Inclusive deliberation and scientific expertise: precaution, diversity and transparency in the governance of risk

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The 'bolt-on' approach to participation

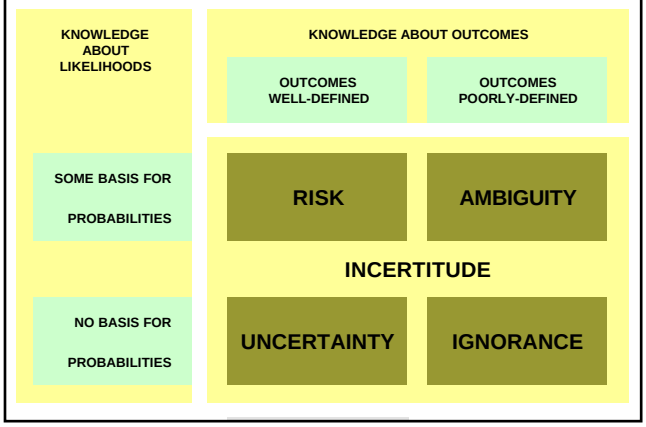
There is growing interest in many industrialised nations in more 'deliberative and inclusionary processes' (DIPs) for the governance of technological risks. This increasing interest is motivated by diminishing public confidence in traditional expert-based and quantitative approaches. The mainstream response in academic and policy circles is to explain this diminishing public confidence in social and cultural terms, rather than through examining existing limitations in expert risk science. Public concerns tend to be regarded as a problem in their own right and attention is often focused specifically on those methods which can help to reach consensus, rather than reflecting comprehensively on the resulting outcomes themselves. Hence, public participation is often approached purely as a matter of democratic process, rather than being equally about the limits of expertise and rationality and so about the quality of the outcomes of decision-making processes. As a result, greater inclusivity is too often seen simply as a 'bolt-on' to the 'real' business of expert scientific assessment.

Problems in expert risk science

By focusing on problems of risk governance that lie 'out there' in society, movements towards more inclusive deliberation may reduce friction with powerful institutional and disciplinary vested interests. This raises the profile of participation in key risk policy debates at the levels of global trade, regional harmonisation and national regulation. However, it does not challenge the privileged status of expert-based, 'sound scientific' approaches to risk assessment. This is remarkable because, despite wider concerns over democracy and communication, these approaches suffer from a number of internal limitations and contradictions, such as for example, the denial of surprise and the neglect of diversity which are explained below.

First, there's the question of 'surprise'. The business of risk assessment basically requires that we can do two things: identify the complete range of things that might happen (the 'possibilities' or 'outcomes') and assign a probability to reflect the relative likelihood of each outcome. The risk that is experienced in any given case is then usually represented as the sum of all the different possibilities, weighted by their respective probabilities. One obvious problem with this is that it doesn't take account of surprise. As can be seen from Box 1, the same logic that defines the condition of 'risk' also defines the conditions of 'uncertainty' and 'ignorance'. These apply in situations where the probabilities may not be fully quantifiable (in uncertainty) or where even some of the possibilities themselves may not be definable (ignorance). Under these conditions, the techniques of risk assessment are, by definition, not applicable.

Box 1 Risk, uncertainty, ambiguity and ignorance[1]



There are plenty of practical examples of the importance in risk assessment of surprises born of this type of ignorance. For instance, there are the recent topical cases of stratospheric ozone depletion, variant Creutzfeldt-Jakob disease (vCJD) and endocrine disrupting chemicals. In the absence of knowledge of their chemistry in the stratosphere, CFCs were thought to be particularly benign products – the ozone hole was therefore initially not just considered unlikely, it was entirely unanticipated. Prior to recognition that 'mad cow disease' is transmissible to people, the very possibility of vCJD disease was unexpected. The crucial issue with endocrine disrupting chemicals is not their *degree* of toxicity, but recognition of

1 This model draws on work in: Loasby, B. (1976) *Choice, Complexity and Ignorance: an inquiry into economic theory and the practice of decision-making*, Cambridge; Smithson, M. (1989) *Ignorance and Uncertainty: emerging paradigms*, Springer, New York; Wynne, B. (1992) *Uncertainty and Environmental Learning: reconceiving science and policy in the preventive paradigm*, Global Environmental Change, 111-127; Stirling, A., (1998) *Risk at a Turning Point?*, Journal of Risk Research, 1, 2, 97-110.

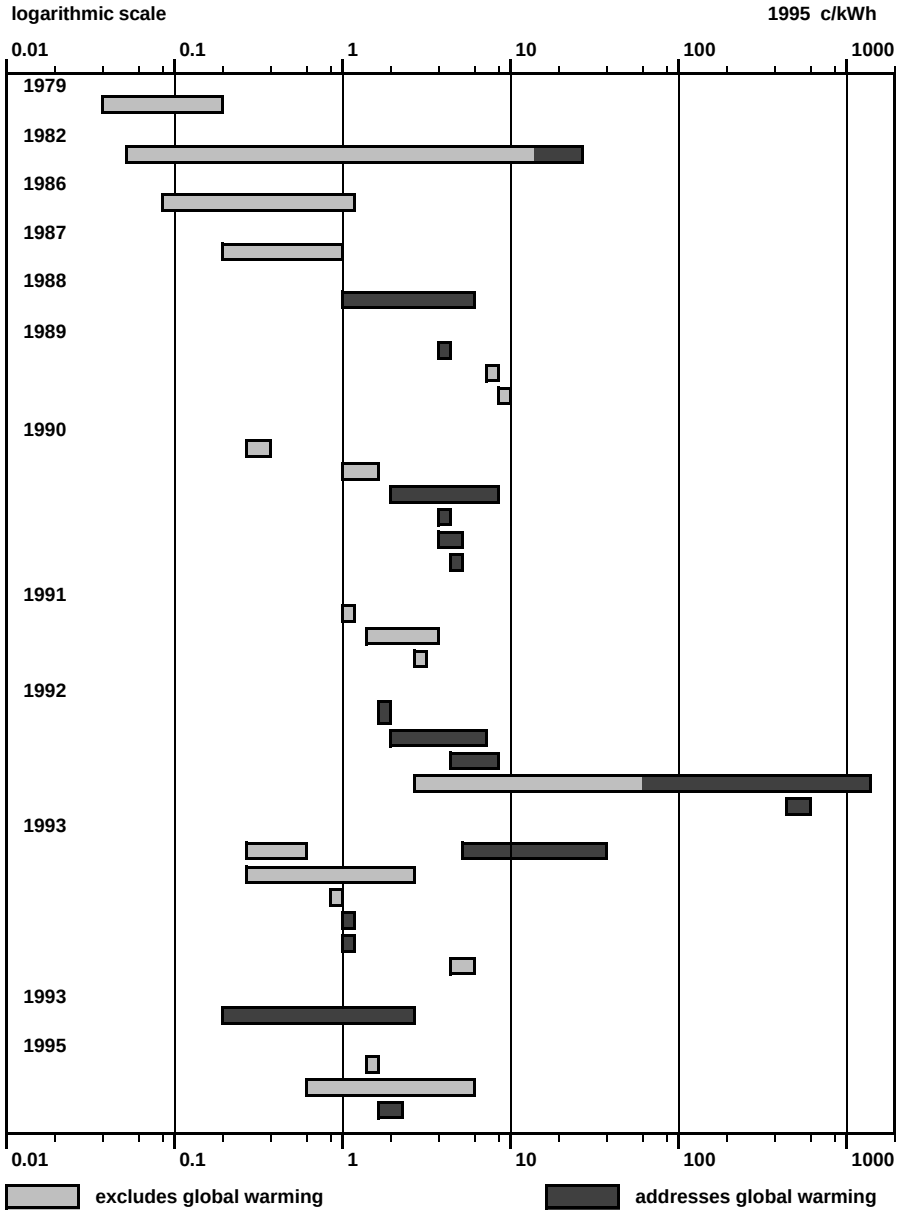
an entirely *new mechanism* of toxicity. Such cases are not just mistakes – where risks were simply assigned probabilities that were too low. Rather it is the case that the sheer possibilities of such technology-related hazards were initially unforeseen. Expert-based and quantitative approaches to risk governance continually understate the relevance of ignorance and surprise.

Second, there's diversity. Conventional risk assessment is usually aimed at delivering discrete, prescriptive judgements concerning the safety or acceptability of a given technology. The results are often expressed with impressive confidence and precision. Yet, each individual study will require the adoption of certain subjective 'framing assumptions' concerning a large number of different questions. For example:

- How to define the system under appraisal?
- How to weigh different types of economic, environmental and health effects?
- What balance to strike between present and future interests?
- How to compare different social, geographical and environmental distributions of impacts?

As illustrated in Figure 1, different, but equally 'reasonable', framing assumptions routinely lead to risk assessment results varying. The resulting ambiguity can have profound implications for the governance of different technology or policy options.

Figure 1 Variability in risk assessment results – an example from the energy sector [2]



(32 major studies of risks from modern coal power, expressed in monetary terms per unit output)

This ambiguity cannot simply be dismissed as methodological inconsistency or institutional bias. It reflects basic problems in rational choice theory, which, along with probability theory, is the major source of intellectual authority underpinning the 'science' of risk assessment. In short, it has been proven from first principles within rational choice theory itself that there is no way definitively to compare and combine different subjective preferences in a plural society[3]. Aspirations that risk assessment can somehow transcend the array of subjective assumptions and come up with single definitive answers in the assessment of risk are not only difficult to fulfil in practice, they are fundamentally meaningless, even in principle. The apparent precision evident in much conventional risk assessment is therefore misleading. To conclude, expert science is necessary for the rigorous assessment of risk, but it is insufficient on its own.

2 This chart is taken from Stirling, A. (1997) *Limits to the Value of External Costs*, Energy Policy, Vol.25, No.5.
3 Arrow, K.,(1963) *Social Choice and Individual Values*, Yale University Press, New Haven; Kelly, J.,(1978) *Arrow Impossibility Theorems*, Academic Press, New York.

An additional imperative for inclusivity: precaution

Recognition of these problems can be identified as a 'precautionary' critique of risk assessment. This raises a large number of implications which are the subject of an increasing body of literature[4]. The main point to be discussed here is that this analysis provides a clear justification for the inclusion of broader perspectives in the process of risk assessment. This is different from the usual arguments for inclusivity; for example, in terms of democratic principles or viewing public involvement as being useful only in as much as it can be an effective way of alleviating public concerns around a particular technology.

This 'precautionary' argument for inclusivity introduces a number of key issues which might otherwise be neglected.

- First, public misgivings over existing approaches to risk governance reflect some appreciation of these problems of surprise and diversity. With regards to this, broad-based lay understandings are sometimes more sophisticated than narrow expert perspectives that neglect ignorance and incommensurability. Therefore, enhanced inclusivity offers a way to make the governance of risk more robust, as expert views are complemented by lay perspectives, which results in a broader-based representation of the issues in question.
- Second, it is important to ensure that a full range of options, effects, perspectives, priorities and assumptions have been taken into account during the appraisal of the issue in hand. The key difference between 'ignorance' and 'uncertainty' in Box 1 is that with uncertainty we at least have a better handle on the possibilities. By bringing in a more diverse array of options, effects, perspectives, priorities and assumptions, we therefore convert at least some part of our ignorance into uncertainty. In addition, the divergent bodies of knowledge of different interest groups and lay constituencies can offer an important source of mutual critical review and quality control. The full inclusion of socio-political dissent in the governance of risk is a basic principle of analytical rigour.
- Third, even the most 'soundly scientific' of appraisal processes cannot provide a definitive basis for policy prescriptions. Therefore, the only truly meaningful objective in this business must lie in the systematic and transparent exploration of the way in which the scientific expertise delivers different answers under the priorities and value judgements associated with different public perspectives. Seen in this way, an inclusive deliberative approach, such as the one described later, offers the means to validate these alternative framing assumptions.
- Finally, increased inclusivity means acknowledging that different decisions may be made in different contexts. This contrasts with conventional risk governance, which aims to generalise, rather than account for a range of diverse views. Such diversity can bring a further source of rigour into the process. This is because both ignorance and incommensurability have one commonsense response. Whether 'we don't know what we don't know', or 'we cannot agree on how to frame the problem', one solid piece of advice is to avoid putting all the eggs in one basket. By pursuing a number of options in parallel, rather than seeking one 'best' course of action, we gain resilience and flexibility in the face of real world complexity and maximise the chances of effective social learning in the governance of risk. This diversity is another robust consequence of greater inclusivity.

A multi-criteria mapping approach[5]

One of the issues that recurs throughout this issue of PLA Notes is a desire for DIPs that allow representation of the widest possible range of perspectives. One way to address this in the field of risk assessment, whilst acknowledging the parallel 'precautionary imperative' discussed above, is offered by the 'multi-criteria mapping' (MCM) method.

In a project funded by the transnational food firm Unilever overseen by a 'Round Table' of widely divergent 'stakeholder' groups and conducted in collaboration with Sue Mayer of Genewatch UK (a non-governmental organisation concerned about genetic modification technology) the MCM technique was applied to a comparative appraisal of the use of a genetically modified (GM) crop (oilseed rape) in the UK. This pilot study took place over a period of fifteen months, involving two researchers in some six person-months of work during 1998-9, a period of intensive conflict on this issue in the UK. Using a specially-developed quantitative computer-based tool, the MCM approach draws on some simple, well-established methods from the field of multi-criteria decision analysis. Basically, this involves approaching appraisal using as many criteria as necessary to characterise the different outcomes, assessing these using whatever techniques are most appropriate and then assigning numerical weightings to each criterion to reflect subjective judgements over the relative importance of different issues. However, rather than using these methods to seek a definitive aggregation of expert perspectives, as is usually the case with these techniques, the MCM approach uses them to help explore precisely how the assumptions, priorities and value judgements

4 For example; O'Riordan, T., Cameron J., (1994) *Interpreting the Precautionary Principle*, Earthscan, London; Fisher, E., Harding, R., (1999) *Perspectives on the Precautionary Principle*, Federation Press, Sydney. Raffensberger, C., Tickner, J. (1999) *Protecting Public Health and the Environment: implementing the Precautionary Principle*, Island Press, Washington.

5 This section draws on research reported in Stirling, A., Mayer, S., (1999) *Rethinking Risk: a pilot multi-criteria mapping of a genetically modified crop in agricultural systems in the UK*, SPRU, University of Sussex. A summary can be downloaded from the web at: http://www.sussex.ac.uk/Units/gec/gecko/refs.htm

associated with different public constituencies relate to the available scientific and technical information.

Involving twelve leading actors from all sides of the GM crop debate (representing key government, academic, industry and non-governmental organisations), this pilot MCM study generated quite a rich body of information. However it should be noted that this was not an exercise in the direct participation of the public, of the sort that is described in this issue of PLA Notes. Rather it was an attempt to explore the relationships between technical assessments and different public perspectives, as represented by different interest groups.,

A basic set of six agricultural strategies was defined by the researchers for the purposes of ensuring comparability. These were:
- organic farming;
- integrated pest management;
- conventional intensive farming; and,
- a series of three different GM policy frameworks.

The participants were then free to add an unlimited array of further options and define these as they wished. The result was a further 18 agricultural strategies, including many interesting aspects routinely excluded from conventional regulatory appraisal of GM crops. Then, a total of 117 criteria was defined by the participants for the evaluation of these options. For no participant (not even government and industry) do current regulatory processes address all their criteria, defined through this process.

Sets of numerical scores and weightings were elicited from participants in intensive individual interviews and revealed interesting information concerning the technical evaluations and value judgements associated with different perspectives. Particular care was paid to the documentation of uncertainty. This was achieved by asking participants to justify performance assessments for their options under both optimistic and pessimistic assumptions. The horizontal bars in Figure 2 represent the ranges in the final performance rankings that resulted from this process. The left hand end of each bar shows the result for 'pessimistic' assumptions, the right hand end of each bar shows the result for 'optimistic' assumptions.

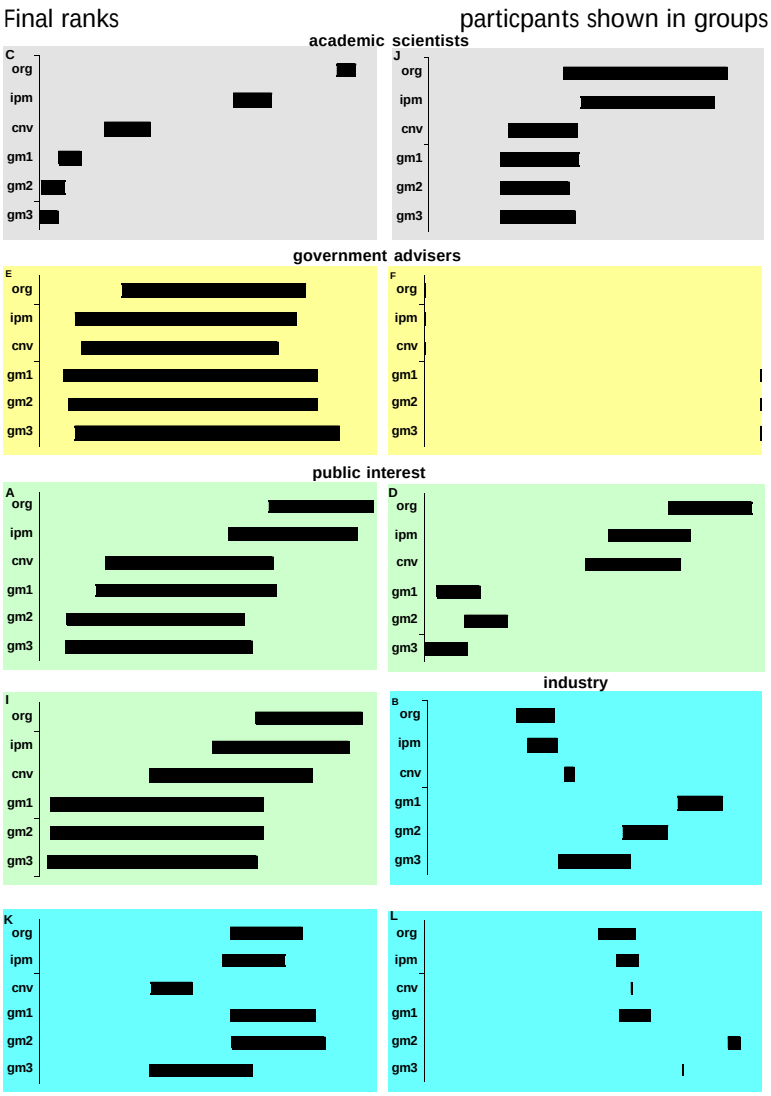
These results were then subjected to extensive 'sensitivity testing', which involved systematically varying the weighting assumptions and seeing the overall effect on results. Based on this process, the results were subject to further deliberation by participants before they settled on final values which accurately reflected their positions. Together with the qualitative information gathered concerning the definition of options and criteria and the way that participants characterised pessimism and optimism in scoring, the 'multi-criteria map' shown in Figure 2 documents the enormous diversity evident in participants' perspectives. The explicit attention to options, criteria, scores, weights and uncertainties helps substantiate the nature and practical implications of divergent framing assumptions. In the absence of such a 'mapping' process, these would remain concealed in the often-tacit variability between different studies, such as that illustrated in Figure 1.

Although not aimed at yielding a single prescriptive recommendation, the study did reveal a series of interesting regularities spanning the picture as a whole. For instance, organic farming emerged across a diverse range of perspectives as being quite unequivocally superior to GM strategies in environmental terms. Perhaps more surprisingly, although subject to disagreement, organic farming also tended generally to display the strongest performance under all criteria taken together across the range of perspectives. Such a finding is automatically excluded where regulatory appraisal neglects public attitudes and concentrates simply on whether a particular GM option is 'acceptable', rather than on which of a wide range of agricultural strategies might be 'preferable'. A similarly revealing picture emerged concerning the relative performance of voluntary and statutory regulation of GM crops, with only government advisers favouring the former option (which was at the time the government's preferred course of action). Such findings are all the more robust for being based on a process specifically designed to highlight differences, rather than to encourage convergence or the engineering of consensus.

Beyond these kinds of directly policy-relevant issues, the MCM study also produced a series of findings concerning the nature of divergent social attitudes in this area. First, it was clear that, although different understandings of the technical uncertainties are important, these are not the dominant factor distinguishing divergent perspectives. Likewise, the differences between perspectives were only partly explained by the assigning of different 'weightings'. Instead, the principal areas of difference were found in contrasting assumptions over what issues to include in appraisal, how these should be framed and prioritised and how the performance of different options might best be characterised and measured.

This said, it is interesting that when careful attention is paid to the detailed implications of the uncertainties acknowledged under individual, sometimes quite entrenched, perspectives, the highly polarised nature of the debate over GM and non-GM strategies begins in some ways to break down. For instance, organic farming is revealed to perform as well as any GM option under one biotechnology industry viewpoint (K in Box 3). Likewise, under one anti-GM viewpoint (I in Box 3), it is conceded that certain GM strategies, at their best, might

Figure 2 A multi-criteria map of the performance of six agricultural options – ten stakeholder perspectives, grouped in four constituencies



Each chart shows the ranges in option performance rankings on an arbitary subjective linear scale, running from low performance on the left to high performance on the right

perform as well as certain non-GM strategies at their worst, thus highlighting the importance of other, often neglected, contingent factors.

Another point of convergence between otherwise highly disparate perspectives was a common acknowledgement of the importance of diversity. Rather than simply highlighting a series of different 'best' options, the MCM study also focused attention on the diverse mixtures of options favoured under different viewpoints. There seems to be widespread appreciation on all sides of an otherwise highly polarised debate that ignorance and incommensurability can be well addressed by not putting all the eggs in one basket!

This pilot MCM exercise goes some way towards addressing the precautionary imperatives for greater inclusivity in the assessment of risk. It provides for unconstrained consideration of diverse options, criteria, priorities, performance evaluations, uncertainties and framing assumptions, whilst retaining a practical focus on policy-usable results. However, it also displays a series of limitations. The quantitative part of the methodology assumes a utilitarian approach under which trade-offs can be made between conflicting considerations. Fundamental matters of principle are addressed only in qualitative inputs, for instance by excluding certain options. Only a relatively small role was played by group deliberation among the actors involved. Inclusion was restricted to specialists from different 'stakeholder' groups, rather than involving lay members of the public. As with any DIPs exercise, there are questions of representativeness and legitimacy.

Each of these issues are currently being addressed in a number of initiatives for the further development of the MCM process. Any judgements over the evaluative implications of such issues should be informed by considering the wider implications of the precautionary imperatives for increased inclusivity. It is with this final subject that this paper will conclude.

Some precautionary implications for increased inclusivity in risk deliberations

The GM pilot study described here illustrates one way in which the need for wider inclusivity in risk governance might be addressed in practice. However, though greater inclusivity may potentially address these imperatives, this is far from being guaranteed. Indeed, in some respects, certain forms of inclusive deliberation may be at least as problematic as conventional risk assessment itself.

One key lesson that has been drawn here concerns the value of *breadth* and *diversity* in the appraisal of risk. Whether participatory or expert-based, an appraisal process can be relatively broad or narrow in a number of ways.

- How many options are considered, with what variety of definitions?
- What range of criteria are employed in evaluating these options and how are these characterised?
- How thorough is the exploration of the uncertainties and possible contingencies that affect performance judgements?
- To what extent does attention focus on individual options or diverse mixtures?

Finally, of course, there is the breadth of the socio-political interests and cultural constituencies that are represented in the process. As in any appraisal, inclusive deliberation processes may be implicitly framed in a number of ways such as to restrict the activities of those involved. For instance, by excluding uncertainties or the consideration of alternatives, any deliberation can easily become as constrained as expert-based risk assessment.

A second conclusion concerns the *plural* and *conditional* nature of appraisal results. Moves are currently being made in a number of countries, and at international levels in areas such as the EU, to complement existing scientific advisory committees with similar bodies for eliciting stakeholder viewpoints or ethical expertise. The purpose of such bodies is often simply to interpret the results obtained by the conventional risk assessment process. Significant though this is, it goes only part of the way to addressing the precautionary critique. It has been shown here, for instance in Figure 1, how subjective framing assumptions permeate the science in a complex and pervasive fashion. Divergent public interests and values cannot therefore be adequately addressed by 'bolting on' inclusive deliberation at the end of an expert-led process or by *ad hoc* inclusion of a few 'lay members'. Nor can the complexity of these perspectives be fully captured by simple mechanisms such as the 'weightings' of multi-criteria analysis. The relationship between expertise and wider public deliberation needs to be far more multi-faceted, directly engaged and symmetrical. In particular, both expert and public deliberation should avoid single prescriptive recommendations.

Third, there are issues relating to the role of *dissent* and the relationships between an appraisal process and the wider socio-political *discourse* of which it is part. There are tendencies, both with expert-based and deliberative processes, to see appraisal as a 'black box' for resolving complex issues. Conclusions are variously justified by appeals to the authority of expert rationality, to participatory theory or to democratic principle, depending on the particular case. Indeed, some of the key perspectives on public deliberation sometimes imply that such processes may be seen as substitutes for the messiness and inconvenience of political conflict. This can lead, for instance, to an enormous, and somewhat artificial, significance being attained by discussions over 'statistical representativeness'. The implications of the present paper, by contrast, are that we might see a more humble relationship between the appraisal process and wider socio-political debates. Here, the main objective is not the engineering of expert or public consensus. Rather, the aim might be to achieve as much transparency as possible in the presentation of dissenting views, such that third parties may systematically audit the practical implications of different perspectives for the available science. Some deliberative processes can be even more opaque in this regard than conventional risk assessment.

Finally this leads to an issue that is continually raised in relation to public participation, concerning the supposed conflict with other forms of political action and existing provisions for representative democracy. Such concerns diminish if appraisal takes a precautionary form. If it is broad-based and unconstrained, systematically documenting the implications of a full diversity of dissenting perspectives and making these transparent to wider socio-political discourse, then 'precautionary deliberation' may actually serve to strengthen democratic accountability and constructively inform other forms of political action. Although offering only one way of attempting to address these precautionary imperatives, the MCM approach described here at least illustrates that such an approach is practically feasible and can deliver meaningful and useful results in a complex and controversial area in the governance of risk.

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Notes

Copies of the MCM report can be obtained from: sprupubl@sussex.ac.uk. Copies of the precaution report can be obtained from: Rafael.Castillo@jrc.es.