

## Royal Society submission to the House of Commons Science & Technology Select Committee inquiry on scientific advice, risk and evidence

### Summary of key points

- Where departmental Chief Scientific Advisers have been appointed at a senior level from outside Government this has led to an improvement in the use of science across Departments and has assisted in the development of a clear strategy for science.
- We are aware that the House of Commons Science & Technology Select Committee is seeking ideas for case studies for the management of cross-departmental science advice. We suggest that the Select Committee investigates the key issues of energy supply and climate change as future case studies.
- For nearly all the critical decisions facing Government, the evidence base is often not as large as one would like. In such cases a judgement has to be taken about whether further research should be commissioned before a decision is taken, or if decisions should be made based on the available knowledge. As the case of climate change demonstrates, incomplete evidence should not be used as an excuse for inaction.

- 1 The Royal Society welcomes the opportunity to submit evidence to the House of Commons Science & Technology Select Committee inquiry on scientific advice, risk and evidence<sup>1</sup>. This submission has been approved by Professor David Read FRS, Vice President and Biological Secretary, on behalf of the Council of the Royal Society.
- 2 In this submission the Society responds generally to the questions raised by the Committee, which are used as headings throughout this document. Responses are not to the case studies. The response draws many examples from the work of the Department for Environment Food and Rural Affairs (Defra). This is not necessarily because it is a poor example of the use of science by Government but because the Society looked in detail at this Department when producing its submission to the Office for Science and Technology's consultation on the use of science by Defra (Royal Society 2005a).

### *Sources and handling of advice*

#### **What impact are departmental Chief Scientific Advisers having on the policy making process?**

- 3 Where departmental Chief Scientific Advisers (CSAs) have been appointed at a senior level from outside Government this has led to an improvement in the use of science across Departments and has assisted in the development of a clear strategy for science. However, it is vital that the CSA is involved in all the key strategic decisions within a Department.

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<sup>1</sup> The terms of reference for the Select Committee inquiry can be found online at [http://www.parliament.uk/parliamentary\\_committees/science\\_and\\_technology\\_committee/sag.cfm](http://www.parliament.uk/parliamentary_committees/science_and_technology_committee/sag.cfm)

**What is the role of the Government Chief Scientific Adviser in the policy making process and what impact has he made to date?**

- 4 The cross-departmental overview is a vital aspect of Sir David King's role. His work to bring together the departmental CSAs and raise the profile of key cross-departmental issues (such as climate change and energy) has had positive impacts. He also brought together key individuals from different Departments during the 2001 foot and mouth outbreak with positive results.
- 5 Sir David has also made a number of positive impacts on the policy making process to date. He instigated the current review of the CSA's guidelines on scientific analysis in policy making, to which the Society responded (Royal Society 2005b). The review of these guidelines aims to further enhance the ability of Government policy makers to make better decisions. He was also responsible for the introduction of OST's programme of science reviews of Government Departments that was announced in June 2003.

**Are existing advisory bodies being used in a satisfactory manner?**

- 6 We suggest that Government Departments' access to independent advice in science and engineering should be based on having a panel (and in some cases panels) of independent experts available to each Department to support their use of science. We welcome the fact that Defra has already established a Science Advisory Council (SAC) with a membership of highly experienced individuals.
- 7 To be effective, these advisory committees should be involved in all major policy issues involving scientific evidence and include a number of internationally recognised scientists (covering an appropriate range of disciplines) in addition to other stakeholders. External advice about the membership of such committees should be sought from learned societies and appropriate professional bodies. The chairperson should have access to ministers when appropriate.
- 8 The advisory committees can act as a nucleus for pulling together expert ad hoc groups to address particular issues. Their roles might involve:
- setting or advising on the scientific questions which experts will be asked to address;
  - participating in stakeholder and public dialogue activities;
  - ensuring that evidence being used by the Department is adequately peer reviewed;
  - ensuring the best advice is available when considering breaking news and identifying appropriate reviewers;
  - identifying the need to replicate work where questions exist regarding validity of evidence;
  - playing a role in evaluating departmental use of the guidelines.

**Are Government Departments establishing the right balance between maintaining an in-house scientific capability and accessing external advice?**

- 9 We recognise the potentially conflicting demands (given limited resources) of ensuring continued capacity in particular science areas, while having the flexibility to allocate funding to tackle urgent problems. For example, Defra has been successful in helping to build capacity in the environmental sciences and has created centres of excellence in universities and agencies such as the Met Office. However in some areas Defra tends to utilise mainly well-trusted long-established relationships with certain research centres and research groups. A broader engagement with the wider research community would be beneficial in terms of increasing the

number and breadth of people engaged in policy-relevant research. Important external sources of advice include learned societies, professional bodies, Research Councils, and universities.

- 10 Reciprocal exchanges between scientists and policy makers (including those without a scientific background) can play an important role in developing expertise within both the Department and the wider community. Although not a reciprocal arrangement, one of our research fellows spent time in Defra's Europe Environment Division which was beneficial to both the Department and the research fellow. Defra-sponsored postdoctoral fellowships could also play a role in building capacity in key areas.
- 11 One of the specific situations that has given the Royal Society, the House of Lords (House of Lords 2004) and others cause for concern in the context of ensuring that the appropriate blend of expertise is achieved is the low level of scientific representation on Defra's Committee on Radioactive Waste Management (CoRWM). Defra failed to establish a committee with adequate scientific and technical expertise to provide the best policy advice. We welcome the fact that the CSA agreed to examine the provision of scientific advice to CoRWM and has introduced peer review and quality assurance into its decision making process (Royal Society 2006).

### ***Relationship between scientific advice and policy development***

#### **What mechanisms are in place to ensure that policies are based on available evidence?**

- 12 We believe that this is an area where improvement is required and we welcome the fact that at least one Department has taken steps to address this. Thus Defra's new evidence-based policy making project was initiated with the aim of ensuring that its policies are based on a comprehensive and foresighted understanding of the evidence (Defra 2005a).
- 13 The review by Godfray *et al* (2004) of the randomised badger culling trial and associated epidemiological research also raised concerns about the link between scientific evidence and policy formulation by Defra and the scientific input from its Independent Steering Group. The review recommended that:
  - processes be put in place to ensure that in future there is better communication between Defra policy units and groups responsible for managing policy-relevant science projects
  - a senior figure with a scientific background takes ownership of large science-based projects
- 14 In order that Departments are able to gather all the available evidence they should access advice from a sufficiently wide range of the best expert sources, both within and outside Government. As indicated in the previous section important external sources of advice include learned societies, professional bodies, Research Councils, and universities. Departments should also have advisory panels of independent experts. In many cases it will be appropriate to use experts from outside the UK, not only where there is a lack of expertise in the UK, but when an international perspective would be beneficial. Organisations such as the learned societies can provide a useful access to international experts.
- 15 When obtaining specialist advice from experts, it is not the diversity of opinion that should be balanced, but the weight of opinion accorded to the various strands of scientific advice within that diversity. In the name of 'balance', the media invariably present opposing views on each side of an argument, regardless of the relative weight of support for those opinions. Departments should ensure that their selection of advisors

matches the nature of the issue and that the breadth of judgement required is sufficiently wide to reflect the diversity of opinion amongst experts in a balanced way.

- 16 An important part of ensuring quality and relevance in their sources of advice involves making certain that the correct terms of reference for the research are established at the outset. This is particularly important where the outcomes are likely to feed directly into policy decisions. The Society was involved in the quality assurance review of a report on health and environmental effects of waste management options commissioned by Defra. We found that the failure to frame the study in the context of a life cycle analysis prevented a complete comparison of the waste management options and reduced the value of the report to policy makers (Royal Society 2003b). Some form of expert review of the original terms of reference might have avoided this situation.

### **Are Departments engaging effectively in horizon scanning activities and how are these influencing policy?**

- 17 For horizon-scanning exercises to be effective it is important that the key people participate. The key people may not always be those that traditionally engage with Government Departments, for example the most appropriate individuals may be international experts in a particular field but not in receipt of research funding from the Department. Departments should have a strategy in place to identify and engage with these people. In terms of ensuring future participation in these types of exercises it is important that the use made of the information received is clearly communicated.
- 18 It is important to ensure that the questions asked are not too narrow and that appropriate experts with a breadth of judgement are selected. It is important to have mechanisms in place for early identification of multi-disciplinary issues which cut across Government Departments or that have an international dimension.
- 19 Many Government Departments undertake horizon scanning activities and we trust that they will evaluate the effectiveness of these processes. We hope individual Departments' horizon scanning will inform the work of OST's new horizon-scanning centre. It is important that Departmental scientific advisory committees are involved with any horizon scanning exercises that their Departments undertake.
- 20 The report published by the Society with the Royal Academy of Engineering on nanotechnology in 2004 (Royal Society-Royal Academy of Engineering 2004) highlighted the value of identifying as early as possible new areas of science and technology that have the potential to impact strongly on society. We identified the need to bring together representatives of a wide range of stakeholders to review new and emerging technologies, to identify at the earliest possible stage areas where issues needing Government attention may arise, and to advise on how these might be addressed. We recommended that the work of this group should be made public and that all stakeholders should be encouraged to engage with the emerging issues. We hope that these recommendations will be fully implemented by OST's new horizon scanning centre and by the other relevant Government Departments' horizon scanning activities.

### **Is Government managing scientific advice on cross-departmental issues effectively?**

- 21 Many issues likely to require scientific evidence cut across Departments and will therefore require close communication and collaboration between Departments. It is not clear that the Government is dealing effectively with the scientific advice on the key cross-departmental issues of energy and climate change. We

are aware that the House of Commons Science & Technology Select Committee is seeking ideas for case studies for the management of cross-departmental science advice. We suggest that the Select Committee investigates the key issues of energy supply and climate change as future case studies.

- 22 We recommend that OST establishes issue-based reviews of the use of science advice in cross-departmental matters in a similar fashion to its departmental reviews. However, we acknowledge that resource constraints may make it difficult for OST to conduct its ongoing programme of departmental reviews concurrently with reviews which are issue-based.
- 23 Nanotechnology is a policy area in which there has been unprecedented collaboration between Government Departments. The Government published its response to the joint Royal Society - Royal Academy of Engineering report *Nanoscience and nanotechnologies: opportunities and uncertainties* in February 2005 (HM Government 2005a). The actions outlined in the response are being coordinated by the Nanotechnology Issues Dialogue Group (NIDG), which includes representatives from the Departments and Agencies involved in implementing the response, and is chaired by the Office of Science and Technology.
- 24 A number of other groups feed into the NIDG, including the Nanotechnology Research Coordination Group (NRCG), another cross-departmental group, chaired by Defra. The NRCG's role is to coordinate publicly funded research into the potential risks presented by the applications of nanotechnologies, to provide a basis for developing an appropriate regulatory framework. The group recently published its first research report *Characterising the potential risks posed by nanoparticles* (HM Government 2005b), which describes priorities for future research based on technical reports commissioned from external expert sources. The report also provides information on relevant activities across Government Departments, agencies and the research councils and its production in itself is a valuable example of joined up thinking.
- 25 The Government's coordination of policy activities surrounding nanotechnologies appears to be a good example of the Government dealing effectively with the scientific advice on a cross departmental issue. However, we trust that the Council of Science and Technology's two year review of the Government progress, to report in 2007 will evaluate the level of effectiveness achieved in these coordinating activities in detail.

### ***Treatment of risk***

#### **Is risk being analysed in a consistent and appropriate manner across Government?**

- 26 Risk assessment is an important part of decision making. Rapidly developing scientific knowledge should not be confused with a corresponding increase in scientific certainty: uncertainties in the science must be identified. There may be some benefit from a wider adoption of some of the formalised techniques that are available for eliciting expert opinion, especially when dealing with issues involving quantifiable scientific evidence. We dealt with some of these issues in our recent report on detecting and decontaminating chemical and biological agents (Royal Society 2004). The objective of these techniques is to arrive at a 'rational consensus' given all the evidence and opinions available; not necessarily an absolute consensus, which is likely to be impossible to achieve in most cases.
- 27 For nearly all the critical decisions facing Government, the evidence base is often not as large as one would like. In such cases a judgement has to be taken about whether further research should be commissioned

before a decision is taken, or if decisions should be made based on the available knowledge. As the case of climate change demonstrates, incomplete evidence should not be used as an excuse for inaction. Once again independent advisory committees can provide guidance on this issue.

**Has the precautionary principle been adequately defined and is it being applied consistently and appropriately across Government?**

- 28 The precautionary principle has several conflicting definitions (POST 2004), which makes it difficult to assess whether it has been applied consistently and appropriately across Government. The Interdepartmental Liaison Group on Risk Assessment (ILGRA), an informal committee of senior UK policy makers, noted that the UK Government is committed to using the precautionary principle as it is defined in the 1992 Rio Declaration on Environment and Development (ILGRA 2002) in preventing environmental degradation.
- 29 It has been suggested that the precautionary principle should be applied in a wide variety of situations. For example, the Society stressed the need to act in a precautionary manner in relation to endocrine disrupting chemicals (Royal Society 2000), marine fishery reserves (Royal Society 2003a) and in the regulation of nanoparticles (Royal Society-Royal Academy of Engineering 2004). It is clear that the question of how and when the precautionary principle should be applied needs to be determined on a case by case basis.
- 30 For example, the Government has agreed to help industry to reduce or remove nanoparticles and nanotubes from waste streams and support research to overcome the technological challenges of doing this. It has also agreed 'to work with industry to prevent the deliberate release of manufactured nanoparticles for environmental remediation until there is sufficient evidence that the benefits outweigh any adverse effects' (HM Government 2005a). In this case, the Government has adopted a precautionary approach. However, since it is too soon to say whether this application of the precautionary principle by the Government has achieved its objectives, the Select Committee might like to revisit this case at a later date.

**How does the media treatment of risk issues impact on the Government approach?**

- 31 The media can have a major impact on public reaction to risks, particularly those that are newly emerging or newly recognised. The Government approach to risk issues needs to take account of the importance of communication through the media, not only to alert a large number of people quickly to new risks, but also for the purpose of informing them of measures to manage the risks.
- 32 The news media tend to give greatest prominence to new risks, or changes in existing risk, which can affect public perceptions and behaviour. This may make it difficult to manage communications about larger existing threats. For instance, evidence of a small but previously unrecognised side-effect of a preventative medicine, such as a vaccine, may be given greater prominence than the already known greater threat to health posed by the disease the medicine is intended to prevent. It is important that approaches to risk are not based solely what is given the greatest media coverage.
- 33 There are numerous examples of the problems that can occur in communication through the media. In many cases these problems occur because only incomplete information about a new risk can be disseminated, without supporting information about the size of the risk or how the risk should be managed. On the other

hand, withholding information about a risk until all associated details are available may prevent individuals affected from taking their own steps to manage the risk.

- 34 Particular problems may be associated when new risks or changes in risk are described solely in relative terms. For instance, information that the risk of a disease occurring is now 2 in 1,000,000 instead of 1 in 1,000,000 could be conveyed as a 100 per cent increase in risk. There may sometimes be a temptation to give greater prominence to relatively large changes in risk, rather than in terms of much smaller absolute risks, because they are perceived to have greater 'news value'. This applies to both journalists and to the 'experts' who are the source of the information. It is essential that absolute risks are conveyed as well as relative changes in risk.
- 35 Problems can occur when there is a dispute between experts over the size of a risk or of the number of people who are exposed to it. In such cases, journalists may find it difficult to choose between conflicting claims. Experience suggests that in such cases, official reassurances from Government Departments and agencies or other perceived 'Establishment bodies' may not be regarded as more reliable. In some cases, journalists will have more faith in the opinions of individual experts, particularly if they are perceived to be independent of any potential vested interests, than in official statements by press officers, civil servants or even Ministers. Further complications can occur if a particular risk becomes the focus of a campaign.
- 36 'Breaking news' in the scientific domain should also be subject to an evaluation by independent experts. The first response to breaking news, if truly ground breaking, should be immediate acknowledgement, accompanied by a clear statement that a full account of the research is not available and/or that there is no evidence of independent review, with a commitment to rectify this situation and to seek further opinions as soon as possible. It is important to explain the uncertainty or lack of corroboration. In these cases it will be important to have a mechanism for rapid peer review. Learned societies and Research Councils can be approached as a source of peer reviewers that can provide a rapid response. If necessary, and if of sufficient importance, a dialogue with the authors of the breaking news and access to the detailed evidence should be sought as part of the evaluation by independent experts.

### ***Transparency, communication and public engagement***

#### **Is there sufficient transparency in the process by which scientific advice is incorporated into policy development?**

- 37 Publication and transparency are vital as third parties must be able to access data and, if appropriate, come forward with alternative interpretations. Therefore, Departments need to have clear policies on data availability. Consequently, we welcome the Defra accessibility commitment and the publication scheme (Defra 2005b & c) that sets out such a policy.
- 38 The Freedom of Information Act 2000 coming into force on 1 January 2005 has meant that a number of Government Departments have updated their publications schemes (such as the Department of Trade & Industry 2002, Foreign & Commonwealth Office 2005, and Home Office 2005), which we also welcome. These publication schemes specify the types of information the Department publishes, the manner in which the information is published and whether the material is available free of charge or on payment of a fee. However, we would recommend that Departments' publication schemes are freely available on their websites, which is not currently the case for all Government Departments such as DTI.

### **Is publicly-funded research informing policy development being published?**

- 39 We note that it is important to publish publicly-funded research that informs policy development. For example, Defra facilitates the sharing, transfer and management of knowledge through its open publication policy. The Defra Science and Research Projects database lists the work it is funding and in many cases contains links to reports or summaries of the research. The scientific work of the five Defra science agencies is debated in the scientific literature.

### **Is scientific advice being communicated effectively to the public?**

- 40 We acknowledge that communicating complex scientific advice to the wider public is a difficult process, particularly on sensitive subjects such as health-related issues. To increase effectiveness, it is important to view communication within the context of the broader science advice process. Three main issues are commonly highlighted. The first concerns how the issues that experts are asked to address are framed, particularly to ensure they are cognisant of public concerns. The second relates to the question of how the assessment and advice processes mutually inform each other, particularly to ensure that debate helps to shape the assessment and the assessment informs debate. The third concerns uncertainty, which needs to be meaningfully represented and communicated in the scientific advice.
- 41 We would welcome the Committee exploring the extent to which these concerns are taken into account by Departments in the development of their advice processes.

### ***Evaluation and follow-up***

#### **Are peer review and other quality assurance mechanisms working well?**

- 42 The effective use of independent peer review is a vital part of ensuring the quality of the work that Government Departments sponsor. For example, we welcome the recent establishment by the Defra CSA of the Science Quality and Priorities Team, which is playing a key role in developing quality assessment within Defra. We can find no evidence that this approach is being taken in other Departments. Departmental scientific advisory committees have a quality assessment role and they should ensure that the findings of quality reviews (eg of programmes) feed into decisions about future funding. Peer review also has an important role in identifying gaps and opportunities for further research.
- 43 While it is important to include wider stakeholder groups in establishing priorities (and in many cases the terms of reference for research), this should not compromise the scientific peer review, which should involve the leading experts in the field, including international experts where appropriate.

#### **What steps are taken to re-evaluate the evidence base after the implementation of policy?**

- 44 It is important to re-evaluate the evidence base after the implementation of policy to take into account any developments in the related science. The need for such re-evaluation is particularly great in cases where the original decision was based on incomplete evidence. This can be carried out as part of a policy review undertaken (or commissioned) by the relevant Department(s). Policy reviews should be based on, or informed by, the most up-to-date statement of scientific opinion. External organisations such as the learned societies



can be approached to contribute to such reviews, which will normally need to access both national and international expertise.

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*Any enquiries about this submission should be sent to:*

Dr Nick Green

Science Policy Section

The Royal Society

6-9 Carlton House Terrace

London SW1Y 5AG

United Kingdom

Email: [nick.green@royalsoc.ac.uk](mailto:nick.green@royalsoc.ac.uk)

Tel: +44 (0)20 7451 2586

Fax: +44 (0)20 7451 2692