

Royal Society response to Chief Scientific Advisor's consultation on guidelines on scientific analysis in policy making

The Society welcomes the opportunity to contribute to the Chief Scientific Advisor's (CSA) consultation on guidelines on scientific analysis in policy making. In preparing this response we have consulted with Fellows and other experts that have worked with us on relevant committees, working groups and science policy advisory groups. They themselves have been involved with Government, the CSA and the Office of Science and Technology (OST) in various roles, as: recipients of funding; employees in agencies funded by Government departments and as members of advisory committees.

The guidelines on the use of scientific analysis are an essential part of demonstrating the Government's commitment to evidence-based approach to policy. Our response summarises the Royal Society's views on the way in which evidence should be sought and applied to enhance the ability of Government policy makers to make better decisions.

1 Summary

- All scientific research or evidence being used by Government departments should be exposed to rigorous independent peer review. In some cases a fast track process will be need to be used to evaluate 'breaking news'. Publication and transparency are vital and departments should have a clear policy on the availability of the evidence on which policy is based.
- Policy-makers need to understand the uncertainties associated with all scientific evidence and have mechanisms in place to evaluate the impact of uncertainty. Departments should ensure that their selection of advisors matches the nature of the issue and the breadth of judgement required is sufficiently wide to reflect the diversity of opinion amongst experts in a balanced way.
- The evaluation of the impact of the guidelines on Government departments is vital and is also an important part of the process of embedding the principles within departments. In this context it would be useful if major policy decisions that draw on scientific advice were accompanied by a statement on how the guidelines had been implemented.
- Many issues likely to require scientific evidence cut across departments and will therefore require close communication and collaboration between departments. This is not addressed sufficiently in the guidelines. OST should take the lead in ensuring that the guidelines are being implemented and evaluated on policy issues that cut across departments such as energy.
- The guidelines should be accompanied by a series of case studies of best practice. These could be identified from OST's ongoing review of the use of science in departments.
- Public and wider stakeholder dialogue is vital in identifying developments in science and technology that may pose health, safety, environmental, social and ethical issues and in developing an appropriate policy response to new evidence. However more consideration should be given in the guidelines as to how this approach should be implemented.
- A wide range of independent national and international scientific experts should be consulted in a balanced way in the horizon scanning process. It is important to have mechanism in

place for early identification of multi-disciplinary issues which cut across Government departments.

- The departmental Chief Scientific Advisors, scientifically trained staff within departments, advisory committees comprising independent experts and external bodies such as the learned societies should play a role in implementing and evaluating the guidelines.

2 Key messages of the guidelines

The guidelines on scientific analysis in policy making address how evidence should be sought and applied to enhance the ability of Government policy makers to make better informed decisions. OST sets out three key messages in the guidelines, namely that the departments, and the individual policy makers within them, should: think ahead and identify early the issues on which they need scientific advice and early public engagement; get a wide range of advice from the best sources, particularly when there is uncertainty; and publish the evidence and analysis and all relevant papers. We support these key messages although suggest a fourth bullet point could be added: to identify key areas where the evidence base is inadequate and should be strengthened. The third bullet point in the list of key messages stresses the need to get a wide range of advice *'particularly when there is uncertainty'*. It is important that policy makers recognise that there invariably an element of uncertainty present in any scientific issue that they deal with.

3 Horizon scanning

Horizon scanning provides early indication of trends, issues or other emerging phenomena that may create significant impacts that departments need to take account of. We welcome the formation of OST's new horizon scanning centre, and have taken the opportunity to be involved in the early stages of its work.

For horizon scanning exercises (and access to advice in general) to be effective it is important that the key people participate. The key people may not always be those that traditionally engage with a given department, for example they may be international experts in a particular field but not receive research funding from the department concerned. Departments should have a strategy in place to 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.

Advisory panels of independent scientists should be available to each department who can be used in horizon scanning, for example, the Scientific Advisory Council in the Department for Environment, Food and Rural Affairs (Defra). For horizon scanning exercises to be effective it is important to ensure 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, such as in the field of energy.

The report that we published 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 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.

4 Accessing advice

Departments should access advice from a sufficiently wide range of the best expert sources, both within and outside Government. 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.

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 scientific merits of those opinions. Therefore the first sentence of the sub-section of the consultation entitled 'Which experts?' should be amended to read: 'Departments should ensure that their selection of advisors matches the nature of the issue and the breadth of judgement required is sufficiently *wide* to reflect the diversity of opinion amongst experts in a *balanced way*'.

At present, the guidelines treat the acquisition and assessment of advice as a somewhat passive process, whereas seeking and understanding scientific advice is an active process, in which the individual and organisation receiving advice needs to be very able and well informed to get good value. The introduction of departmental CSA's has led to an improvement in departmental use of science, although there is a need for an improvement in the range and quality of scientifically trained staff across departments. In the previous section we have highlighted the importance of having a strategy for engaging with experts that do not traditionally interact with a department. Departmental advisory committees and learned societies can be a useful way of identifying such experts and facilitating their involvement.

5 Decision making based on scientific advice

Risk assessment is an important part of decision making. Rapidly developing scientific knowledge should not be confused with a corresponding increase in scientific certainty. Therefore, uncertainties in the science must be identified and there is a need for clearer guidance on how these can be addressed. There may be some benefit from a wider adoption of some of the formalised techniques for elicitation of expert opinion available, 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 in most cases.

For nearly all the critical decisions facing Government, the evidence base is often not as large as one would like. Decisions will need to be taken about whether further research should be commissioned, or if decisions should be made based on the available knowledge. As the case of climate change demonstrates, incomplete evidence should not always be used as an excuse for inaction. Once, again independent advisory committees can provide guidance on this issue.

6 Stakeholder and public dialogue

We welcome the fact that the guidelines recognise the importance of public dialogue in science and technology. In planning any dialogue activity it is important to distinguish between particular stakeholder groups (such as NGOs, environmental groups, industry or regulators) and the general public. In issues of scientifically-related public policy, for example the application of new and emerging technologies such as nanotechnologies, the Royal Society has previously highlighted the importance of dialogue with both groups to identify possible issues of concern that may need addressing by scientists (Royal Society & Royal Academy of Engineering 2004).

The public engagement focus within the guidelines represents a major shift from the traditional way in which policy making has been undertaken for many departments to date. However, little consideration is given in the guidelines to how in practice this type of approach would be developed and there are major cultural and capacity (skills and resource) issues that have not been addressed. There is not a strong tradition of deliberative public engagement in either horizon scanning or risk assessment within Government and even OST's horizon scanning centre does not plan to engage the public directly. It may therefore be optimistic to suggest this rather radical change with no operational support to address the issues of the need for new skills and further resources.

7 Role of peer review and publication (consultation question 1)

7.1 Principles of peer review

Best practice for each department should be to ensure that the scientific evidence on which policy decisions are based is rigorously peer reviewed. Departments may use evidence published in peer reviewed scientific journals or instigate the independent peer review of evidence from work it has sponsored or commissioned. In some cases scientific journals may be used to quality assure the results of research commissioned by Government, as in the case of the results of the Farm Scale Evaluation (FSE) trials which were published in two of the Royal Society's journals (Philosophical Transactions of the Royal Society: Biological Sciences and Proceedings of the Royal Society: Biological Sciences) following rigorous peer review.

The consultation document questions whether there are exceptional circumstances where peer review might not be needed. We cannot envisage situations where potentially important pieces of evidence should be accepted without some type of independent evaluation. Issues of national security should not be a reason not to seek peer review. A number of independent scientists have security-clearance and could be used by departments for peer review where needed, although these situations may restrict the nature and range of the external review that can be undertaken.

The use made of peer review should be publicised by departments. This will increase confidence in a department's use of science.

7.2 Identifying reviewers

Departments can use similar sources of peer reviewers as they do for accessing advice. Learned societies and professional bodies have access to a wide range of specialists, including international experts, and could be approached to nominate reviewers. In addition, members of the Research Council Peer Review Colleges might be approached to act as referees for departments.

In certain circumstances, it is essential to identify appropriate referees quickly and to get a response from them. Independent scientific panels discussed previously could serve this function. This is linked to the issue of fast track review below.

7.3 Dealing with breaking news and fast track review

'Breaking news' should also be subject to an evaluation by independent experts. The first response to breaking news, if truly radical, 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. It may be useful to have a clearly defined group of advisors for particular fields of expertise on stand-by who can be contacted at short notice, perhaps including the department's own scientific advisory committees. As previously discussed, 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.

7.4 The impact of evidential change on existing bodies of evidence

The consultation document questions whether policy makers should mitigate the impact of radical evidential change on existing bodies of evidence. We think that the use of the word mitigate could be misleading. This could be interpreted as seeking mechanisms that allow departments to minimise the impact of evidence that is not consistent with existing policy. The mechanisms discussed in the previous section for dealing with 'breaking news' are appropriate here, that is immediate acknowledgement followed by a commitment to obtain a full account of the research and peer review if that has not already been done.

In addition to dealing with 'breaking news' it is important to assess regularly whether there has been a change in the balance of scientific evidence supporting a particular policy. This can be done 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. As mentioned above there are procedures for quantifying the uncertainty among independent experts in areas of scientific doubt which could be recommended for evaluating radical new data. External organisations such as the learned societies can be approached to contribute to such a review, which will normally need to access national as well as international expertise. Policy reviews will also take into account the views of the wider stakeholder groups where the establishment of a dialogue between these groups and the relevant scientists may be useful. Policy reviews can also be used to demonstrate to non-experts the complexity of scientifically-based policy development and illustrate the fact that scientific understanding does change and develop.

7.5 Replication

Replication is the only method of validating new scientific evidence and, as such, underpins the scientific method. However in many cases it may not be possible to replicate studies such as long-term ecological studies on an appropriate timescale for decision makers. As we outline above, advice from the relevant scientific advisory committee or organisation may need to be sought on whether a change to existing policy is justified while awaiting corroboration of new results. In these circumstances, the rigorous peer review of the new scientific evidence is vital.

7.6 Publication

Whilst the consultation document asks about peer review and publication, the specific bullet points refer to peer review alone. The two should not be confused. Subject to considerations of national security, publication and transparency are vital and third parties must be able to access data and, if appropriate, come forward with alternative interpretations. Therefore, departments need to have a very clear data availability policy, which may include the use of the department's web site.

8 Evaluation of the impact of the guidelines (consultation question 2)

OST has an ongoing programme of evaluating the use of science by Government departments and the Royal Society has recently contributed to its review of the use of science in Defra (Royal Society 2005). While we support this initiative it will take some time to assess all departments and other methods of evaluation will be required in the meantime. Whilst recognising that departments are subject to a considerable amount of evaluation, the Royal Society supports a combination of all three methods of evaluation listed in the consultation document, namely that OST will: work with senior policy makers in each department to ensure that the principles of the guidelines are fully embedded in departmental policy procedures; that they should be followed up in greater detail under Science and Innovation Strategy Assessments; and that policy documents/publications should be sampled to identify how the guidelines were used. Evaluation may be made easier if all documents that incorporated scientific evidence contained a statement on how the guidelines were used.

There are a number of ways in which policy documents/publications may be sampled to identify how the guidelines have been applied and if appropriate procedures were followed. Random sampling of documents is common practice in financial audits and the same could be practiced in scientific audits where a detailed assessment on a randomly selected sub-set of policy documents/publications could be conducted. Alternatively, documents could be prioritised and a detailed assessment conducted of all important decisions.

A further problem with departmental evaluation is that there is relatively little emphasis on inter-departmental collaboration. Many issues likely to require scientific evidence cut across departments. Therefore many issues will require close communication and collaboration between departments as the norm rather than the exception. This is not sufficiently addressed in the guidelines. OST should take the lead in developing mechanisms for evaluating the use of science advice in cross departmental issues such as energy, perhaps by establishing issue-based reviews in addition to departmental reviews. Learned societies and the Parliamentary Science and Technology Committees, with their experiences of working on cross-departmental issues, can contribute to this process.

Evaluation is an important part of the process of embedding principles within departments. This is essential and OST should work with the departmental CSAs (where they exist) and senior policy makers in each department to ensure that the principles of the guidelines are embedded within all departments. However, it would also be beneficial for departments to offer help in using the guidelines at all levels of Government. OST should offer advice on best practice based on its experience of evaluating the use of the guidelines in other departments. The development of cross-departmental network of policy makers aimed at developing and sharing best practice in the use of science in policy making may also be a valuable tool in the dissemination of the guidelines and their implementation.

Finally, the guidelines should be accompanied by a series of case studies of best practice detailing how the guidelines were applied, perhaps as an annex. These could be identified from OST's ongoing review of the use of science in departments.

9 Role of CSAs, scientific advisory panels and policy networks

Where departmental 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 in developing a clear strategy for science. CSAs have an essential role to play in implementing the guidelines and it is vital that the CSA is involved in all the key strategic decisions within a department.

As discussed throughout this consultation response, we suggest that Government department's 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, the membership of which includes Fellows of the Royal Society.

To be effective, these advisory committees must 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 needed.

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.

10 References

The Royal Society (2004). Making the UK safer: detecting and decontaminating chemical and biological agents. Royal Society: London

The Royal Society and The Royal Academy of Engineering (2004). Nanoscience and nanotechnologies: opportunities and uncertainties. Royal Society: London

Royal Society (2005). Royal Society response to OST's consultation on the use of science by Defra. Policy document 07/05 (www.royalsoc.ac.uk/page.asp?id=1167)

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