repository might inadvertently be disturbed and on the other, placing materials deep underground (even in storage rather than in a disposal facility) might mean that other, better solutions would not be pursued. For many, therefore, a repository would need to be literally visible, in order that the ongoing nature of the problem was continuously addressed.

Retrievability was something for which participants in all groups argued. There was a widespread feeling that it was important to be able to remove the wastes should something go wrong. In addition, most participants took the view that it is too early for permanent disposal – feeling that not enough is known, that the risks are unacceptable, and that the potential for developing new solutions had not been fully

explored. Views varied on whether it should be stored on the surface or underground. For some, deep storage, like deep disposal, had the virtue of remoteness.

Why can't they stick it in deep mines and retrieve it when the technology [to treat it] is available. I don't like the idea of it being near the surface. (Birmingham)

Nevertheless, virtually all those who proposed a deeper underground facility saw it as entailing continued access and retrievability.

There's only one [option] there that bears any resemblance to reality and that's sub-surface but obtainable. As in down a tunnel, down a shaft, middle of a mountain, but you can go in and get it when you need it. (Fort William)

Deep storage was thought by others to be incompatible with visibility, monitoring and being able to respond to problems.

A natural disaster could still affect it above surface but you've got more chance of being able to see these things coming and move them or monitor them as it happens but if it's down a mine shaft and the rock starts to move, you've got no chance, how do you get something three hundred metres out quickly...and effectively? You don't do it. (Fort William)

I think probably that burial near the surface is what I would go for out of [these] not very ideal solutions. They have to be able to monitor what's happening to it and there have to be safeguards in place so that, the monitoring, should there be problems discovered, the public should be informed and there should be safety, whatever they can manage, to the degree that the knowledge, present knowledge allows, safety should be ensured as much as possible. And if a problem arises it should be dealt with and it shouldn't just be pushed away somewhere and forgotten like on the bottom of the ocean or down in a great big deep mine, unless there's some way of keeping tabs on it (St Ives).

Those who argued for surface or near surface storage saw this as facilitating both monitoring and retrievability.

I went away last night thinking, If you bury it, will it be 'out of sight out of mind'? And I don't really agree with that because I think if it's there, if it's above the ground, it's easily accessible if anything does go wrong and if there is a problem it's detectable.... And also we can see it. And that might be a reminder for everybody to not use so much power. You know, if it's buried, we can all pretend it's not there. But it is there. And then I worry about the future. If it's there under the ground [...]there's more chance of it, if anything happens, getting into the water system. [...] Whereas if it's stored on the top and everybody's assured that it's being monitored all the time... people will be more confident with that, comfortable with it. (Gosforth)

There were some interesting speculations on the size of a waste storage facility: perhaps because we illustrated the volume of HLW produced in the UK with

reference to the size of the room in which we were meeting, participants focussed on the volume of HLW which was generally thought to be small. The size of any eventual repository (on which we gave no guidance), however, or of the accumulation of wastes over time, was perceived in a very variable way, with the exception of some members of the Sellafield group who were familiar with the RCF plans and felt them to be an enormous visual intrusion, notwithstanding the proximity of Sellafield. Whether a repository is perceived as being 'big' or 'small' is obviously a relational judgement, but may have significant repercussions in relation to its acceptability.

As some of the earlier references suggest, many participants in the focus groups focused on the possibilities of nuclear transmutation. In fact, even before the list of waste management options was introduced for discussion, several people had raised the possibility of a technological solution that would in some way alter the nature of the radioactive materials.

The one that's superficially the most attractive is that nuclear transmutation. (Birmingham)

I like the transmutation one. That's the one I was thinking along the lines of yesterday, more or less. (Bridgend).

I like the nuclear transmutation because that's what I was saying, could we kill this radioactivity? (Cheltenham)

I can't believe they are still talking about...shooting it into space and down into the ocean floor when they've got this nuclear transmutation on the cards (Gosforth).

Nuclear transmutation, definitely, if we get the technology for it up to industrial level, probably one of the better ideas. (Leeds)

This or some similar technological development was seen as complementing a short or medium term storage strategy.

Not deep deep underground, but where you can access and get in there. Vast acres and acres of it underground and you can stockpile until the scientists can develop something, like you say, that can break down all the particles, speed the process up. (Bridgend)

We don't know anything at all about the [new technological solutions] and they probably know not much more than we do. So out of all of them, burial near the surface pending technology. That's all it can be. (St Ives)

As this last quote suggests, some people were sceptical of the viability of transmutation but nonetheless recognised that over time there was likely to be some technological progress. While recognising that it was not yet available, many argued that resources should be made available to develop this technology.

They should spend the money on the nuclear transmutation because, I mean, whatever they do with [the waste] it's gonna cost a lot of money to either bury

it or put it in the ice or shoot it out into space, that's gonna cost millions to do that, because of the depths that you're talking about. So why not spend the money on new technology and get rid of it once and for all? (Birmingham)

Maybe spend a bit of money now, you know, trying to get this nuclear transmutation up and running (Bridgend).

Given the time-scales being discussed, even the somewhat unpredictable lead-time for bringing such a technology on-stream was not necessarily seen as problematic.

It could be that in 150 years, or 100 years, that the whole problem is finished with. It could've been sorted out. [The scientists] are not gonna get to that stage, with the transmutation, and stop, are they? If they suss what you're talking about there, they're gonna go on to see if they can make it completely safe aren't they. And it could be done in 150 years. It's only 40 years old, nuclear waste. (Bridgend)

The idea of applying transmutation was not received uncritically by all, however and some pointed out that it did not eliminate the waste altogether.

I do like the nuclear transmutation [idea], though the only thing is if they're gonna separate these long lived ones for the shorter lived ones, there's still a lot of waste that still has to be buried somewhere, it's just a different sort of waste (Birmingham).

Whether or not nuclear transmutation proved to be the most viable option, it was generally seen as important that all possible alternatives, even those which were as yet more speculative, be investigated and receive serious consideration, and that the public be informed about those alternatives.

I don't think they should be going for a single option, should they? I think, I mean, as we've said about the most favourable options at the moment for disposal, but also to carry on developing the technology that then might open up different avenues for disposal. (St Ives)

Then again, it is very easy to close your mind to it. It's like you drive your car and you know that it's damaging the environment, but still you drive your car because you haven't really got an alternative. Therefore, in order for society...for all of us to change ...we need to be offered the alternatives. When we think about this problem, because they [the experts] can't see a solution neither can we really...until we're offered an alternative ...until we are given...."Here you go, here's a battery powered car that costs the same or costs less" or "Here we go, here we've got nuclear transmutation". We need to be offered the alternatives in order to open our minds to see how we can change. If you haven't got the alternatives, I don't think people can change very much. (Gosforth)

To sum up the discussions about options, we found a surprising convergence of views. While not completely unanimous, the general view was that radioactive waste should be *stored* on land in the short-to-medium term, should be *monitored* and

should be readily *retrievable*. Where views differed was the question of whether storage should be above or below ground and, if below, how deep. A deep store was seen by many as providing an additional barrier between the radioactive materials and the human environment, with the physical remoteness of the waste store giving time for remedial action to contain any leakage. However, there were also concerns that storage at depth would make effective monitoring more difficult and, in case of any problem with containment, would delay or hinder any remedial response or retrieval of the waste. Some participants therefore argued for waste being stored on or near the surface, where it would remain visible and hence not be 'forgotten', thereby ensuring that the waste received continued attention while research into *potential technological solutions* such as transmutation was pursued.

6 Siting issues

6.1 Location

Initial responses to the question of where to actually locate wastes (assuming that a storage or disposal method is agreed) centred around remoteness from people, but also on 'being able to keep an eye on it'. Scotland was widely perceived as a large, empty place that might provide a suitable location. The predictable exception to this view came from the Fort William group who largely felt that existing Scottish wastes should be kept in Scotland, on site of production or at Dounreay, but that English wastes should remain in England. However, as others pointed out, the British Isles are not large enough for anywhere to be truly 'remote' or to be chosen without some human or environmental implications:

I'm sorry, we're too small a country to not create waves. Wherever it goes, you're going to create waves. We're too close to everything not to create waves. (Berkeley)

Storage on existing sites was a popular option, and there was a widespread feeling that no new site should be used. There were three main reasons given for this: first it would cut down the need to transport the waste, thereby reducing the risks to the public; second that existing sites were already contaminated and that this contamination should not extend to new sites, and third because nuclear expertise was seen to be located at those existing sites. It was also suggested that this might be combined with underground storage:

But if it was actually, say for arguments sake, it was Burfield or Aldermaston where they've got hoards of acreage of land, even if they built tunnels going down into actual underground bunkers, I mean, they could build whatever underground...and it's all on site. There'd be no transport so they'd be no risk to the public with transport and lower risk to the environment as in transportation, it would be safer for a lot more people because you wouldn't have to worry about transporting it via lorries through your towns at 3 o'clock in the morning or whatever because it's all done on site. (Reading)

In order to press people further, the hypothetical problem of siting a long-term waste facility was brought closer to home by asking people how they would respond if their own locality was the proposed site. Surprisingly, despite an initial tendency to reject

such a proposal, in the course of discussion many people found reasons to accept the possibility on the condition that it could be demonstrated that theirs was the safest possible site. A number of reasons were given for being willing to entertain such a possibility. Particularly prominent was the argument that this was a collective problem, not simply a national concern but one that concerned their own children and grandchildren, and that there was a moral obligation to take whatever responsibility was necessary. For others, the possibility that individuals in a host community would be compensated or given the option of relocation would also make the situation more acceptable. Even the Gosforth group, although concerned and very suspicious, still felt that Sellafield could be the right place for storing wastes, as so much was there already and, to a lesser extent, because of the economic importance of Sellafield to the area.

6.2 Volunteers and vetoes

Views were mixed on how a location for a long-term waste facility should be chosen. Some were very supportive of the idea that, given suitable physical conditions, communities should be given the opportunity to volunteer as host sites in return for a comprehensive package of community benefits. However, others dismissed almost completely the viability of this idea, as they thought no community would do this. Others expressed concern that poor or deprived communities might feel pressured into nominating themselves because it was the only way to secure needed resources, a situation which was felt to be morally questionable. Others were concerned that no community is homogeneous and that, however the decision was arrived at, some would have the decision forced upon them.

It's never gonna be a complete community is it. So the only winner is gonna be the one who gets his choice anyway. You never get 100% of a community saying yeah, that's what I want. There's always gonna be somebody who's severely going against their wishes or having an issue forced upon them. Usually there's not an additional compensation package for them to get out of it. You know, they say right, it's going to go in St Ives, we've had an 80% vote, yes, it'll go in St Ives. So 20% of the people voted against it, they're not gonna get a package to get out of it. (St Ives)

Drawing an analogy with local authority powers for the compulsory purchase to make way for needed urban development, a few people argued that the national interest must come first and that the choice of location should be determined to ensure the safest possible site, regardless of the views of any affected community, although adequate compensation should be paid. Although some argued that a community affected by a siting proposal should have the right to veto the decision, others felt that this would make a waste facility unsiteable, as any community with that right would exercise it in what was seen as a NIMBY response.

6.3 Compensation

Compensation was generally felt to be appropriate for any location hosting a long-term waste facility. It was felt that this should take the form both of offering a relocation package to those who wished to move away from the area and of financial compensation for any decline in property values due to the proximity of the waste site. Some went on to argue that people should also have equivalent employment

provided, and there were concerns about the personal consequences of moving away from an area in which, for example, one's family had lived for generations. The mobility that is sometimes assumed to be characteristic of contemporary life is not available to or desired by all social groups and in all locations. It was recognised in the groups that people might be closely tied to a particular locality. However, there was a general agreement that people should not be compensated individually, e.g. in terms of cash payments, if they remained in the area, but that needed community facilities should be provided. One suggestion from the Gosforth group was that a 'state-of-the-art' medical centre could be set up to provide check ups and reassurance to those worried about health effects of radiation exposure and to monitor, treat and support cancer victims.

However, there is another side to compensation. As one member of the Leeds group pointed out, to offer compensation may be seen as acknowledging the riskiness of the waste site and may therefore increase people's anxieties and opposition.

I think people know deep down, that it really is risky, they know that. They know it's risky but until someone actually says it, they don't seem to get in a panic about it. It's just when the issue's raised in the news or, by the government that they actually seem to take notice. So I think, I think they would have to offer something but...the only problem with compensation is the idea that people are gonna... sort of like an admission that this is a really risky place... and it raises an issue. People should know really that here is gonna be some risk involved in the first place, but with the government offering that it's probably gonna make fears even greater. (Leeds)

Once discussion had focused on land-based storage, the key question for many people was where it would be located and how that decision would be made. The arguments presented highlight the diversity of views on the siting issue and the strength of public feeling that the process should be seen to be fair whilst also producing the safest option, requirements that were recognised by some as having the potential to produce a considerable dilemma. They also suggest that these concerns need to be anticipated imply in the design of the public consultation process, although it is not likely that the issues raised would be any closer to being resolved at that stage.

7 Institutional issues

7.1 Public involvement

There was a very strong sense among the people to whom we spoke that the public has been excluded from decisions on these issues. This feeling of exclusion is coupled to the sense that the industry is secretive and pursues its own interests, rather than those of the public or society at large. This general feeling became particularly acute in the case of those living near Sellafield who, as noted earlier, felt that the RCF siting process had been conducted in such a way as to actively exclude and mislead the affected local public. An additional contributor to this sense of being excluded from being able to participate in the debate is that the discussion is framed largely in scientific and technical terms, which not only excludes the lay public but appears to ignore most of their most pressing concerns. A debate and consultative process that acknowledges the moral, social and communicative dimensions of this issue is

therefore likely to be seen not only as addressing issues of public concern but also as being more accessible and inclusive.

There was virtually unanimous agreement among participants that the public should be consulted regarding decisions about radioactive waste management. However, there were also few suggestions as to what form this consultation should take. This reflects the lack of knowledge regarding potential forms of consultation, although the focus group discussions in which they participated were often pointed to as a method that allowed people to 'have their say'. Several people suggested a referendum following a substantial information campaign, perhaps with a clear set of options being presented.

If you limit the choices of the general public, you could make a decision [by involving] scientists and companies and the public as well. 'Cause if the scientists and government look at it and say "Well, these are going to be the best two or three options", and then you put it to the public and say "Look, we get rid of it this way, that way or that way, which do you think is the best?" You've limited it down and people can't then say, "Well, do whatever you want", because they've got a definite decision to make. (Leeds)

On the other hand, others pointed out the problems of providing neutral information and of assuming that members of the public would take the time to assimilate and reason through the arguments. Despite the arguments about the importance of consulting the public and what the public should do, it seemed that the impetus for such involvement was unlikely to come from members of the public themselves.

In terms of the decision making process itself, there were different views on the role of the public, some people supporting the view that the public should have some sort of substantive role in decision making, whilst others believed that the public could never 'know as much as the experts' and that it was experts who should at least advise on decisions.

Notwithstanding a widely held belief that the public in general is unwilling or unable to become sufficiently familiar with the issues to contribute meaningfully to decisions, there was a strong view that the public have a form of 'common sense' which is highly valuable. The public, it was felt, 'can see through all the bullshit' (such as the highly unpopular PR produced by the nuclear industry, which was seen as promoting the industry's interests and being far from balanced).

7.2 Who should decide?

Openness, transparency, and honesty were all words used to describe what the appropriate managing organisation should ideally be, and are obviously at the front of the public mind when considering the institutions responsible for issues of this sort. Again, despite their relative lack of knowledge of the particular problems associated with radioactive waste management, people turn to their experience or knowledge of the management of other public issues to draw lessons about how such a body should function.

It was very clear that the majority of participants felt that some sort of independent commission should be responsible for managing the wastes, and for taking decisions on the way forward.

It should be completely independent from everyone. British Nuclear Fuels, everyone... (St Ives)

Some participants, however, questioned the possibility that a body with the appropriate expertise could have the necessary 'distance' from the industry:

If you go to an independent source, you're going to have to have people who have worked in that field, who have worked for the companies before. Where are you going to get the specialists from? You're gonna have to take them from them. [...] They're not going to be independent [...] there's no way they could be. (Leeds)

Nevertheless, for most of the people who participated in the research such a body should be representative of different opinions, so 'all sides of the argument' were on the table for consideration. If this were to involve political representatives, cross-party representation was seen as a way of neutralising the influence of particular political interests. The nuclear industry was seen as a necessary member, as it could contribute expertise and experience. Greenpeace and other environmental groups were also seen to be necessary to provide a balance of views, although their views were not automatically assumed to be the 'right' ones. The makeup of such a body appeared to contain two dimensions – balanced representation and independence. Although there were repeated assertions that independent individuals were the right people to be making decisions, the question of who was independent also arose. University 'scientists' were the most commonly suggested, but this was usually followed by someone saying that universities gain a lot of their funding from industry, which was seen to compromise their independence. What is clear at this stage is that the perceived – 'vested' – interests of groups or individuals, coupled or equated to who is paying, are major issues when considering who qualifies as independent. Given the difficulties of independence, balanced representation was seen to be necessary, not, it seems, so that all groups should be represented in a democratic sense, but so that the 'best' solution could be found through some process of putting everything on the table and deliberating over it.

A related issue that was raised in some groups was how such a body should be funded. There was concern that funding drawn directly from the industry would compromise the independence of the body. For most of those who raised this issue, the best solution seemed to be government funding, perhaps involving a levy on producers of radioactive waste, but with no political strings attached.

Other possibilities raised included parliamentary decision making ('it's their job/it's what they're paid for'), and leaving the problem with the nuclear industry, both because it was 'their problem' in the sense that they had created it and therefore they should have to sort it out and because the industry was seen as knowing more about the wastes than anyone else. Neither of these options was as widely proposed or supported as that of a body independent of political or industry control, although most

people recognised that in the final instance the decision would probably lie with Parliament.

The other possibility which had greater or lesser support was that some form of international commission be established, as this is a global problem and because pooling resources between countries was seen as leading to the 'best' solution being identified. However, although several people saw this as an 'ideal' solution, most agreed that producing the relevant political agreement was likely to be impossible.

The most widely supported proposal, of a independent body to guide the search for and development of a solution to the problem, even if an interim solution, brought us to the question of the role of Nirex.

7.3 Nirex

Spontaneous awareness of Nirex was generally quite low in most groups. It was identified in the course of the group discussions as the organisation set up to investigate and develop a technical solution for the long-term management of intermediate level wastes but participants were not informed until the close of the discussions that Nirex had funded the research.⁸

The Gosforth and Fort William groups displayed the greatest familiarity with Nirex, in connection with the identification of potential repository sites.⁹

Do we know who Nirex is? They're the...they were set up to develop a deep underground disposal for nuclear waste and Dounreay and Sellafield were the sites selected, coincidentally... Sellafield was where they developed a laboratory and then it got axed, which is why there's no policy at the moment. (Fort William)

These groups were the most suspicious of Nirex and their comments were mostly negative. Nirex was generally seen by these people to have been secretive and underhand.

They made such a botch of it with Nirex in the first place. They didn't inform anybody ...kept it all secret. Well it was all very secret, there was planning applications for bore holes that people didn't know what they were for in the very beginning and then it started..."have you heard about Nirex" and it all started oozing out. It was very hush hush and secret. Wasn't it. (Gosforth)

There was a related perception among the people from the area around Sellafield that despite the public inquiry and the decision not to approve the proposed rock characterisation facility, research into the site had not stopped, as illustrated by the following exchange between two participants:

⁸ One participant, who knew of the company's activities in Scotland, commented on the obscurity of Nirex and its activities to many people: "There was a lovely story about that actually with Nirex because they were looking for their great site and they came onto this lady's farm and she invited them in and made them tea, and then phoned all her neighbours 'cause the nice people from Pyrex were there". (Fort William)

⁹ One member of the St Ives group, who had in past had some connection with the nuclear industry, also referred to this.

Nirex has gone but they'll be back within 10, 15, 20 years. In some shape or form...

There's soil mechanics, they're starting to come back...

Well, they've never gone yet...

There's a lot more of them kicking about ... (Gosforth)

That said, although the overwhelming perception of the nuclear industry and associated institutions is one of secrecy, mistrust and threat, nearly everyone responded well to Nirex's funding of the focus group research. Once again, the notable exceptions were the West Cumbrian and Scottish groups, who had had previous 'experience' of Nirex and remained suspicious of its motives, worrying that in some way the outcomes of the research will be used 'against' them. Most other people saw it as 'the sort of thing they should be doing' and as indicating that Nirex was at last interested in what the public thinks.

Participants were given an outline of the ownership and funding structure of Nirex, and the majority expressed concern that this was divided between the nuclear industry and government. A few people felt this was appropriate, given the responsibilities of the waste producing organisations, but most saw it as making Nirex a tool of the industry or of government.

I mean, some of the people involved with Nirex might [be] more independent. But it's not independent if it's the industry funding it and employing people to be on it. (Lancaster)

This in turn was seen as compromising Nirex's ability to do the job that was needed in a disinterested way, that is, to explore the options and seek the best possible solutions, regardless of the particular financial or political interests of producer organisations and institutions. There was a widespread view that Nirex, or the body carrying out that role, should be independent of such interests, along with the recognition that the producers of radioactive waste had both the responsibility and the expertise to play a leading role in the development of a publicly acceptable solution. Two suggestions emerged that people felt would enhance the accountability, legitimacy and independence. Firstly, many participants argued that the board of Nirex should include representatives of other relevant organisations, including environmental groups, to ensure that a wider range of views would be considered and to 'balance' industry interests. However, there was also the view that *all* of the organisation participating should take a responsible and constructive approach to working together to solve a pressing and very serious problem, and not simply continuing to fight old battles. Secondly, many felt that the financing of Nirex should in some way be restructured in order to remove the possibility of undue industry influence over decisions. Some suggested direct government funding, with others suggesting that that should be resourced by a levy on the industry (on the basis that the producer of the waste should pay) or by charging the waste producers.

Well, they could charge people for their services. I mean, I'm regulated by the Department of Transport. I have to pay them something every three years and they come down and check me every so often. I've got no choice in it, I can't say you're not checking me, I've got to do it. So they could do it like that, they

could charge a billion pounds and say "Right, we're coming round to check you, you've got to pay it". (St Ives)

These views and the suggestions put forward by participants raise important issues about the identity and role of Nirex and about the perceived legitimacy of any future process of policy development in this area, issues that should be considered when preparing the planned public consultation exercise.

8 Factors influencing public views

In 1992, the Royal Society published a report on risk that contained an influential review of the field of risk perception research.¹⁰ In what it identifies as 'perhaps the most significant' development in recent research, the report notes the widespread acknowledgement by researchers of the significance of social, cultural and political processes in shaping individual attitudes towards and the social acceptability of risks. From the results of this project, we can identify several processes - recognisable from research on other technological risk issues - that influence people's views on radioactive waste management.

First, the results that are reported in earlier sections of the report indicate that *trust* is a critical dimension of public responses. Those who are willing to put their trust in the institutions and organisations that control radioactive waste - including the industry, government regulators and their scientific staff and advisers - to do their job competently and in good faith are disposed to be less concerned about the safety of waste management practices. The participants in our groups certainly recognised the need for such institutions and expertise - they repeatedly acknowledged the limits of their own understanding. However, as we have seen, many people are not confident in government institutions, the industry or scientists. As is widely recognised, perceived failures of institutional and organisational competence or responsibility, such as provoked the recent controversy over quality control on reprocessed fuel shipments at Sellafield, can seriously undermine public trust - even more so in cases where it results in danger or harm to the public, as in the BSE case. Similarly, perceptions that organisations are being secretive or duplicitous, as the nuclear industry is often perceived to be, inevitably results in profound public distrust. Current rhetoric in political and industry quarters that refers to regaining public trust implies that some kind of *status quo ante bellum* can be restored. If such a happy state existed, which is perhaps questionable, there is no doubt that under contemporary conditions in which risk is a pervasive feature of public consciousness and in which science is regularly contested in high-profile public controversy, public trust will only ever be provisional. That is not to say that there is nothing to work for but that the public is only likely to suspend its distrust rather than resume a state of unquestioning confidence - and then only as long as the institutions in question manage to meet public expectations.

A second very important factor is that of *empowerment*. It was clear that many of the people (although we would not claim all) to whom we spoke felt alienated from these key institutions and from the relevant political decision-making processes. We should be clear, the members of the public in our groups did not all wish to take an active role in making decisions on radioactive waste. What they did require, however, was

¹⁰ N. Pidgeon et al (1992) 'Risk Perceptions', in *Risk: Analysis, Perceptions, Management*, London, The Royal Society.

the sense that the public could have some influence over a process which they perceived to be of importance to them all and, even more importantly for many, to their children and their children's children. These feelings are clearly closely bound up with the issue of trust, for people are reluctant to delegate unquestioningly such vital decisions to institutions which they distrust - even if they recognise that they need the expertise provided by these institutions to understand and control the hazards involved. Acknowledgement of this need to involve and empower the public is the driving vision behind many of the recent attempts at consultation on key technological issues. However, the public is also sensitive to such processes being used simply as cynical exercises in legitimation. Great care needs to be taken not only in the design of the consultation but, more importantly, in ensuring that the issues raised by such an exercise are given appropriate consideration and weight in the decision-making process and that that is seen to be done.

A third influence on public views is the overwhelmingly negative pattern of cultural associations evoked by radioactive waste. In the public mind, nuclear technology itself tends to be perceived as a *stigmatised* technology. Anything to do with it is very often an object of instinctive fear and distrust. As we have seen, it is associated with war, sickness, death and deformity. This image had been reinforced not only by countless popular representations in film, TV, books and comics but also by the various high-profile incidents that have entered the public consciousness, culminating in the Chernobyl accident. Similarly, 'waste' is not a term with positive connotations, signifying something unwanted and very likely contaminating. The associations that it raised for people brought to mind such images as pollution and leaking landfills. A further problem, in terms of the eventual problem of siting a facility, is that something which is stigmatised is often seen, in turn, as polluting and stigmatising: it marks the place where it resides. Against this burden of negative cultural associations, the issue of radioactive waste management will never have an easy public reception. However, maintaining an awareness of these associations when engaging in dialogue with the public - perhaps even making people aware that they are being influenced them - may help produce a better quality of communication.

A fourth source of influences on public perceptions of and responses to radioactive waste issues - one that may have particular bearing at different stages of the consultation and policy development process - is that of *location*. Locational factors can refract - focusing or diffusing - the other factors outlined above. The initial expectation might be that groups near to nuclear installations are more familiar with the nuclear industry and radioactive waste issues. Whilst this is true in part, as we saw above, 'nearness' needs to be defined by participants, and people tend to know only about issues concerned with the particular installation in their locality or that in some way have relevance for them. The Reading group, for example, had heard about discharges and contamination from Aldermaston through the local press, whilst the Gosforth group voiced concerned about the deep repository plans and local contamination from Sellafield, but not about nuclear power stations. Living in close proximity to a nuclear facility may also result in people having social networks that include facility workers, which results in informal channels of communication about what goes on there. This can be a source of reassurance:

I think all the long service awards for Berkeley power station and the labs [...] several hundred twenty or thirty years certificates, so I guess most of the people who work down there are surviving. (Berkeley)

A glimpse of the inside view may also, however, highlight uncertainties and leave individuals feeling rather less confident in the safety of operations.

The thing is, they've actually been in the dark because they've never decommissioned a nuclear power station before. I do have a friend who is a scientist down there, and he said it's really like fighting in the dark because they've never done it before, so they're hoping that they're doing it right. (Berkeley)

Apart from their experience or knowledge of the nuclear industry, people also draw on other areas of experience to make sense of issues. The Reading group, for instance, referred repeatedly to leakage from landfill and the problems of building on closed landfill sites. This had obviously been an issue in the area and the participants drew on this local knowledge in relation to waste disposal when thinking about the implications of underground disposal of radioactive waste. As another example, in Wales and Cornwall people drew on local knowledge about groundwater ingress into mines to raise questions about the safety of disposal in deep shafts. Locally-based knowledge, whether a source of confidence or concern, need to be acknowledged when communicating with the public. At best, they can point to areas of experience on which to build communicational bridges between what are otherwise remote institutions and lay publics. They can also highlight particular issues that previously or in other contexts may not have been recognised.

One final factor that we have not so far mentioned but which can have an important bearing on public responses to a technological issue is the perception of *social need*. A controversial development that is perceived as not being needed will usually be rejected. For example, genetically modified foods were widely perceived in this country to be unnecessary but to entail unpredictable new risks. In our discussions, it was clear that many people felt that the nuclear power industry was not needed or that nuclear weapons were not needed, while others did. However, whatever their views on the technologies that had given rise to radioactive waste - even if they were angry that it had been brought into existence in the first place - they all recognised that something had to be done about it. In this sense, there was in general recognition of a societal need for a long-term management strategy and associated technological and siting options to be developed. Most people appeared to feel a strong sense of responsibility - not least to future generations - that the 'right thing' should be done. Given the otherwise fearful or hostile views that many people hold on nuclear matters, this latent sense of citizenship and good-will is a valuable resource that should not be underestimated. It was clear that most of the members of the public in our study, given time to deliberate on the issues, were perfectly capable of taking a mature and measured view of the problems and possible solutions.

There are, then, a number of factors, related not simply to the technology but to the social relationships within which it is embedded - including trust, a sense of empowerment, stigma, relationships within localities and perceptions of social need, that shape people's views on radioactive waste issues. An awareness of these factors

should inform the design and implementation of the planned public consultation, as well as the subsequent policy development process.

9 Summary of participants' views on the way forward

The question that remains is, how do we proceed? In this section, it seems appropriate to let the participants give their own suggestions. During the closing stages of the group discussions, participants were invited to formulate a brief message for policymakers and others responsible for the development of a strategy for managing radioactive waste.¹¹ These concluding statements, together with arguments made elsewhere during the discussions, summarise the key messages that recurred across the different groups. Some of these related to the relationships between relevant institutions and the public, some to the way in which the policy development process should proceed, and some to specific policy options.

- Organisations and institutions involved in the development of waste management policy are perceived as being secretive and untrustworthy; they must be open, honest and fair
- The public should be informed, in a clear and comprehensible way
- Information from all sides of the debate should be made available
- The problem should be addressed now, not left for future generations to deal with
- The search for solutions should be adequately resourced
- All possibilities should be considered and a long-term perspective taken on the problems, unconstrained by economic or political short-termism
- More research should be carried out, particularly into longer-term technological solutions such as transmutation rather than simply 'burying' or 'dumping' the waste
- Although calling for all possibilities to receive serious consideration, the majority view was that wastes should be stored on land (not beneath the sea or the sea bed)
- Safety should be the priority, not cost
- Wastes should be monitored and retrievable, although views were divided on whether this should be on or near the surface or in deeper storage facilities
- Siting considerations should include the proximity to centres of population and the availability of compensation, both for loss of property values and to make the option of relocation available to local residents
- Storage at existing nuclear sites was suggested in many groups
- Transport remains an issue of general concern
- An independent body should be responsible for overseeing the development and implementation of a waste management strategy
- There should be wide-ranging public consultation throughout the process

As we have noted, this research was intended to identify issues and concerns that should be taken into account in the development of a wider process of public consultation. However, as demonstrated by the list above, participants also arrived at some substantive policy proposals. A few words of elaboration will serve to flesh out the bare bones of the bullet points listed above. The weight of opinion was in favour of storage, rather than permanent disposal, of waste on land, although views differed on whether this should be on existing reactor and reprocessing sites or in a new central facility and whether it should be 'deep', 'shallow' or surface storage. There was

¹¹ The responses that members of each group gave are listed in Appendix 4.

an associated concern that, given the time-scale involved, waste should not become 'out of sight' and therefore 'out of mind'. As we have seen, solutions involving disposal at sea were generally rejected as being inherently more risky. The use of the oceans as a 'dumping ground' tends to evoke a powerful response in the public mind, even where technical assessments find the risks and potential impacts to be within 'acceptable' limits, as the Brent Spar controversy has so graphically illustrated. This touches on values relating to the integrity of the oceans, as well as to other areas of the planet such as the Antarctic which tend to be perceived and valued as being relatively 'untouched'.

The participants in the focus group discussions also lent further support to the proposal that monitoring and retrievability of wastes should be central to any solution that is developed. This view was endorsed previously by the members of the lay panel that participated in the UK Consensus Conference and is already under investigation by Nirex. There was also considerable interest in and support for the development of transmutation or some other, as yet unidentified, technology to treat the waste, although those more sceptical of technological 'fixes' were less persuaded of the viability of such an approach.

Finally, the research suggests ways in which Nirex (or whichever organisation is responsible for investigating, developing and, subject to political approval, implementing a 'solution') might enhance its public credibility and legitimacy. Importantly for the process of wider consultation and involvement upon which Nirex is embarking, this is not simply a matter of PR but of the political viability of the organisation. The views expressed in the groups suggest that Nirex not only needs to be more open in its dealings with the public and its activities more transparent but that it may well need to review its governance and funding structures to meet public expectations of independence.

10 Conclusions

This report has summarised the findings of a study involving discussions with a wide range of individuals living in different parts of the British Isles and having varying levels of familiarity with the nuclear industry and radioactive waste issues. Their views and concerns on a range of related issues have been outlined, as have their views on how to proceed with addressing this problem. We have also seen that there are a number of factors that influence public views, in particular levels of trust or distrust in responsible institutions, the extent to which the public feels empowered or powerless, the negative cultural associations and stigma attached to nuclear and radioactive waste issues, the effects of local experience and knowledge, and the extent to which there is a perceived social need for the developments being proposed. These factors provide parameters within which public views are shaped.

The results of this research, outlined in the preceding sections, clearly have implications for the public and stakeholder consultation process to be carried out by Nirex. To begin with, they strongly support such a process but emphasise the need for it to be carried out in a completely open and transparent way. It will undoubtedly be difficult for an organisation that has in the past been perceived to be secretive and even dishonest to shed that image but a well-designed and conducted consultation process may help to reduce public and stakeholder group scepticism. Independent

third party monitoring and evaluation of the process would also help to validate the process.

The research highlights the need for the points of view of all sides of the debate to be heard and for the public to be informed of these different viewpoints and arguments. However, it also presents something of a challenge to those different parties to present their views and address the problem in ways that are perceived by the public to be constructive. The people who participated in these groups took the issue extremely seriously and were critical of political posturing and point scoring by any of the parties involved. At the same time, there is the challenge of finding ways of providing information on this complex and emotive issue that manages to be concise, comprehensible and, above all, credible to the non-expert public.

The research also points to the importance of proximity to and previous experience of nuclear sites and the nuclear industry.¹² In view of the direct experience of these local communities, they represent an important section of the public and, given some of the arguments made about siting in the focus group discussions, their views may have considerable significance for future debates about how to site any proposed waste facility. This should therefore be taken into account when designing and carrying out the consultation process.

Finally, the issues raised in the groups and outlined in this report identify a range of substantive issues and areas of concern that should be incorporated into the consultation design. One issue that should, perhaps, be singled out here is the issue of siting. Although often seen as an issue to be addressed at a later stage in the process, once a technical solution has been identified and agreed, it was clear that for many people the development of an acceptable siting process was seen as integral to the development of a solution. Care should therefore be taken that it is not perceived as being ignored in the consultation process or, even worse, as being knowingly withheld from public discussion.

The results of the research map the most prominent issues for those members of the public who participated in the research and identify the most recurrently expressed views. Given the limited nature of this study, they should not of course be taken as in any way anticipating or pre-empting the conclusions of the ongoing consultation planned by Nirex. However, attention of these results in the design of the proposed consultation process will increase the likelihood that the process is seen to address public concerns and enhance its chances of success.

¹² Proximity to nuclear sites was also found to be a significant factor in the research conducted by Leeds University (see Appendix 5 below).

Appendix 1: Group recruitment criteria and locations

Group	Criteria	Location	Nuclear neighbours
(1) Workers	C2D	Reading	Yes
(2) Parents	Young children at home	Lancaster	Yes
(3) Previous site	No direct BNFL links	Gosforth	Yes
(4) Managers	AB	Birmingham	No
(5) High radon	House owners	St Ives	No
(6) Retired	Retired Aged 60+	Cheltenham	No
(7) Young people	18-23, students and non-students	Leeds	No
(8) Scottish nationalists	SNP activists	Fort William	No
(9) Unemployed, Wales	Unemployed	Bridgend	No
(10) Proposed low level waste site	10 years + in area 50-64 yrs old	Burnham-on-Crouch	Yes
(11) Decommissioning	15 years + in area	Berkeley	Yes

Appendix 2: Radioactive waste - initial associations

Berkeley

Transport through towns
Being dumped in the sea
Long-term effects
Leukaemia
Lack of expert knowledge
Stored in vaults
Different types, high-grade recycled, low-grade buried?
Low-grade incinerated?

Birmingham

Risk
Makes money for the country
Sellafield
Japanese shipments
Hazardous waste
Concrete tombs
Dumps
That sign, a yellow thing with a black triangle in the middle
Dangerous
Chernobyl and the disaster there.
Leaking canisters at the bottom of the ocean.
Ships transporting the waste around.
Sellafield not sticking to their quality assurance guidelines
The end of the arms race and all these nuclear weapons have got to be decommissioned
Russian nuclear subs and things [...] it's just a time bomb waiting to go off.
BNFL and Aldermaston.
The cost to taxpayers of decommissioning
Sellafield, the apathy...not doing their job properly
Train disasters [carrying waste]
Lots of things are hushed up

Bridgend

Plutonium
Glow in the dark sheep
Not being treated right - just dump it in any old sheds
Waste breaking out of the concrete blocks they put it in
Why import it from other countries?
Green acid stuff pouring out [from science fiction film]
Sellafield and pollution in the Irish sea
Chernobyl
If dumped in the sea, what happens if it leaks?

Burnham

Leaking into the environment, the countryside, the water supply, the food chain.
Landfill sites

Bags of toxic waste

How long we've got to keep it
Transportation by public railways and roads - accidents do happen.

Cheltenham

Environmental damage
Danger to future generations of children
It fills me with horror.
Transportation through big cities, derailment.
Concrete blocks at the bottom of the sea, effect of leakage.
Lack of policy about disposal
Our country seems to be becoming a sort of dumping ground.
Train crash experiment on TV.
Japan, dumping of nuclear waste from Japan up in the Sellafield area.
Sellafield, mistakes at Sellafield.
Better here than in a Third World undeveloped country
Dumping in the sea.
Japan, waste from Japan
Not enough information.

Fort William

Frightening.
Scenes of folks with masks on handling something that's not a very nice substance
Radiation is invisible, intangible, imperceptible.
Problem for future generations
There's no safe method of disposal.
The only way forward is to stop making the stuff now.
Very frightening
Lack of accountability or openness, secrecy
The amount of time it lasts, you can't get rid of it you can only store it
Health defects, cancers at the time, birth defects for the next few generations.
I'm scared of what I've heard
Wouldn't want it on my doorstep
The secrecy worries me
Fear

West Cumbria

Dark and dingy
Sellafield: It's work for a lot of people.
Sellafield: Well, it's there.
It has to be dealt with safely...there's no half measures you can take with it.
Concerns for the safety of the environment
How it's stored and how safely is it being stored
It's there, it's never going to go away and you just live with it.

It's the children really, you know, that's my main concern...

Leukaemia clusters

Worry about the future and the environment

Don't know what's going to happen in a hundred years [...] if there's an earthquake or something. The Gemma Darcy story. They tried to prove that she got leukaemia through Sellafield.

It took a lot of thinking about to create radioactivity, a little more thought can surely get rid of it.

Lancaster

Cancer

Danger

Where could it be dumped safely?

Cancer and birth defects

Leakage and pollution.

You can't really, as far as I understand, dispose of it safely.

Leukaemia and childhood diseases and things like that.

Accidents that happen at nuclear power stations, that sort of thing.

Chernobyl.

Leakages that have happened 20 years ago, all hushed up at the time.

Trains travelling through the night.

Undercover things.

It's only when accidents happen that you actually hear about it.

Other countries are sending us their waste

Leeds

Pollution effects, dumping and...illegal stuff

Visions of it not being quite right, people dumping it on the sly and things.

Power stations, leaks, panic, radiation bunkers

A dangerous thing

Chernobyl: Something you associate with nuclear disasters, like Chernobyl.

Chernobyl: Images like that Chernobyl one...deformed babies and stuff like that.

You shouldn't really go near it or have anything to do with it.

Death and destruction of all life, [through] war mainly, and power stations as well

Plutonium or uranium fuel rods.

Just dumping the fuel somewhere.

Big huge barrels and trailers carrying it away.

Damaging the environment and people's health

Reading

Warfare

Metal

The amount of years it is active for.

Environmental

Health risks

Energy

Storing it and distribution and getting rid of it
Chemicals

Leakages

Is it stored correctly?

It used to be dumped in the sea at one time.

Leukaemia

Cancer: I think Berkshire's the highest cancer rate.

Aldermaston

Greenham Common was the nuclear American airbase...

Burfield, underground weapons research

St_Ives

Japanese fuel shipments

Nuclear submarine in Gibraltar - damaged.

You don't hear about it until something dodgy happens.

Radon

Windscale

Nuclear power

Different types - low grade or high grade

Stored in a stable area such as Scotland or possibly Cornwall.

Japan refusing to take the shipment from Sellafield.

Nuclear submarines on the River Tamar - waste emissions.

Atom bombs

Don't really think about it.

Appendix 3: Waste disposal and management options

In the second meeting of each focus group, the following list of waste disposal and management options (taken from the House of Lords Select Committee Report) was presented to participants for discussion.

Geological disposal: Mined tunnels and chambers at least 300 metres deep, with even deeper boreholes to contain waste. Problem: perceived as a 'dump'.

Burial nearer the surface: Intermediate solution pending technological advances which would render waste harmless or offer a better solution than found so far. Problem: the possibility of human interference.

Ocean bed: Disposal at depths of several kilometres by dumping canisters filled with waste or building a concrete bunker. Problem: unacceptable to many nations.

Ocean bed sediment: Firing torpedoes filled with waste into the ocean floor. Problem: unacceptable to many nations.

Ocean rock: Placing canisters in boreholes on the ocean floor. Problem: unacceptable to many nations.

Subduction zones: Canisters placed in areas of the ocean floor where the earth's crust folds under another section, taking waste towards Earth's centre before it re-emerges after hundreds of millions of years. Problem: no guarantee waste would not reappear too soon.

Antarctic ice sheets: Canisters placed in drilled boreholes in ice sheets. Would be moved downwards by melting ice. Problem: potential instability of ice sheets.

Ejection into space: Problem: catastrophe if spaceship crashed.

Nuclear transmutation: Separation of long-lived radionuclides from wastes and conversion into shorter lived ones with a particle accelerator. Problem: technology still a long way in the future.

Synroc: Mix synthetic rock material with waste. Problem: technology not demonstrated.

Appendix 4: Messages for policymakers

At the conclusion of the discussions, participants were invited to give a brief message to policymakers and those responsible for addressing the issue of radioactive waste management. These messages are listed below. Where there are relatively few statements from a particular group, it is because several members of the group simply registered agreement with one of the statements that had been made.

Birmingham

Put the R&D into it but put the money into it as well, we need something within the next few years to remove the waste. They've talked about it for long enough, we've had it for 60 years, we've just gone round in circles.

Put a time limit round it, to meet certain targets by certain times. And reasonable targets that can be achieved.

We should find a solution to the actual problem of the waste, not just burying it but to change it some how, rather than just burying it or getting rid of it that way.

They need to put all the resources into finding a way of making it safe instead of burying it and sweeping it under the carpet which has gone on for 60 years. Enough is enough really.

Technology is the answer. It should be pursued with all the rigour they can muster.

Resources, it's all about priority and resources and leadership that we've said that we need. Government has got to take responsibility and say this is an issue that affects everybody.

Bridgend, South Wales

More public awareness. Definitely more public awareness.

Give us some more information.

Just look to the future, make sure that it's safe.

Don't put it off for other generations all the time, do everything that we can do now.

People have got to be made aware.

Money shouldn't be the problem when it comes down to safety.

Think of the planet, because it's a very special planet.

Don't put it in Scotland! [from a Scot]

Basically, you managed to make it, how come you can't manage to sort it out. I mean there's got to be a way of making the stuff, so there's got to be a way of breaking it down. You seem more interested in building bombs and killing people than sorting things like this out.

They're building power stations without wondering how they're gonna clear the mess up after them.

Burnham, Essex

More research.

More openness.

There's got to be research because the longer they take the more it's piling up. So they can't afford to sit back on their heels, they need to be doing it now.

I'm against them saying, "we'll do this now" when a better solution could be found as a result of the research. Rather than say "oh we're going to bury it all somewhere and that's it", they've got to always keep an open mind.

Well they've just got to get on with it. They've got to come up with an intermediate solution now and then get on with the research. Store it safely now and put money into research.

Cheltenham

Include the older age group in consultations.

More understandable information.

There ought to be an early decision on a policy.

Fort William, Scotland

Let us catch up, let time heal the wounds, let us catch up with it, let the technology catch up with us.

At the moment we are still very scared, we need more information.

Protect future generations and stop making radioactive stuff now.

More accountability and much more openness in this debate.

Take responsibility, stop now, let technology catch up, it's the only option

Much more openness and education of the masses and in particular the children, let them know about it now.

Gosforth, West Cumbria

Don't keep people in the dark.

Consult everybody.

We live here, it's our concern [near Sellafield].

It's all about consultation really, isn't it.

Everybody knows the nuclear waste is there and it has to be dealt with in the correct manner.

Everybody's got to be aware of the problem, how it's going to be solved, not just rush into the easiest or cheapest ... or the most profitable option.

Be responsible about it. Don't leave it for future generations. It's there. Even if we have to see it [living near Sellafield], do it in the safest way possible.

Be fair, be open and make sure it's damn safe.

Lancaster

Keep people informed.

Be honest.

Throughout my impressions of the nuclear industry there's a lot of things that have been very secret, or they've been one sided opinion. It needs to be open debate.

Leeds

I'd say there is no simple solution to neutralise this problem, but with the research, with the funding, I think there is a solution out there. Just keep on digging away to find the right solution.

A lot more research needs to be done.

A lot more research, look at every aspect of what will happen if you do a certain thing - not just at how much it's gonna cost - and what will happen to people, or what will happen to the environment around it and the long terms effects as well. Look at everything and then decide based on that.

Do a lot of research into each option and choose the safest rather than the cheapest.

Put the money in, put the funding in, do all the research and look to the long term, not just 50, 100 years, but way down the road, a thousand years into the future. Look at what effects they'll be having on us then.

Reading

Get it started, get it off the ground. Get the ball rolling. Let people know that something's being done and not behind closed doors.

They've got to do it right and not just shove it under the carpet for another few more years for other people to deal with it. It's our generation that started it so it's up to us to finish it. Or at least conclude what's going on and to make a start on dealing with it now.

Make sure that it's safe and secure for future generations to be able to live their lives.

Just sort it out, make sure everything is sort of environmentally safe and see if we can cut back on the risks of illnesses like cancer, and put a stop to its production.

Get it sorted now before anything disastrous happens.

Be up front.

St Ives, Cornwall

Ensure definite safety to the public.

Stop, take stock and look at the situation. Stop additional production of the problem materials. And see where you can move on from there.

They've got to stop and try and sort out the problem now and not cause any more.

Industry scientists and environmental group scientists should work together instead of just arguing.

Be aware that they are accountable and that the public will protest and that there will always be someone who will protest and the truth will out if there is any attempt at cover up.

Always monitor the waste, don't just push it away and forget about it.

Keep the public informed, don't keep them in the dark, otherwise they might reap the whirlwind, more public disgust and anger.

Appendix 5: Comparison with other recent research

In this Appendix, we briefly compare the results of the CSEC research with those obtained by recent studies of public views on radioactive waste management issues carried out for Nirex by the Future Foundation and for the Nuclear Installations Inspectorate by Taylor Nelson Sofres Harris. A third study conducted by the University of Leeds, which focused on the use of the Internet, is also reviewed. The main findings of these three studies are reviewed and then in the following table compared with those of the CSEC study, which are described in the main body of this report, to identify common conclusions.

The use of the Internet to facilitate stakeholder dialogue on spatial information
School of Geography, School of Psychology and Leeds University Business
School, University of Leeds (UL)
May, 2000

Aim of study

The study aimed to conduct basic research into stakeholders' use of a computer system comprising an information system and a question/task module. The hierarchical information system was produced with a 'positive' and a 'negative' problem framing (as defined by the researchers). The study also aimed to 'review and evaluate existing approaches to stakeholder dialogue; evaluate the effectiveness of interactive, on line methods of communicating spatial information and issues to a lay audience; develop a greater understanding of the advantages and disadvantages of online methods within the limitations of current technology; and gain insights into better interface design for public use with particular reference to radioactive waste management'.

Form of study

This study conducted an experiment comprising six focus groups (made up of staff and students at the University of Leeds, some moderated and some task-based), an on-line questionnaire using the prototype computer system (focus group participants plus 23 others, n=64), and 6 interviews with questionnaire respondents. This was supported by a review of risk perception and risk communication literature.

33 respondents were introduced to the questionnaire via a 'negative' statement and 31 received a 'positive' statement regarding nuclear waste management. This framing did not appear to affect responses.

Findings

'Techniques and approaches to stakeholder dialogue have been reviewed and evaluated using existing literature and online searches. Key conclusions from the review of risk perception and communication are as follows:

- The importance of facilitating trust and how this should be achieved in any interaction with the public at large and, ore specifically, Internet dialogue with key stakeholders. This will also need to take account of stakeholder differences.

- The need to recognise different definitions and interpretations of risk and what this might mean or any dialogue with stakeholders. An Internet system will not be received positively if it is seen not to address stakeholders concerns and understanding of important risks and hazards.
- The importance of involving the public at all levels of the process. It is not appropriate to simply reflect public values in a 'scientific' risk analysis. Instead stakeholders need to be involved in the definition, investigation and interpretation of findings. This may be achieved by including lay representatives reflecting different stakeholders. This can be achieved through the Internet, though we need to be mindful that not all stakeholders would be available through this medium. A failure to take key stakeholders along in the process will seriously jeopardise its chances of success.
- The need to communicate information in a way that plays down the fright factors and minimise simple affective responses if the process of consultation is not to make people's attitudes more negative.
- The need to identify key stakeholders and the positive/values/position they are likely to take with respect to hazards in general and nuclear disposal in particular. This may involve a simple stakeholder analysis at the outset, and an attempt to characterise different groups in terms of the existing typologies. Also need to recognise that stakeholder affiliations change over time. For example, "my views will change if it is to be sited in my area".
- The need to recognise that people use simple thinking routines when processing complex information. This has implications for good ways of eliciting stakeholder views about nuclear waste disposal and subsequently for all other communications with them.

In terms of informed decision making, it is important in considering the implications of the body of academic knowledge, to try to differentiate what is interesting from what may also have a significant influence on the understanding that UK Nirex Limited develops from any Internet-based dialogue. From this perspective, among the points that may need to be prioritised for consideration are:

- Current guidance in good practice in written, oral and computer-mediated communication of the complex information on radioactive waste.
- Ensure that the information transmitted back to the public after any consultation exercise reflects the full complexity of people's responses to the issues.
- Seek an appropriate balance between communication of information and attempts to gauge public opinion, perhaps through carrying out separate exercises.
- Frame the problem appropriately; i.e. as a social problem that Nirex has responsibility for.
- Use a range of approaches in framing the impacts; i.e. in both personal terms and statistically.
- Make all information physically accessible (wherever possible) but take particular care to present it in such a manner that it is also understandable by as wide a range of people as possible. This may mean providing a basic level of access to all with provision for deeper access to more detailed information for those that wish to view it. All requests for information, whether basic or detailed, should be logged and cross-referenced to the user requesting it for later analysis.
- Set up and staff an E-mail back facility for information requests that cannot be answered by a computer-mediated database.

- Pay particular attention to the careful and unambiguous presentation of information, to minimise the scope for different interpretations of information, insofar as this might be induced by the communication process itself.
- Strike an appropriate balance between open-ended questions (to get richness of perspective) and specificity (to avoid ambiguity and mixed interpretations).
- Use appropriate questions to check the respondent's reference point with reference to both spatial and non-spatial perspectives, and investigate the use of simple cognitive mapping or other techniques to capture respondents' mental maps of the issue.
- Review in more depth each of the concerns identified, with a view to judging (a) the extent to which that are likely to occur, (b) the likely magnitude of any distortions that might result, and (c) the availability of cost-effective ways of circumnavigating problems.
- Triangulate responses, using web-based procedures alongside other methods such as stakeholder mapping, focus groups and citizen's juries, to seek the required understanding of stakeholder attitudes. Choice of such complementary assessments should reflect known concerns about facilitating effective stakeholder dialogue.
- Use multi-stakeholder workshops to bring together key stakeholders to work on a realistic but hypothetical risk problem. These workshops identify stakeholders' perceptions, understandings and expectations of regulatory authorities with respect to the risk problem, comparing/contrasting differences between the different stakeholder groups. Workshops of this kind help to develop a better understanding between different stakeholders, build trust and understanding and provide a good vehicle for developing strategy and plans for joint actions

Establishing the value of wider public consultation

Future Foundation

November, 2000

Aims of study

- 'To establish that it is possible to consult the UK public about the complex and serious issues involved in the management of radioactive waste;
- To develop a reliable and repeatable research methodology which will allow Nirex to gauge public opinion on a regular basis as it moves forward with its plans for the wider dissemination of information to the public; and
- To explore the level of information, the channels of communication and the regulatory framework that is most likely to engender trust amongst the public and to create a positive environment for decision-making about the management of radioactive waste in the future.' (P.5 Final Report)

Form of study

8 focus groups of mixed age, gender, social class and household membership (regarding children) were conducted in April and May 2000 in Putney, Osterley, Oldham, Newcastle and Edinburgh. A 15 minute video was used as prompt material in four groups, and printed material used in the remaining four, as a form of 'product

testing. A survey questionnaire delivered by face-to-face interview with 1035 respondents was conducted in August.

Findings

- The majority of people think that the public should be given more information on radioactive waste
- The issue of radioactive waste is not an everyday concern
- People know little about the issue
- However, people believe radioactive waste is an important issue
- People have not established fixed 'positions' in relation to radioactive waste
- The public mistrust the industry
- People are concerned that information should be accessible to all
- There is widespread support for public involvement in debate about radioactive waste; a quarter of people expressed the wish to be personally involved
- Decisions should be made by representative bodies (government)
- 2% of respondents had heard of Nirex

Conclusions/recommendations

- Disseminate information in the public domain
- A cross-section of interested parties should have a say in the future management of radioactive waste
- A credible, independent watchdog is needed to oversee the management of radioactive waste

A Public Opinion Survey

**Taylor Nelson Sofres Harris for the Nuclear Installations Inspectorate
March 2000**

Aims of study

'To establish

- Current level of public concern about nuclear related issues
- The identification of specific issues of concern e.g. energy production, waste management, reprocessing of spent fuel etc
- The 'tolerability of risk' with respect to these specific issues and in comparison with other industries e.g. chemical, mining industries.'

Importantly, this study was not directed towards radioactive waste specifically.

Form of study

Four focus groups each with 6-8 respondents were conducted to form the basis of a questionnaire delivered by telephone interview to 1006 respondents in 10 locations, half designated by the researchers as near to nuclear installations. Respondents were contacted by random digit dialling, and are not demographically representative.

Findings

- ‘top of mind issues of concern about living in the UK today are crime (28%), health (17%), unemployment (15%) and education (13%)
- overall, the nuclear industry accounted for 7% of mentions
- nuclear waste was cited by only 3%
- on prompting, top of mind issues of current concern are:
 - crime
 - nuclear waste
 - chemical waste
 - unemployment
- those living close to a nuclear installation, either as defined by the sampling regime or by self classification, were no more likely to be concerned about nuclear issues than those living further away
- nuclear energy is the preferred source for 8% of the sample, with those considering they live very near a nuclear site more likely (13%) than those living near (6%) or not near (8%) so thinking
- pre-disposition towards nuclear energy is higher amongst those with a positive view of it (20% v 6% for those neutral and 1% for those negative)
- although attitude towards the industry is generally negative, 29% see it in a positive light. Those living very near or near a site are more positive (34%) about the industry than those living further away (27%), as are those who agree with de-commissioning plans (35% v 23% for those not in agreement)
- overall, the sample agrees that:
 - the industry is a source of energy
 - in 10 years time we will be more reliant on nuclear energy than on other sources
 - the industry is a source of jobs
 but not that:
 - people can safely live near a site
 - nuclear waste can be stored safely
 - nuclear energy is less harmful to the environment than other sources.

Risks and benefits

- the main benefits of the industry are cheap (19%) and clean (15%) energy. However, 53% could not specify any benefits. Ignorance is higher amongst women, those with a negative view of the industry and those unaware of NII
- at 34%, nuclear waste is more significant a drawback than all other risks apart from the risk of accident (30%), and is more of a risk for women and those aged 65+
- there is more concern over the possibility of a one off accident than the risks of more long term pollution
- half the sample consider that nuclear waste arises from power/electricity production (29%) or fuel production (21%)
- more than two-fifths (44%) could not specify any source, and this is particularly so of women
- ignorance is greater amongst those who do not live near a site, and amongst those who have no knowledge of NII

- storage as a management solution accounted for 54% of responses on current treatment, but only 26% of responses on preferred treatment. However, 53% could not specify a preference
- concern over nuclear waste is greater amongst
 - women
 - those living very near a site
 - those with an overall negative view of the industry
 - those not agreeing with de-commissioning plans
- respondents are more concerned about the global impact of nuclear waste than on either national or local implications
- the sample is generally in favour of current de-commissioning plans
- respondents in favour of de-commissioning plans are more likely (10%) than those neutral (5%) or negative (4%) to favour nuclear energy
- overall, respondents do not consider themselves at risk from nuclear waste and in fact consider it significantly less of a risk than diseases like meningitis or cancer, smoking or road accidents.

Conclusions

In response to the main objectives of the survey:

- current spontaneous level of concern over the industry in general (7%) is low, and lower still for nuclear waste (3%). On prompting, concern over nuclear waste scores 7.44 on a 1-10 scale
- the specific issues of concern about the industry are:
 - nuclear waste (34% of responses)
 - risk of accidents (30% of responses)
 - health risks (26% of responses)
- personal risk from nuclear waste is not of overt concern, scoring 5.81 on a 1-10 scale, and is less worrisome to respondents than risk from diseases like meningitis or cancer, smoking or road accidents

Although the fieldwork coincided with the negative publicity surrounding Sellafield, the overall results largely mirror the qualitative findings, with the industry in general and nuclear waste in particular top of mind concerns neither for the sample as whole nor those living close to sites. Although respondents showed concern over nuclear waste on prompting, there is no evidence that they feel particularly at risk from it, and this is equally true for those living near and further away from sites. Furthermore, respondents aware of NII were generally more positive than those without this awareness, and increasing awareness could do much to enhance the image of the industry.

Overall Conclusions from Four Studies

These conclusions represent findings from all four studies. Comparing results from studies designed with different aims and using different research designs and methods and different frameworks within those methodologies is problematic. However, it is clear from comparison of the four studies that where similar questions were addressed, in some cases similar answers emerged (for example, regarding the highly negative response towards ‘radioactivity’). In other cases, there are several significant strands of response to an issue (for example, with respect to the continued production of wastes from nuclear energy generation, one strand sees this an inevitable whilst another sees it as foolish to continue producing wastes). Inevitably, we have used our judgement about when to include or exclude findings as generic or otherwise significant. Findings relating to areas where there was a divergence of views are indicated by the addition of an explanatory footnote.

The second column indicates which components of which studies draw this conclusion. The key to abbreviations used is as follows:

Study	Component
UL = University of Leeds CSEC = Lancaster University FF= Future Foundation TNSH = Taylor Nelson Sofres Harris	fg = focus groups q = questionnaire i = interviews r = review

It must be emphasised that the number of studies indicated as reaching a particular conclusion should not be interpreted as an indicator of the strength of that conclusion, as there were differences in the way that questions and issues were addressed in different studies. Where a study does not appear in the right-hand column it does not necessarily indicate disagreement with the conclusion but, more likely that this issue was not addressed in that particular study.

Conclusion	Study
<i>Institutions</i>	
The industry and government are mistrusted	ULq, FFfg/q, CSECfg
Environmental groups are trusted more than the industry and government	ULq, CSECfg ¹³
Most people have a negative attitude towards the nuclear industry	TNSHfg, FFfg, CSECfg
The industry is associated with secrecy and underhandedness	FFfg, CSECfg
The industry should be more open	ULfg, CSECfg
<i>Knowledge and information</i>	
Lack of knowledge: Most people have very little knowledge about radioactive waste	TNSHq,

¹³ This is line with other surveys on environmental information more generally. It appears that people expect information to be framed in a way that suits the interests of the information provider, and thus all information is biased (including that from environmental groups). However, it seems that environmental groups are seen to be acting in the interests of the environment, rather than being self-interested, and are thus more trustworthy.

issues	CSECfg ¹⁴ , FF, ULfg
Most people feel themselves to be inadequately informed	ULfg, FFfg, CSECfg
Most people say they would like to be better informed	ULfg, CSECfg
Most people say that ‘realistically’ they would be unlikely to seek information unless prompted (e.g. by site proposal or having their interest aroused through, for example, participating in a focus group)	FFfg, CSECfg
Many people assume that knowledge is never complete	CSECfg
Many people expect ‘scientists’ to be able to invent solutions	CSECfg
Many people do not have established positions with respect to radioactive waste	FFfg, CSECfg
The vast majority of people have not heard of Nirex	CSECfg, FFq ¹⁵ , TNSHq, ULfg
Many people believe that the media only reports bad news about the industry	FFfg, CSECfg ¹⁶
Some people believe quantitative information is more reliable	FFfg, CSECfg ¹⁷
Many people are sceptical about information provided by the nuclear industry	FFfg, CSECfg
Most people believe that information is biased in the interests of the provider	FFfg, CSECfg
There is a strong requirement for information to be provided in public domain - but this may be so that ‘others’ (e.g. Greenpeace) can verify or challenge claims and establish legitimacy of information base - and, of itself, this demonstrates openness	CSECfg, FFfg/q
Most people have a good ‘feel’ for the Geographical issues Ethical issues Social issues Economic issues Decision making issues	ULfg CSECfg CSECfg, ULfg ULfg CSECfg
Most people have a bad ‘feel’ for the Technical issues Radiological issues	ULfg, CSECfg CSECfg
Most people think information should be easily accessible and understandable	FFfg, CSECfg
Power production is the most widely identified source of	ULq, CSECfg

¹⁴ Generally, those with more knowledge have either worked for the industry in some capacity (where training is very often provided), have a family member who has worked for the industry, or have a special interest. Although some people living in the immediate vicinity but not working for the industry have more knowledge, many have not.

¹⁵ FF give a figure of 2%. TNSHq gives a figure of 5% for awareness of HSE/NII.

¹⁶ In the CSEC focus groups, at least, this did not seem to imply the corollary that good news was unreported, but that media coverage was recognised as partial and that the public are not told the ‘whole story’.

¹⁷ There was also a feeling in the CSEC focus groups that figures can be manipulated to hide or show things; one requirement therefore was a standardised format of reporting.

radioactive waste, with some identification of medical uses	
It makes a difference whether issue is presented as ‘Nirex’s/the industry’s problem’ or a shared social problem	ULr, CSECfg
People are willing to see radioactive waste as a shared social problem	CSECfg
Waste management should be funded by industry, but not controlled by industry	FFfg, CSECfg
Women are more concerned than men	TNSHq ¹⁸ , FFfg
Spontaneous expression of concern is low, however, when prompted, concern is high and the issue is considered to be important	FFq, TNSHq, CSECfg
There is diversity of views, but these are not (or only very weakly) related to demographic variables	TNSHq, FFq, CSECfg
<i>Principles for radioactive waste management</i>	
Safety is paramount (cost should not compromise safety)	ULq, CSEC
Human and environmental protection is paramount	CSECfg
Cost is not important	ULq, CSECfg
<i>Management preferences</i>	
Storage is preferred to immediate disposal	ULfg, TNSHq, CSECfg
Waste should be retrievable	ULq, CSECfg
Waste should be monitored	ULfg, ULq, CSECfg
Waste should be stored on the surface	ULi, CSECfg ¹⁹
Waste should be stored/disposed of underground	ULq, CSECfg
Research into alternative options should be pursued (including recycling/finding uses for wastes)	ULq, CSECfg,
More international efforts should be made	FFq, CSECfg
Transport of waste is seen as high risk	ULfg, ULi, CSECfg
Many people believe no community would want to accept radioactive waste in their locality	FFfg, CSECfg
<i>Public participation and decision-making</i>	
The public can respond reasonably to the issue	FF, CSECfg
Decisions should not be party political	ULi, CSECfg
Public should be widely consulted/involved	ULq, FF, CSECfg
Referendum is inappropriate due to complexity of issue, un-/mis-/ill-informed public, and impossibility of presenting all necessary information in an unbiased way to a large audience	ULi, CSECfg
Independent scientists, the industry, and environmental groups should be consulted	ULq, FFfg, CSECfg
Independent scientists, the industry, and environmental groups should be included in decision-making	ULq, CSECfg, FFfg
Public should be consulted but decision should be made by ‘experts’ as public are not sufficiently informed (1)	ULi, CSECfg, FFfg

¹⁸ Most studies of public responses to risks find that women express higher levels of concern.

¹⁹ Although UL state that all their six interviewees expressed this preference, responses within the CSEC focus groups were more mixed, with a substantial proportion expressing a preference for this option.

Decision making/advisory body should be independent and include representatives of all relevant interests and expertise (including government (cross-party), industry, independent scientists and environmental groups)	FFfg/q ²⁰ , CSECfg
People are capable of understanding information and developing informed positions	FFfg, CSECfg
Siting	
Population density is important for siting	ULq&fg, CSECfg
Geology is important for siting	ULq, CSECfg
The ‘common good’ or ‘national interest’ are accepted concepts -	ULfg, CSECfg
But people will resist a facility in their local area	ULfg, CSECfg
Nearness to nuclear installations	
Distance and nearness to nuclear installations as understood by participants is not necessarily the same as geographical distance	CSECfg, TNSHq
Proximity to nuclear installations, however defined, is not a predictor for concern	TNSHq
People living near and tolerant of nuclear installations are more likely to accept the storage of locally produced radioactive wastes	CSECfg
The nature of the problem	
The associations of ‘radioactive waste’ are highly negative, e.g. bombs, military, contamination, risk, danger, cancer, birth defects	ULfg, FFq/fg, CSECfg
‘Radioactive’ is a highly negative term	ULfg, FF, CSECfg,
Radioactive wastes are predominantly associated with nuclear power production	TNSHq, CSECfg
The source of the waste is not relevant to its management, but does raise questions about whether it should be produced in the first place	CSECfg, TNSHq
The majority of people do not believe that wastes can (currently) be stored or disposed of safely	TNSHq, CSECfg
Radioactive waste is a global rather than local problem	TNSHq, CSECfg
No one would be happy living near a radioactive waste repository	ULfg, FFfg, CSECfg ²¹

²⁰ Whilst the Future Foundation’s survey found that the majority of people (given one selection option) chose the British government as the body which should have the final say about radioactive waste management, in focus group discussions a more inclusive body was suggested. The model of the cross-party committee was represented favourable in both CSEC and FF focus groups, as was the idea that a variety of representation would both enable the ‘best’ ideas to come forward, and counteract the negative facets of various institutions.

²¹ Although this was an immediate response in the CSEC focus groups, upon reflection some people stated that they probably would remain in the area, and some that they already lived with the waste from existing installations in their neighbourhood and that it would be acceptable to continue storing ‘their own’ waste, but emphatically not that from other installations.