

# SAFETY IN NUMBERS?

- *How we assess environmental risks*
- *Applications in the Environment Agency*
- *Compatibility with Deregulation.*

Modern life is full of risks - some we accept readily on a day-to-day basis (such as driving), while others attract headlines even when the risk is much smaller - particularly in the field of environmental protection and health. Regulatory authorities attempt to apply some consistency to this field via the 'science' of risk assessment, but there can be a wide gulf between what the scientists say the risks are and what the public perceives; the resulting disputes reverberate in Parliament. Meanwhile, there are moves to extend the use of risk assessment under the Deregulation Initiative.

*In view of these developments, the Board of POST decided a review would be timely. This note summarises the full 60-page report<sup>1</sup>.*

## BACKGROUND

In our complex society, virtually all decisions involve some implicit or explicit assessment of risks. But, as recent bouts of public alarm over beef, babies milk, etc., reveal only too well, public perceptions do not always tally with official estimates of risks. Yet such public perceptions feed back into the priorities assigned by regulators and may have substantial public expenditure implications.

The process of risk assessment (RA) tries to achieve a common framework whereby society can get the best value for money from its investment in protecting health or the environment, and has been widely deployed for many years. Why then a report by POST now? There were a number of reasons. Firstly, debate over the use of RA in environmental and consumer protection coincides with a drive towards using risk assessment as part of the Deregulation Initiative. Secondly, the formation of the Environment Agency in England and Wales (and the Scottish Environmental Protection Agency, SEPA) raises questions over how readily the disparate cultures and RA methods used by the Agency's predecessors will be integrated within the one Agency. Thirdly, the Government will lay before Parliament (in mid-June) draft guidance on the Agency's objectives and how it can *inter alia* assess risks and take account of the costs and benefits of its decisions. This report may assist parliamentary consideration of this guidance.

1. "Safety in Numbers? - Risk Assessment and Environmental Protection" is available from POST at 7, Millbank, London SW1P 3JA (tel 0171-219-2840). Free to Parliamentarians; £12 otherwise.



POST  
REPORT  
SUMMARY

81

June  
1996

*This is a summary of a 60-page report available from the PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (extension 2840).*

Table 1 ENVIRONMENT AGENCY BUDGET 1996/7

Source of Funding	Amount (£M)	% of Total
Flood defence levies	210	38
DoE grant-in-aid	114	21
Water abstraction charges	84	15
Pollution control charges	80	15
MAFF / WO flood defence grant	39	7
Fisheries, navigation & recreation charges	16	3
MAFF grant-in-aid	7	1
TOTAL	550	100

## THE ENVIRONMENT AGENCY

On 1 April 1996, the Environment Agency took over the responsibilities of its predecessors:

- Her Majesty's Inspectorate of Pollution (HMIP);
- National Rivers Authority (NRA);
- Waste Disposal Authorities (WDAs);
- some DoE responsibilities (e.g. contaminated land).

The new Agency's budget is shown in **Table 1**.

The full report reviews the previous responsibilities of the constituent parts and the Agency's new mission, in particular its responsibility under the Government's draft statutory guidance (provided under Section 4 of the Environment Act 1995) "to protect or enhance the environment taken as a whole so as to make a contribution towards attaining the goal of sustainable development." The full report describes the other statutory objectives - in particular the emphasis on "sound science", taking into account costs, meeting the goals of **sustainable development**, and applying the **precautionary principle**.

## RISKS AND THEIR MANAGEMENT

Many of today's laws and institutions have come about because people want to feel safe in their day-to-day activities, and be protected from risks ranging from unsafe medicines to radioactivity. Assessing risks is not straightforward, but can perhaps best be understood as a circular process with three main stages (identification, evaluation and management of risks), with communication in the centre, informing and influencing each stage, as illustrated in **Figure 1** (next page). The full report looks at all of these stages in some detail, illustrating the process of identifying, evaluating, managing and communicating risks with a hypothetical proposal to build a chemical factory.

Events over the past year (e.g. Brent Spar, BSE/CJD) show that an increasingly important aspect is the **public perception of risk**, and the full report explains how this is influenced by a number of factors in addition to the actual size of the risk. Factors appear to be:

- **Control** - People are more willing to accept risks they impose upon themselves, or they consider to be 'natural', than to have risks imposed upon them.
- **Dread and Scale of Impact** - Fear is greatest where the consequences of a risk are likely to be catastrophic rather than spread over time.
- **Familiarity** - People appear more willing to accept risks that are familiar rather than new risks.
- **Timing** - Risks seem to be more acceptable if the consequences are immediate or short-term, rather than if they are delayed - especially if they might affect future generations.
- **Social Amplification and Attenuation** - Concern can be increased because of media coverage or graphic depiction of events. Or reduced by economic hardship.
- **Trust** - a key factor is how far the public trusts regulators, policy makers, or industry. If these bodies are open and accountable - being honest, admitting mistakes and limitations and taking account of differing views without disregarding them as emotive or irrational - then the public is more likely to place credibility in them.

Some risks can be arranged according to the above factors (**Figure 2**) to explain why some are perceived as more serious than others. Thus the dread and catastrophic potential of nuclear power make it perceived as riskier than coalmining, even though the West's experience so far is the reverse.

A key question is how far these more subjective considerations should affect the reliance placed on the numerical calculation of risk. Some have suggested that calculated, 'scientific' probabilities are the only objective measures of the 'real' risk, and that perceptions of risk should be disregarded as being entirely subjective and based on incomplete information, emotion or irrational thought. Others, including the DoE, acknowledge that in many areas (e.g. environmental and medical science) the precise knowledge needed for true objectivity may not always be available, and that there may be a role for considering people's perceptions and values in deciding the correct policy response to reducing risk. In this context, the Government's Advisory Committee on Business and the Environment (ACBE) has set up a working group to look at how to improve the way Government and industry deal with values and perceptions held by interested parties.

In practice, the picture of risks being either wholly 'real' or wholly 'perceived' is too simplistic, and the balance will vary with the individual risk involved. Thus engineering calculations are sufficiently robust to be

FIGURE 1 THE RISK ASSESSMENT PROCESS

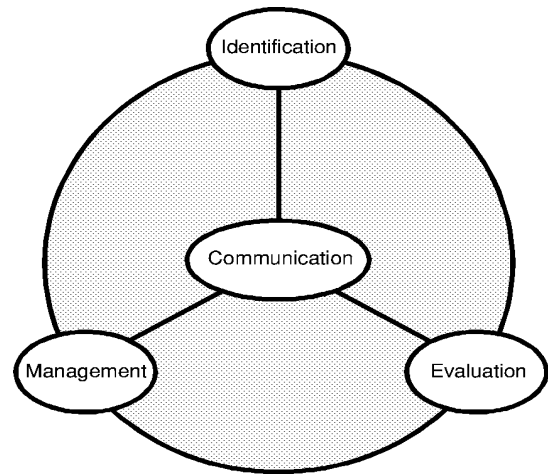
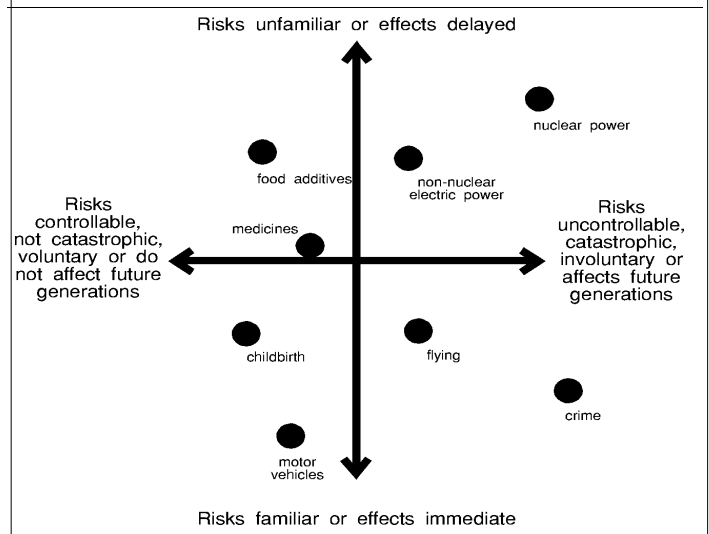


Figure 2 DIFFERENT WAYS IN WHICH RISKS ARE PERCEIVED



able to predict with confidence that a road bridge is 'safe' and any driver with the perception that it was about to collapse would probably be acting irrationally. On the other hand, in some areas (e.g. the recent concern over the possible transmission of BSE to humans - see POST Report 78), the data on which to base a numerical estimation of risk are simply not available, and perception (i.e. whether you **believe** the assessment of scientists and Government) becomes a critical factor determining public acceptability of the risk.

The full report goes on to explore how far it is necessary to mesh these quantitative and qualitative approaches together. In many areas of risk assessment, quantitative methods have a long track record which is still seen as reliable, comprehensive and acceptable. This is particularly the case in work-place safety, where conditions may be most favourable for making accurate estimates of risk. As one moves away from simpler situations, however (e.g. into the area of environmental protection), matters get more complicated and uncertainties start to creep in which can have a substantial effect on the outcome. This can lead to regulatory authorities turning to concepts such as the precaution-

2. This principle is that where there is a significant risk of environmental damage, cost-effective action to reduce or eliminate the harm need not wait for scientific proof, and should be taken on a precautionary basis.

ary principle<sup>2</sup>. But equally, more consultative and participative models of risk assessment may be deployed, where a consensus is sought on the basis of the scientific assessment of risk **informing discussion rather than dictating** the regulatory response. Examples of such approaches are described in the full report, which also looks at how environmental risks are assessed in the areas of:-

- Managing radioactive wastes.
- Preventing and controlling pollution.
- Protecting against floods.
- Managing municipal and industrial wastes.
- Controlling contaminated land.

## DEPARTMENTAL RISK ASSESSMENT

The full report reviews how risk assessment has evolved in different departments in response to a range of threats to public safety and the environment, and recent attempts to take stock of who did what and why through the Interdepartmental Liaison Group on Risk Assessment (ILGRA). Steps have followed to :-

- Achieve greater coherence and consistency.
- Facilitate inter-departmental co-operation.
- Improve Government's communication with the public on risk matters.

But there is also considerable activity via the Government's **Deregulation Initiative**. Risk assessment is part of the overall requirement to conduct formal 'Regulatory Appraisals' before deciding whether a problem requires regulation, and if so, to match any ensuing regulations to the scale of the problem involved. Ministers must personally 'sign off' **Compliance Cost Assessments** and risk assessments to certify that the balance between costs and benefits in the proposal is appropriate. The full report points out that while current guidance is clear in principle, the complexities and uncertainties of risk assessment create problems of implementation, including:-

- Placing **monetary values** on risks and benefits is, at least in the environmental field, very subjective.
- Reliance on **subjective categories of risk** such as "serious" as a basis for action opens the process to disagreement on how seriousness is judged.
- The public's **perceptions of risk** may differ from those of the experts. The guidance limits the extent to which public perception is taken into account when reaching policy decisions by leaving it to "*explicit ministerial judgement*".
- One aspect of the uncertainties and complexities involved in risk assessment is the possibility that **unforeseen risks** might occur. Although the guidance recognises that assessing risks involves a great deal of uncertainty, it implicitly assumes that all risks can be identified and quantified even though this is generally not the case.

- Costs and benefits may be delayed, so it is necessary to **discount costs and benefits** to enable a comparison to be made. Discounting places emphasis on short-term costs rather than long-term benefits.

## ISSUES

As already explained, the electorate expects Government to protect it against risks such as collapsing buildings, sinking ferries, environmental disasters and even minute threats to health. Risk assessment is basically an attempt to bring consistency to this complex web of interacting pressures in order to achieve:-

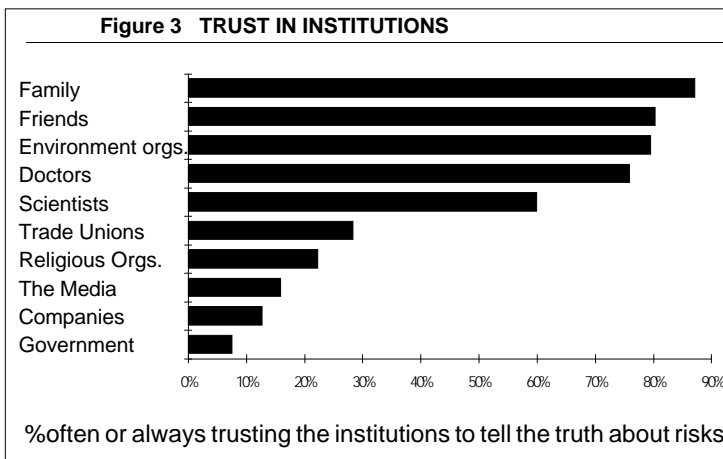
- **equity** - the sense that all should have similar 'rights' to protection;
- **value for money** - in the sense that society's resources for health and environmental protection are finite, and it thus makes sense to allocate these according to their relative 'importance'.

The full report questions whether these objectives are always achieved at present.

RA however has its own strengths and weaknesses. The main strength is that, in its ideal form, the risk assessment process can be used to make decisions in a structured and systematic way, making explicit the many assumptions, value judgements and uncertainties involved. The main weakness is that the process relies on experts being able to identify and quantify all relevant risks, even though understanding of the complexity of human and environmental systems is incomplete. This leaves room for a gap to develop between expert and public assessments of risk. The latter may be less influenced by whether the calculated risk of a pollutant is 1 in a million or 1 in 10 million, than whether there is one well-publicised event, or an orchestrated public campaign.

Recognising the shortcomings of the present system is one thing; doing something better is quite another, and a debate has been going on for some time between those who argue that decisions must be based on the best quantitative assessment of 'objective risk', and those who claim that there is no such thing, and all concepts of risk are subjective. The DoE's guidance on risk assessment moves some way to recognising that, particularly in the environmental field, uncertainties make many quantitative risk assessments difficult, and that perceptions should be taken into account.

A key lesson of research into perceptions of risk is to emphasise the **importance of gaining and maintaining trust and credibility for decision-makers, regulators and industry** in order to gain public acceptance (or even support) for proposals. Research at the University of East Anglia (see **Figure 3**) has found that few people trust advice on environmental risks given either by government (7.6%) or companies (12.8%), but 80% trust environmental organisations.



Other areas of risk research suggest general principles which might be incorporated into risk assessment procedures to encourage participation, and the full report describes experience in consensus conferences, the UK Round Table for Sustainable Development and local Agenda 21 initiatives.

Much attention is also given to the challenges facing the Environment Agency in bringing together responsibilities which range from flood defence to nuclear waste, and targets for protection which range from human health, through land and property, to the diversity of ecosystems. Immediate challenges include.

- Deciding the degree to which all the parts of the Agency assign the first priority to prevention of waste rather than controlling pollution. A number of bodies argue that continued reliance on 'end-of-pipe' technologies should **not detract from the primary importance of developing cleaner production techniques to eliminate or minimise waste.**
- Deciding the geographical boundaries of control - whether process-based (as in Integrated Pollution Control) or geographical area-based, as with Integrated River Basin Management.

In the longer term however, the Agency may need to:

- develop a more consistent framework for risk assessment across the Agency's many functions;
- apply lessons from risk research;
- apply the precautionary principle;
- contribute to sustainable development;
- accommodate deregulatory policies.

The full report discusses each of these in detail, and identifies a number of focal points or options which may be of interest to Parliament.

The fact that a wide range of functions now reside in one Agency offers the opportunity to apply a more consistent approach than was possible as separate Agencies. This could be done by **institutionalising a strategic review process** and developing a set of agency-wide standards and guidance which will lead to the most 'important' risks being identified, and resources and expenditure redeployed to reflect the new priorities.

As already mentioned, one of the key lessons of risk research is that trust in institutions is a key factor in risk perception. In view of the high degree of scepticism among the public over Government's assessments of risks (Figure 3), perceptions of the Agency's own credibility may be influenced by its relationship to Government. The full report discusses some areas where the Government's draft statutory guidance to the Agency may have a bearing on this aspect.

One key question in the environmental field is how and when to apply the **precautionary principle**. This is one way of dealing with uncertainties, but may be open to controversy. Ways of minimising disagreements may include **making the uncertainties explicit, carrying out 'sensitivity analyses', or calculating different scenarios** on differing assumptions to encourage constructive debate. Sustainable Development and the term "*sound science*" are also recurrent themes, and the full report discusses how these interact with the moves towards a more consultative approach to risk assessment.

Finally, the full report considers the interaction between practice in the environmental field and moves emanating from the **Deregulation Unit** towards a cross-departmental approach to risk assessment. The full report points to areas where the DU guidance is seen as creating something of an 'unlevel' playing field on which future regulatory decisions will be made. Not only may the net costs of environmental regulation be overestimated in some cases, but the guidance's emphasis on discounted costs makes it easier to quantify (and attach greater weight to) the short-term costs of regulation, than environmental benefits. This tension raises the question of **how far the initiatives will drive the Agency towards adopting a narrower interpretation of cost-benefit analysis and risk assessment than is currently applied in the constituent parts of the Agency**, and those envisaged in the DoE's own guidance. If it does so, **it will be moving in the opposite direction to that indicated by much risk research.**

The report closes with a review of research needs aimed at **improving current methods, taking account of the need to understand and include public perceptions of risks, as well as ensuring that regulation and policy are based on sound science.**

## IN CONCLUSION

The importance of risk assessment and its public acceptability have been illustrated on a number of occasions during the last year, whether this be the Brent Spar episode, or concern over BSE and CJD. It is hoped that this review will be useful to Parliamentarians who must deal on a day to day basis with the public's perception of risks.