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RISK PERCEPTION AND 'THE PUBLIC'

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Summary

This paper considers four questions arising in the process of understanding the public perception of risk. The arguments given are illustrated with findings from recent research undertaken in the context of disputed risks from Sellafield and, to a lesser extent, awareness of other nuclear-related issues. The paper seeks to foster wider appreciation of the real complexities encountered in the field of risk perception research. The four questions, and brief summaries of how they are answered in the paper (these answers are developed and illustrated in the main text), are as follows:

1. Who are 'the public'?

'The public' consists of a multitude of overlapping and diverse sub populations within and between which there are very different risk attitudes. Clarification over motives for wanting to comprehend public risk perceptions should direct attention to particular subpopulations, and any specific findings that may follow may have little relevance beyond these groups.

2. What determines people's risk perceptions and attitudes?

People's (nuclear) risk perceptions and attitudes are determined by their interpretations of what they recognise as the attributes (material and symbolic) of nuclear power. What attributes people identify, and what they then mean, depends on people's prejudices and values, and their experiences of everyday (economic and social) life. They are manifestly different for different people, and fluid. To speak in terms of irrationality and misperception (amongst other elements of self-blinding vocabulary) is plainly to misunderstand how people, all of us, cope with conflicting realities.

3. How can risk attitudes be represented?

Representations (meaning data or other indicators that might be referred to to denote the state of risk attitudes) are inevitably partial and selective, and some are more valid than others. Faithful representations of risk attitudes must be grounded in people's own experiences and interpretations. Anything else (or the blind adoption of a single representation, to the exclusion of others) is make believe, therefore of limited validity, and can be counterproductive.

4. What might be done to ameliorate adverse and 'inflated' risk attitudes?

To seek to change public risk attitudes is a formidable prospect. A failure and counterproductivity of past initiatives can be explained in terms of their failure to catch the depth, complexity and ambiguity of people's perceptions. The way ahead must entail learning to live more positively both with the realities of the social world, and with the uncertainties in the state of scientific knowledge. In a democratic society, this entails not imposing industrial or authoritarian over social wants, and not disguising or dismissing imperfections in knowledge, but being more receptive to calls for new social contracts and institutional reforms whereby the newly emerging demands and newly appreciated uncertainties may be more realistically confronted.

Risk perception and 'the public'

Introduction

Much has been written about people's perception of risk, particularly since the 1960s. In the case of nuclear energy - the context for the present paper - the products of research have taken a number of forms: general attitude polls, many showing a progressive increase in 'fear' and decrease in 'support' for nuclear power in Europe and America (1); studies of the (un)acceptablility of the siting of nuclear facilities in various locations (2); and the identification and testing of qualitative factors (such as 'dread', uncontrollability, invisibility and longevity of effect) which seem to account for people's often adverse attitudes towards 'the risks' of nuclear power (3). More recently the deliberations of the House of Commons Environment Committee have been published (4); and, of course, there has been much commentary about Chernobyl, about Sellafield, and about sites for low and intermediate level nuclear waste disposal in the UK. The general message is clear - 'public concern' is one of the major problems of the nuclear industry, affecting, by extension, authorities with regulatory responsibilities.

A common technocratic (5) way of viewing the problem presented by the pubic's concern for risk has been in terms of irrational fear and

misinformed minds, prey to deception by irresponsible and unrepresentive political activists and the media. This technocratic view may be convenient and temporarily satisfactory for a 'rational' and 'knowledgeable' industry and regulatory authority (but see the companion paper by Wynne (6)). However it is plainly inconsistent with serious understanding of risk perceptions: it is inaccurate and it misses issues of real significance. Moreover, its ways of addressing the 'adverse perception' problem have tended to be limited to increasing authoritarianism ('we know best'), doing nothing (because 'people are irrational and immature'), undermining people's credibility (rather than addressing their points of concern), or advocating programmes of education of staggering ambition ('if only people were better informed ...'). Each is unsatisfactory.

The basic premise of the present paper (and the very germ of the meeting for which it was written) is that what are ordinarily referred to as 'the public's risk perceptions' are of far greater importance than the technocratic view recognises. Rather than being dismissed, excused or so badly misunderstood, the complexion and determinants of people's risk perceptions (cf what the risks actually are) need to be explored more seriously. This must entail sound methodology and 'real' data (not bogus techniques or pure speculation), and acknowledgement of the true complexities of risk perception research. Questions increasingly faced by policy makers, such as that of how they might weigh scientific risk

assessment against public perception can then be addressed from a more informed position.

This paper seeks to foster a fuller understanding of public risk perceptions and attitudes through sketching out some answers to the following four questions: 1. Who are 'the public'? 2. What determines their risk perceptions and attitudes? 3. How can their risk perceptions and attitudes be represented? 4. What might be done to ameliorate adverse and 'inflated' risk attitudes? It is hoped that the answers can provide useful new starting points for those faced with addressing and negotiating problems in which adverse risk attitudes play a significant role.

The general argument of the paper draws on findings from recent ESRC sponsored research investigating aspects of the Sellafield risk controversy and, to a lesser extent, awareness of other nuclear issues. The Sellafield research included an assessment of risk attitudes in West Cumbria and examined the relevance of the Black Report - with its message of reassurance to people concerned about a possible health hazard in the vicinity of Sellafield - to the way local people look at the issues (7). The broad complexion of the recent Sellafield risk controversy will be assumed familiar to most readers.

I Who are 'the public'?

The first question is important because debate about public risk perceptions can become frustratingly ambiguous, sterile or (perhaps deliberately) misconceived if the answer is not apparent. In commentary about Sellafield for example, (and ambiguity over who really are being referred to as 'the public' is hardly exceptional to this case), different references to an otherwise unspecified animal simply alluded to as 'the public', turned out to be references to one of a number of different populations:

1. The national audience of the YTV programme (estimated at 3 million people)/people concerned about its disclosures/and or allegations.

2. "The people" of: West Cumbria/Seascale/Copeland/6 Parish councils/Millom ward/ . . . other spatially definable local areas.

3. "The people" of: Britain/Scotland/Northern Ireland/Eire/Isle of Man .

4. Regional Councillors/District Councillors/Parish Councillors/MP's..in other words, elected representatives.

5. People who write letters to newspapers/are interviewed on TV in a non-professional capacity/talk to journalists.

6. Activists - Greenpeace/CORE/COMM/Coastwatch/. . .

7. People who support particular political/interest groups (to the exclusion of people who do not).

8. All but one or more of the following: politicians; nuclear industry management; nuclear industry employees; civil servants; experts; . . . other professionals.

9. The media - very frequently taken as some sort of barometer of a broader, unobserved, climate of public mood or opinion.

10. National Mori/Gallop poll participants (70% of which, according to a

recent poll, considered Sellafield to be unsafe; 40% considered it should close).

11. No-one in particular.

Serious appreciation of public risk perception must acknowledge that there are many different publics - a fact plainly neglected or left ambiguous in the dominant technocratic view (as well as in opposition 'populist views'), which instead falsely adopts an implicit absolute of a homogeneous body of people who need not be identified (still less consulted).

An example of how easy it is (inadvertently) to ignore the above considerations is found in statements made by Sir Douglas Black following the publication of his Inquiry's report. Sir Douglas repeatedly voiced his belief that 'members of the public' who had been concerned about possible radiation induced health risks arising from Sellafield's operations would be justifiably reassured. It was not always clear which particular public he (or others who adopted the same position) had in mind. But subsequent interviews with several hundred inhabitants of West Cumbria (8) stand as living proof of the very groundlessness of this belief for one particularly important 'public' in this context.

Though differences in attitude, interest and value may be fully expected as between different subpopulations, it should also be recognised that within any identified subpopulation, there is likely to be a considerable

differentiation as between different people's positions. In other words, to fix on a public, is not to fix on an inert, uniform mass. In Seascale, for example, a village just about entirely dependent in one way or another on Sellafield, all inhabitants similarly stigmatised by recent publicity, and all living in the village most directly 'at risk', there is not a simple homogeneous pattern of opinion (as might be casually imagined). On the contrary, there are striking differences. There are about as many people who speak of concern for radiation induced health risks linked to Sellafield's operations as there are who reject any basis for concern. The area is not one of endemic fear; neither is it one in which there is little concern, expressed only by an insignificant, irresponsible, or clueless minority, or where it is unanimously repressed by an employment conscious local workforce. Rather, there is a breadth and diversity in local 'risk attitudes', underpinned by rationalisations, justifications and arguments of differing nature, depth and complexity. There is no evidence to suggest that diversity in attitude is peculiar to this particular subpopulation.

To get beyond the ambiguity about who really are the public may raise difficulties easier left hidden, and it may be politically convenient not to lay these bare. Such difficulties include the unrepresentative nature of one particular public of others, and the onus to discover 'the public's' positions and see if they are what they had been assumed to be (thereby losing a symbol of convenience and having it replaced by some

actual people). Acknowledgement of the manifest diversity of peoples' positions can also prompt the uncomfortable realisation of an impossibility to please everyone. So who matters most? Is it those 'objectively' deemed to be at most risk? Or, those 'objectively' deemed to have most at stake? Or, those with the most adverse perceptions? Or, those whose interests are in most conflict with those wanting to understand perceptions? Or, those most politically dangerous? Or, those fitting some more general notion of a 'climate' of opinion?

Given the practical difficulty of keeping track of all possible publics, choice becomes inevitable. The way this choice is made can, in the end, only be determined by identifying ones motives for wanting to understand public perceptions. Possible motives are many, and they include: keeping on top of the politics of anxiety; seeking to change (re-align) people's perceptions; ameliorating concerns; or, making a disinterested study of a phenomenon, to elucidate its intricacies or possibly to test related hypotheses. While disinterested academic research may identify most closely with the last of these motives, agencies more centrally and actively involved within risk controversies (as some kind of stakeholder) are more likely to be motivated by one of the earlier mentioned goals. What is clear is that the choice about 'which public?' can be problematic (perhaps a subject deserving of research in its own right), and its outcome will inevitably direct attention to a particular public, and exclude others. Any particular findings, deductions, or conclusions about

public risk perceptions which may then follow may have very little relevance for other publics (for example, special interest group of wider communities; elected representatives of smaller-than-constituency subpopulations) - a fact that is often ignored.

The intricacies over who really are the public are unimportant if technocratic pretences can be maintained. They can continue to be ignored by, for example, media commentary, which can continue to sustain itself on less rigorous an appreciation of reality. Greater integrity is required on the part of anyone seeking a serious understanding of perceptions.

In summary, 'the public' consists of a multitude of overlapping and diverse subpopulations within and between which there are very different attitudes. Clarification over motives for wanting to comprehend public risk perceptions should direct attention to particular subpopulations, and any specific findings that may follow may have little relevance beyond these groups.

II What determines people's risk perceptions and attitudes?

At a general level, this question can be answered by reference to figure 1. It portrays risk perceptions as being determined, on the one hand by individuals' own private reflective understanding of things - their minds, brains and a lifetime of personal experiences - and on the other, by individuals' wider continuing communication and interaction as a member of a social milieu. This includes both informal (eg friendship, kinship) and formal (eg authoritatirian, workplace, commercial) networks, whereby communication and dialogue with others can serve to confirm and verify already held positions or perhaps lead to revisions in view. The model presents people's perceptions, attitudes and opinions (their positions (9)) as products both of their own awareness and interpretations of things, and of their material and social (cultural and institutional) experiences as members of a society. Suggested components of these experiences for people in West Cumbria are sketched in figure 2.

The dominant determinants of risk attitudes in West Cumbria (subpopulation 2 in the previous list) appear to be the following:

(i) Material benefit - the importance of Sellafield to individual and community prosperity is very much recognised.

(ii) Personal investment - it is no less locally apparent (though much less appreciated more widely) that individuals and communities have invested their whole lives in Sellafield, and this cannot but condition the way they look at the issues.

(iii) Workplace - with a Sellafield worker in virtually every family, everyday experience of operations/containment/malpractices/pride or dissatisfaction with work is very readily apparent, and group knowledges quickly spread and disseminate to others and become embedded in the local vernacular.

(iv) Malign effect - many (though not all) locals recognise their area as one which has high cancer/leukaemia rates - a phobia of the twentieth century.

(v) Science - different understandings of science, and different views of the authority of science and science-based control of the nuclear industry.

(vi) Media - either providing continual proof of Sellafield's malign radiation environment; or doing increasing harm to local quality of life through their stigmatising allegations.

The different mix of these factors generates the differentiated local views that have already been referred to; and while some people's attitudes rest on very firm and self confident justifications (steadfastly rejecting any opposing forces), others signal people's confusion and disorientation.

Broadening the discussion to a wider UK public (subpopulations 3 or 10 in the previous list) the various influences on people's perception of nuclear risk have clearly produced adverse effects. A plausible explanation for this might run as follows. Media commentary (for many people the sole means of awareness - see also Table 1), feeding on operational errors and scientific disputes (and more generally, the fall from grace of scientific authority) provides frequent reminders of the possibility of malign effect from the nuclear industry and hence a basis of natural concern. Even disregarding obviously sensationalist reporting

('Villages of the damned' 'horror in the hoover' 'spiders big and strangely coloured and geese deformed' have all arisen in recent Sellafield reportage (10)), issues are (of necessity) described in language (unknowingly) laden with potent signification (in the public sphere, words such as radiation, contamination and plutonium do not have the neutral, technical meanings ascribed to them by the 'industry'); welling up with further adverse connotations (cancer, bombs, leaks, catastrophic accidents, genetic damage, long term harm); and generated by an industry whose operations are complex, incomprehensible, remote and require space-age clothing and security fencing patrolled by armed guards. This is all very potent stuff.

The adverse significations are not all-powerful for individuals for whom stronger affirmative forces are acting (faith in expertise, material gain, counter-argument, improved quality of life), but for many, a natural concern is the only rational response, and any reassurance that may be offered is short lived in the face of renewed information or disclosures of an adverse or controversial kind. And for people impressionable to forces both adverse and affirmative, the result can be some very awkward contradictions to live with, leading to confusion, ambiguity, disorientation and suppression of feelings too overwhelming or contradictory to bring consciously to mind in order to 'get on with life' in the most tolerable way possible.

'Getting on with life' (and any initial interpretion of the adverse and affirmative signals) does not occur in a vacuum. What do other people say - family, friends, acquaintances, social leaders, social enemies, experts? Whose views have credibility; whose don't? And what other social encouragements and pressures are there for adopting a particular position? (The importance of other people, and more generally the idea of perceived risk being a social and institutional c.f. a physical, calculable, phenomenon, is clearly illustrated in the remarks reproduced in Table 3.)

Social interaction leads to positions being confirmed, adapted, and, in some cases, discovered or expressed for the first time. Positions and arguments which are 'successful' get repeated, and so both individual's own rationalities and the cohesion of particular social groups is maintained and, likewise, the rejection or suspicious appraisal of opposing or threatening positions. Prejudices develop. These are not irrational whims that may be ignored by anyone with a serious interest in understanding perceptions, or that can be suppressed by an individual. Rather, they are objective forces which are filters to peoples openness to the world and are a part of people's very being. They are simply conditions whereby what people experience or encounter says something to them. Prejudices (or what might more simply be called filters of perception) can be very deep rooted indeed and have very deep social investments in them - systematic mistrust of Authority; systematic faith in employer, or in Science; the automatic ascribing of particular meanings

(and not others) to words.

It is not simply a question of risk perceptions and attitudes deriving from interpretations which are shaped by people's already held prejudices and which are reinforced in the course of their daily lives as social individuals. Rather, risk positions themselves can become a means for developing social cohesion and interrelationships - the feeling of belonging to a community or cause group, perhaps. It also then becomes obvious, rather rational behaviour, to take on board whatever other arguments and possible activities reinforce the groups' aims (and corresponding extreme derision or hostility towards threatening ones). The 'risk perceptions' that are the forces of internal cohesion for some groups can at the same time be forces of dissent and disruption in some broader social context.

What is also important to appreciate is that people's own prejudices are typically not fully apparent to them - and this includes 'experts' and 'authority' as well as 'public' (see again Wynne (6)). Thompson (11) has talked of people being ensnared in their own provincial ways of looking at things. Linkages with the ways in which others in 'the same' controversy look at things may be tenuous or unknown. To ask 'who is right?' (about how big the risks really are) may be a proper focus for inquiries concerned only with the validation or refutation of objectively verifiable 'facts'. But that is not the problem posed by adverse risk perceptions.

It does not help to tell people they are 'wrong'. Analysts who fail to recognise this, but speak only of 'irrational' bias and 'misperception' miss issues of real interest and mask them with their false implicit absolute of rationality. Rationality is only definable with respect to the prejudices which constitute it. There are many.

The perception analyst, though having to confront the manifest complexity and diversity of people's prejudices and ways of looking at risk issues, is at least released from the onerous (and now evidently impossible) task of searching out an unbiased, unprejudiced or uniquely rational view.

In summary, people's nuclear risk perceptions are determined by their interpretations of what they recognise as the attributes (material and symbolic) of nuclear power. What attributes people identify, and what they then mean depends on people's prejudices and values, and their experiences of everyday (economic and social) life. They are manifestly different for different people, and fluid. To speak in terms of irrationality and misperception (amongst other elements of self-blinding vocabulary) is plainly to misunderstand how people, all of us, cope with conflicting realities.

III How can risk attitudes be represented?

Whereas in answering the previous question the various influences on people's perception of risk have been surmised, here it is necessary to clarify what is going to be used or referred to (what representation) as evidence of what people's perceptions are. In particular, what sorts of data, measures or other characterisations can be used to tell an analyst, or other interested observer, that there is or is not an 'adverse risk perception' problem. There are many possibilities. Any one of the following might be referred to as an indicator of social attitudes to Sellafield:

attitude polls
qualitative scalings
representation of local discourses
product of anthropological observation
political action (eg Greenpeace)
evidence of local protest action
the size of subscriptions to particular campaigns
news media reportage
media correspondence
media documentaries
fish sales
hotel business
beach use
house prices
parliamentary questions
letters to MPs
children's drawings
waiting lists for particular GP's practices
a sense of crisis

Against this array of diverse possibilities three points in particular

will be chosen for elaboration.

First, each individual indicator will give its own characteristic depiction of risk attitudes. None can claim to do so in a comprehensive or permanent way (in other words, none should claim to be truly 'representative', though certain studies pretend otherwise) but only partially and temporarily. No-one would claim a painting to be a comprehensive representation of its subject, a mathematical model a comprehensive representation of the system it depicts, or a map a comprehensive representation of the earth's topography. The same is true of attitude representation. A representation of the social world cannot (by definition) in itself be the social world. One can seek to observe and somehow record particular social practices - people's behaviour, arguments, or whatever, - or identify some likely indirect indicators (fish sales, hotel business). And some will yield more faithful, telling and longer lasting clues than others. What is represented will depend on what it is chosen to observe and on the instrument of observation, including how it is employed (eg the design of survey questions, choice of sampling frame and sensitivity and guiding intuition of the analyst). It is also important to recognise that particular indicators are, either by nature or by design, specific to particular publics, and it is no practical use intending to 'monitor' the perceptions of a particular public using an indicator which reflects another (for example, West Cumbrian attitudes via national opinion polls; moral support for political

activists via a count of active members or of subscriptions).

Second, there is the question of which representation to refer to. It follows from the previous point that there is no unique or objectively correct choice. While it is possible to visualise an ideal choice process, in which particular (and most faithful) representations are consciously chosen from amongst all possible alternatives, in practice this ideal is unlikely to be realised. Specifically, the most faithful representations may not be the easiest to obtain (notably because of inevitable resource constraints) or the most obvious (for example the politically most active groups may assert their importance over others); or there may be political pressure on or motives of the analyst (or other commentator) to adopt a particular representation in preference to others; or a particular representation might be unconsciously selected from the investigator's own subcultural envirionments and then adopted (blind to alternatives and to what is really 'there') as if it is the only reality. It is not at all clear that perception researchers have adequately managed the problem of representation. But its existence should at least be recognised, and it should not be dismissed as being insignificant.

Third, there are some critical implications for the rather structured representations of perception and attitude being advanced elsewhere in certain influential analyses, notably. representations of perceived risk in terms of a quantifiable (10-n) phenomenon (12). They are at best of

limited validity and utility, and perhaps worse, misleading. They manifestly fail to appreciate the way ordinary members of the public look at things. Few people perceive possible health risks from nuclear power in stark, technical terms, but rather as something malign but often intangible that is generated from the existence of an imperfect technology. Its attributes and complexities are interpreted as part of much wider and deep-rooted structures of experience and meaning. Serious understanding and representation of perceptions must tap into these structures and engage with people's 'real life' frames of reference. Statements and analyses based on alternative, make believe representations are (almost inevitably) impotent or irrelevant. Among such make believe representations are not only those making direct use of low probability, quantitative reasoning, but also those freely invoking comparisons with other risks deemed (though, significantly, not always definitively established) to be of a similar (or lower) order of magnitude. A lack of congruence with people's 'real life' perceptions is also one of the key factors reducing the effectiveness of Sir Douglas Black's message of reassurance (see also below).

Rather more sophisticated, though still seriously limited, representations of peoples perceptions are (as Wynne (13) argues and illustrates at greater length) those embedded in the increasingly popular multi-attribute utility analyses. While allowing greater scope for individual subjective evaluation of the significance of different qualitative risk

attributes alongside quantitative physical risk magnitudes, they take only limited account of the very great diversity among people, and fail to acknowledge the fundamentally interpretative nature of people's perception of risk. In particular, though representing a risk source in terms of a set of descriptive attributes, they do not allow for different people choosing to include different elements in the set, or for different people ascribing different meanings to a given descriptor, or for people failing to view a risk source in terms of a discrete list of descriptors. To re-cap an earlier argument, risk attitudes derive from a well of experience, argument, reflection, agreement and resistance. It is difficult to see how any formal, structured, discrete representation of such a diverse and fluid sphere of thought and action can be satisfactorily achieved.

To conclude the discussion of representation and to bring out some nuances of social survey representations, some findings from the Sellafield survey undertaken in Seascale and nearby towns and villages in West Cumbria in December 1984, are described in more detail. As already remarked (and shown more specifically in Table 2) there is a wide distribution of attitudes. It is noteworthy that although the aggregate pattern of response is similar for each of the two risk issues identified - radiation induced health risks to children, and beach radiation levels - many people did not answer in the same way for each question. A distinction between the two issues was deliberately made in the design of the survey, and the

distinction was also clearly a real one for a number of interviewees. This reminds us that even 'concern' is not a simple matter.

Underlying the broad indicators of position given in Table 2 are different kinds of rationalisation and justification, articulated to different extents by different people. Free response questions invited people to talk in their own words about the way they looked at the issues, and a number of their comments are reproduced in Table 4. Alongside these comments we can propose that the most telling formal definition and representation of what is often loosely referred to as someone's 'risk attitude' is not a numerical expression of percieved risk magnitude, nor a discrete grading on some scale of concern or anxiety, but rather the way an individual selects from the available material of 'risk discourse' (14). Also, not surprisingly, it turns out that there are some correspondences between the sorts of rationalisations and arguments which people use and their social and demographic characteristics, this reflecting the different experiential and connotational resources of different people.

In summary, although representations are inevitably partial and selective, faithful representations of risk attitudes must be grounded in people's own experiences and interpretations. Anything else (or the blind adoption of a single representation, to the exclusion of others) is make believe, therefore of limited validity, and even counterproductive.

IV What might be done?

Adverse nuclear risk concerns delineate a crisis of confidence in the industry, with ramifications for those with statutory responsibility. To overcome the crisis would require forces to overcome those which are currently acting to shape attitudes in an adverse way. Quite simply, if 'industry' and 'attitudes' are out of kilter, their (re)alignment requires either (A) changing attitudes, or (B) changing industry (or a bit of each). What are the possible means?

(A) Two strategies for changing attitudes are: (i) to induce people to change their position by offering them material gain; (ii) by reason and argument. They can each be problematic.

(i) The elementary logic behind the first is plain - if people stood to gain more obvious benefit, they may take a more positive attitude. It is the logic behind recent proposals to offer compensation to communities finding themselves local hosts of noxious dumps (15); behind 'willingness to pay' initiatives (16); and behind (oversimplistic and somewhat inaccurate) risk-benefit explanations of the apparent acceptability of risk to Sellafield employees.

The logic is too elementary for general application, however, there being ready evidence that the attempted substitution of money for value can be

pathetically inadequate and sometimes quite counterproductive. First, the logic that for some individuals constitutes a reasonable risk-benefit balance is for others plain evidence of harm

> ". . . the compensation paid out by BNFL to the families makes me feel that there is something in the accusations against them",

or immorality

> ". . . its disgusting to try to buy off people's lives like this".

Second, the complex differentiations within society means that the 'average' individual for whom compensation may be 'calculated' is unlikely to be representative of many others, and may not even exist. Third, the material compensation strategy tries (falsely) to re-focus the perception problem back onto risk as a quantifiable phenomenon, or as a set of finite, discrete attributes. Since people do not see the problem in such terms but rather in a much more complex and often ambiguous way (cf the answer to question 2), so the logic for risk-benefit compensation can become very tenuous indeed. Fourth, even without the above complications, the practical achievement of compensations that are generally seen to be fair could be quite problematic.

(ii) Reason and argument is not necessarily more successful. The author's recent Sellafield-based research, for example, showed very clearly that Sir Douglas Black's message of reassurance, emerging from his high level Committee of Inquiry, and intended assuage people's concern about possible

environmental health risks from Sellafield, was received in West Cumbria with a mixture of disinterest, confusion, satisfaction, deferred judgement and sharp criticism. Overall, the reassurance and the argument on which it was based, though repeatedly stressed by Sir Douglas in a large number of mass media statements following the publication of his Inquiry's report, did not appreciably affect the way most people in West Cumbria look at the issues. Notwithstanding the point that 'presentational' aspects could have been better (17), and the possible obscuring effects of the scientific controversy that followed the Black Report's publication (18), this is uncomfortable news for anyone who would want and expect such a distinguished public policy initiative (and argument of reassurance) to have greater social relevance. Its role otherwise is merely to interest scientific, medical and other elite communities, to exist as an object of occasional media attention or, more hollowly, simply to stand as a ritual act of political expediency (19).

That Sir Douglas was a medical man, and a somewhat anti-establishment figure with no connections with the nuclear industry, really underscores a profound problem here. In particular, the Envirionment Committee (20), amongst others, have talked of the importance of having experts who are independent of the nuclear industry to offer advice and reassurance to members of the public. Here was an important occasion when such independence of expertise was nowhere nearly enough.

The above West Cumbrian example is by no means unique in pointing to the lack of effect of authoritarian reason and argument. Drawing on a wealth of academic experience (and perhaps also their own) the Environment Committee (4), for example, plainly recognise the enormity of the problem, in commenting that it is naive to think that the public as a whole is easily going to be 'educated' technically in the way the industry has imagined, nor are their adverse perceptions likely to be countered by superficial public relations tactics. We are led once more to acknowledging the formidable complexity, subtlety and ambiguity of people's perceptions.

And, of course, there can be no promise of the 'reason and argument' strategy succeeding among people who are convinced about immaturities and uncertainties in the science of radiation induced health risks. For these populations, there is no scientific basis for offering reassurance. It is also only sensible to acknowledge that the distinction between 'public' and 'authority' among participants in related scientific debates is not necessarily that between 'lay' and 'expert'.

The limited effectiveness of reason and argument can perhaps be more closely considered by discriminating between two (linked) aspects - the social and the scientific. In social terms, limitations arise due to stronger forces acting at interpretational, psychological, cultural, institutional, experiential or political levels (these are the sorts of

things described in answer to question 2). In scientific terms, limitations arise if there are legitimate points of entry (because of immaturities, uncertainties and the fundamentally socially constructed nature of knowledge (21)) for fundamental dispute of the scientific basis of reassurance. In other words, dispute over 'the facts' about radiation induced health effects from nuclear power.

Succeeding in changing attitudes through reason and argument is difficult enough if the possibility of legitimate scientific limitations can be discounted. The task is then that of trying to find a final compromise between people's conflicting interpretations, wants, beliefs and values, but at least against an assured basis of scientific fact ('truth' about how big the risks really are). The difficulty of the task is severely compounded if the possibility of legitimate scientific dispute cannot be discounted - a position for which there is a growing weight of opinion and evidence, not least Chernobyl (also, perhaps, the prospect of increasing debate as a result of increasing access to information; and new research findings such as those potentially resulting from the studies instigated by the Black Report's recommendations). There are then not only the contradictions and fluidity of the social world to contend with, but also the complications and ambiguities of an uncertain (though not non-existent) science too.

So, whereas in the presence of social, but not scientific, limitations

there is the possibility - however 'irrational' to certain minds - that social choices will reject what is scientifically sound; in the presence of possible scientific limitations, the possibility of adopting a course that proves folly both in scientific and in social terms becomes all too real. The question of what should be done in such circumstances is not easy to answer; though to act in pretence that the science is definitive when it is actually embryonic is to fudge the issues, to invite later rebuke and to renounce the principle of knowledge-based decision making (22).

(B) Alternatively, rather than seeking directly to change public attitudes, possibilities for changing the industry, thereby making it more publicly acceptable, might be pursued. These could act on two levels: (a) change the industry's operation; (b) change the industry's style.

(a) The proportion of the present crisis of confidence is in no small way due to the number of operational incidents (elsewhere - obviously Chernobyl and Three Mile Island - as well as in the UK). The beliefs of an increasing number of people, that errors are systematic or 'normal', mean that for them a future of stable operations (one possible view of 'change') is just wishful thinking. They instead advocate more radical change - running the industry down. A parallel state of affairs is in evidence in the context of low and intermediate waste disposal - whole communities calling for a radical change from the proposed option of

shallow trench sites.

For some the entertainment of such radical alternatives flies in the face of science (23); for others their dismissal flies in the face of reason. What, if anything, should be done in terms of change, then, depends on how much authority should be given to (which) science, reassurance and its institutional practice; and how much to alternative social wants. The choice will depend, not for the first time, on motives, as will the thoroughness with which the costs, opportunity costs and error costs of different alternatives (in all their complexity and subtlety) are investigated.

(b) Changes of style, as interpreted and recommended by the Environment Committee (amongst others (24)), and gaining increasing Political currency, would mean the industry ridding itself of its remoteness, over self confidence, complicatedness, secrecy and unaccountability. Such changes would constitute something of a revolution in terms of the kinds of social contract under which the industry has operated throughout its life to date, and it is difficult to see the extent to which the nature of the nuclear industry is intrinsically compatible with such change. After all, the crisis has deepened at a time when the industry has moved closer to 'the public' than ever before.

In summary, to seek to change public attitudes is a formidable prospect. A failure and counterproductivity of past initiatives can be explained in terms of their failure to catch the depth, complexity and ambiguity of people's perceptions. The way ahead must be to learn to live more positively with, on the one hand, the realities of the social world and the demands it makes on, in this case, the nuclear industry and regulatory authorities, and, on the other, various uncertainties in the state of scientific knowledge. In a democratic society, this entails not imposing industrial or authoritarian over social wants, and not disguising or dismissing imperfections in knowledge, but being more receptive to calls for new social contracts and institutional reforms whereby the newly emerging demands and newly appreciated uncertainties may be more realistically confronted (25).

Conclusion

A crisis has been described (26) as a moment of transition in which something which held before does not hold any longer, and there is an inadequate capacity of society to respond to change in a positive way. This description seems very fitting to the contemporary position of the nuclear industry in the UK. Tacit acceptance on the part of a large number of publics has been successively replaced by growing doubt and recognition of uncertainty; growing concern; and accidents, incidents and fresh 'disclosures' about the health hazards of nuclear power. This is at the same time a portrayal of change, and of far from positive adaptation. The crisis is manifest not merely in terms of such symptoms as low opinion poll ratings, and increasing receptivity to 'bad nuclear news' reportage, making for a lack of acceptance of nuclear power, and difficulty in communication between 'industry' and 'public'. More seriously, there is outright rejection of the industry by an increasing number of publics, total collapses of communication, and, seemingly, less and less agreement as to what any future dialogue might be about, or who it should be between.

Any valid weighing of scientific risk assessment against public perceptions in nuclear risk management will have to catch the currents of the contemporary crisis. Anything else would just be a misplaced desire for (a socially rejected) utopia.

The answers to the four questions posed in this paper have tried to contribute to the ways in which the 'adverse nuclear risk perception problem' - the crisis - may be sensibly contemplated. They amount to a statement that it has a depth and objective complexity which must be more honestly acknowledged and reckoned with. If the appearance is that of so much complexity and so few final answers, then some further comments are perhaps in order. One is that serious social research into nuclear risk concerns is not the soft, unimportant option that it is often made out to be. Rather it is a point of entry into worlds of conflicting social interpretations and wants, and uncertain scientific knowledge. Another comment, possibly more profound, is that in more completely discovering problems - revealing complexities that have not yet been sufficiently appreciated and thereby fostering wider acknowledgenent of how difficult certain problems might be to confront realistically - the academic can claim to be engaged in a singularly appropriate and positive activity. To have more effectively forewarned policy advisers about the comprehensive rejection by communities up and down the country of sites contemplated for nuclear waste might be an example of where a superficially negative 'academic' appraisal is in reality just what was needed to be known. Only on the basis of appreciating the true nature of current or impending problems and crises can developments to reverse them be properly founded.

Notes

(1) There seem few exceptions in recent polls undertaken in different countries.

(2) Such as work underway at Surrey University Psychology Department.

(3) Notably the Fischhoff/Slovic school in North America.

(4) House of Commons paper 253 i-xvii (1984-85).

(5) Technocratic denoting faith in the performance and 'rightness' of, in this case, nuclear technology.

(6) B Wynne (1986) 'Frameworks of rationality in risk assessment', School of Independent Studies, University of Lancaster.

(7) Complementary aspects of the research included an examination of media reportage of the genesis, preparation and publication of the Black Report, and an interpretation of the Black Report as a scientific study. Frans Berkhout and Gordon Walker were co-workers on this project, and their major contributions are gratefully acknowledged.

(8) S M Macgill and F G Berkhout (1985) Child leukaemia around Sellafield: local community attitudes and the Black Report. Working paper 450, School of Geography, University of Leeds.

(9) To maintain a distinction between perceptions and attitudes is not necessaryily helpful; the term positions can be less restricting.

(10) G P Walker and S M Macgill (1985) The Black Report and the media. Working paper 449, School of Geography, University of Leeds.

(11) M Thompson (1980) Political culture, an introduction. IIASA WP-80-175.

(12) There are continued pre-occupations with probability theory (not people) in a number of contemporary risk research schools.

(13) Wynne 1986 op cit.

(14) S M Macgill and F G Berkhout (1986) Understanding 'risk perception': conceptual foundations for survey based research. School of Geography, University of Leeds.

(15) An early discussion of compensation possibilities is given by R Pushchak and I Burton 'Risk and prior compensation in siting low-level nuclear waste facilities'

(16) There are recent initiatives by the NRPB/HSE along these lines.

(17) People commented that Black was distant; that the report was difficult; and that summaries were not available.

(18) For example, a succession of articles in Nature, The Lancet, New Scientist and The Guardian.

(19) S M Macgill, J R Ravetz and S O Funtowicz (1985) Scientific reassurance as public policy; the logic of the Black Report. Working paper 448, School of Geography, University of Leeds, Leeds LS2 9JT.

(20) Drawing in particular on contributions by T O'Riordan.

(21) J R Ravetz (1971) Scientific Knowledge and its social problems. Clarendon Press, Oxford.

(22) S O Funtowicz and J R Ravetz (1985) Expressing technical information in policy-related research, Journal of the Operational Research Society, present a new tool for facilitating the handling of scientific uncertainties in decision making.

(23) There were comments to this effect in opposition to proposals for zero (or in some cases just reduced) discharges from Sellafield.

(24) Jack Cunningham m.p. has put forward similar views.

(25) This inevitably portrays the present period as one of uncertain transition.

(26) Discussion between U Eco and S Hall, 'Voices' Channel 4 Television, May 1985.

Figure 1

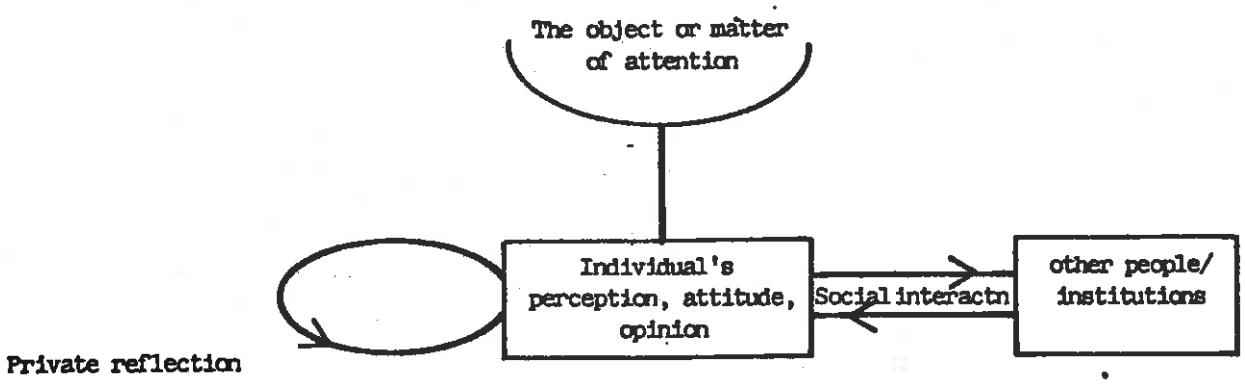
The object or matter of attention
Individual's perception, attitude, opinion
Social interactn
other people/ institutions
Private reflection

Figure 2

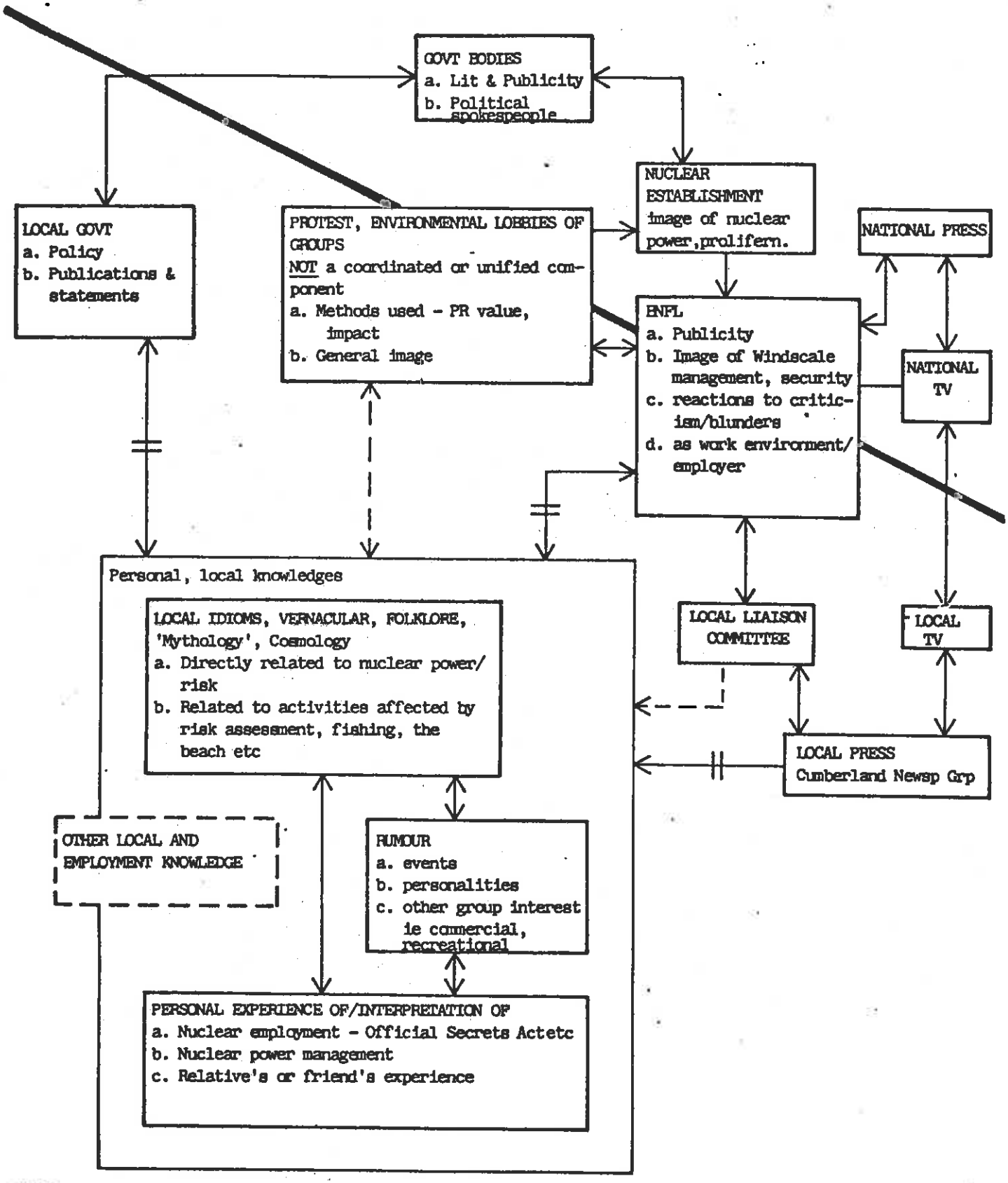
GOVT BODIES
a. Lit & Publicity
b. Political spokespeople
LOCAL GOVT
a. Policy
b. Publications & statements
PROTEST, ENVIRONMENTAL LOBBIES OF GROUPS
NOT a coordinated or unified component
a. Methods used - PR value, impact
b. General image
NUCLEAR ESTABLISHMENT
image of nuclear power, prolifern.
NATIONAL PRESS
BNFL
a. Publicity
b. Image of Windscale management, security
c. reactions to criticism/blunders
d. as work environment/ employer
NATIONAL TV
Personal, local knowledges
LOCAL IDIOMS, VERNACULAR, FOLKLORE, 'Mythology', Cosmology
a. Directly related to nuclear power/ risk
b. Related to activities affected by risk assessment, fishing, the beach etc
LOCAL LIAISON COMMITTEE
LOCAL TV
LOCAL PRESS
Cumberland Newsp Grp
OTHER LOCAL AND EMPLOYMENT KNOWLEDGE
RUMOUR
a. events
b. personalities
c. other group interest ie commercial, recreational
PERSONAL EXPERIENCE OF/INTERPRETATION OF
a. Nuclear employment - Official Secrets Actetc
b. Nuclear power management
c. Relative's or friend's experience

Table 1. Sources of 'nuclear' information for various publics*

	SURREY UNIVERSITY SURVEY DATA			IBA SURVEY DATA	
	South West	Hinkley Point	Great Britain	World News	Local News
TV	48%	68%	74%	62%	18%
Radio	29%	24%	13%	13%	13%
National Papers	36%	22%	49%	23%	
Local Papers		52%			54%
Friends	16%	13%	5%	1%	11%
Anti nuclear sources	16%	1%	4%		
CEGB Sources	24%	1%	3%		
Sample size	1354	182	1511	1009	
Date	1982	1982	1984	1984	

(* Surrey survey data, supplied by J. Brown)

Table 2. Seascale risk perceptions*

2a Aggregate Seascale attitudes towards possible radiation induced health risks to children as a result of BNF's operations

Not worried	concerned	anxious	cannot say
38.5%	50.4%	7.5%	3.6%

2b Aggregate Seascale attitudes about beach radiation levels

Not worried	concerned	anxious	cannot say
51%	40.7%	4.4%	3.8%

* 135 respondents ≈ 1 in 14 of adult population, December 1984

Table 3 Illustrations of the importance of social and institutional factors in determining people's 'risk perceptions'.

"They wouldn't put peoples lives at risk"

"A friend's father is 'high up' in the monitoring organisation and the word is it's OK, yet another friend who works there says the monitoring is a joke"

"If the experts say risks are acceptable, who are we to argue with them"

"My mother has been concerned since by birth in '58; I listen to her views, she has good arguments, they're feasible. My husband thinks everything's OK. My mum's arguments carry greater weight"

"I've seen top engineers taking their children onto the beach"

Table 4. Languages of risk in West Cumbria

"I'm bothered when I go past the plant - I feel I ought not to breathe"

"The workers at Sellafield are probably the healthiest in the area"

"I'm terrified; every time I have an ache, the place comes to mind"

"It's wrong that so much was shoved out to sea, you hear a lot from workers there that a load more gets shoved out at night - when nobody's looking. It happens all over, not just here. They seem to let go twice as much as they should do"

"Can't really blame BNFL as my husband works there"

"I'm at the sharp end so I know what I'm talking about, radiation hasn't done me any harm in the four to five years I've worked in the radioactive area"

"They talk of working within limits - but it's a new industry - who makes the regulations? It's so new they don't know who it's going to harm"

"I'm quite anxious most of the time. It makes you more concerned when the children are ill"

"I lived here when I was a child and I'm alright"

"You always seem to have a thought in the back of your mind if you do go on the beach, you wonder if you should be on it, not perhaps for yourself, but your children"

"If I was concerned, I wouldn't have retired here. Why aren't there dead fish and birds floating about?"

"I'm a bit worried about future generations"

"Cars kill more people than radiation"

"I live each day as it comes - you've got to die of something"

"You can never say you're not worried about radiation problems ... and someone who is not worried, in a sense, is daft"

"I'd still go on the beaches ... wouldn't swim though. There may be a lot of doubt there.."

"It's a cloud hanging over us - so much uncertainty"

"I'm surprised how many women are worried but don't admit it because their husband works there"

Table 5. Some illustrative risk positions, by social group

Retireds

"If there was a danger from cancer, I think I would have contracted it by now"

"I might be more worried if I was younger or had children"

[Also, an age of greater deference to professional expertise and the perfectability of nuclear technology]

Sellafield employees

"I'm at the sharp end so I know what I'm talking about. Radiation hasn't done me any harm in the 4-5 years I've worked in the active area"

"My knowledge of the plant makes me confident that BNFL is working satisfactorily. It's just the November 1983 issue that brought it into people's minds. They don't realise you can get a higher dose of radiation just from luminous watches"

"Jake Kelly shouts about as if he's running Sellafield. He knows nothing about the place. Got to work there to know"

[Mutually reinforcing exclusions and justifications of working at Sellafield. 'Concern' as a word not much in evidence in vocabulary]

Home

"There's nowhere for children to go in summer. You could turn a blind eye but you're never sure. My husband wouldn't let the children on the beach"

"You always have a thought in the back of your mind if you do go on the beach, you wonder if you should be on it, perhaps not for yourself but your children"

"I can't really blame BNFL as my husband works there"

"Different experts have given me totally opposing views ...."

[All housewives; resp. for children; only indirect knowledge of Sellafield; rely on views of others; statement of unconcern; defensive of husband's workplace]

Public services etc.

"I feel I shouldn't be subject to any levels of radiation and I resent someone saying "it's safe" because I feel no-one really knows"

"They talk of working within limits - but it's a new industry - who makes the regulations? It's so new they don't know who it's going to harm"

Table 5a How respondents describe their feelings about radiation induced health risks in the context of radiation levels of BNFL's operations at Sellafield

	Not worried	*Concerned*	*Anxious*	*Cannot say*
Personal risk	67%	22%	4%	7%
Risk to other adults	64%	21%	5%	7%
Risk to children	45%	40%	12%	4%

Table 5b How respondents feel about radiation levels for each of the following

	Not worried	*Concerned*	*Anxious*	*Cannot say*
On the beaches	45%	39%	12%	5%
In house dust	75%	9%	3%	13%
In the air	69%	16%	4%	12%
In fish and other sea food	60%	26%	8%	7%
In milk	71%	14%	5%	10%

Table 5c Concern about radiation induced health risks to children, according to place of work

	Concerned or anxious	
Place of work		
Public administration	72%	more concerned
Home	60%	↕
Sellafield	45%	
Retired	29%	less concerned