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SCIENCE IN POLICY

Government departments spend ~£1.5 billion per year on research to support policy and delivery of services. Recent reviews by the Government and the National Audit Office found wide variations in how departments procure and use research.[1,2] This briefing explores how natural and social science research is commissioned and used by government and how it links with policy.

Key points:

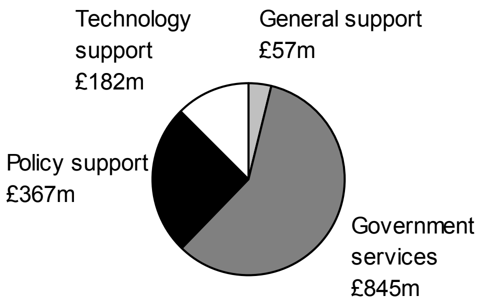
- **BSE triggered concern over how governments use science; steps are being taken to improve the situation – e.g. departments are appointing chief scientific advisers, and government science will be examined by a new directorate within the Office of Science and technology (OST)**
- **motivating researchers to improve all-round communications would enhance the use of science**
- **political issues also arise over governments' use of science - for example in justifying predetermined decisions, and underplaying uncertainties**
- **little is currently known about how policy makers actually use science.**

Background

In 2000-01, civil government departments (i.e. excluding the Ministry of Defence) spent around £1.5 billion on research and development (R&D) to support their activities. Following a steady decline until the mid-1990s, departments have recently increased R&D spending – a trend projected to continue for the next few years.

The figure opposite shows how this expenditure breaks down by purpose. This briefing focuses on government R&D to support policy making (technology support, general support and government services are not considered explicitly here).[3] Most departments undertake some R&D for policy support: the vast majority being in the areas of environment, agriculture, transport, industry and health.

Civil department R&D spend by purpose, 2000-01[4]



- General support - advancing knowledge and postgraduate research
- Government services - R&D relevant to providing Government services
- Policy support - R&D to inform policy and monitor significant developments
- Technology support - advancing technology underpinning the UK economy.

Science in government

Government departments acquire three main types of scientific knowledge: scientific advice, research and monitoring and surveillance data. Defining scientific advisory bodies is difficult, but there are probably 100-200 such bodies. One example is the Committee on the Safety of Medicines which advises the Department of Health. Departments commission research from:

- government departments' in-house facilities
- public sector research establishments, particularly NHS laboratories and research council institutes
- universities
- learned societies – such as the Royal Academy of Engineering and the Royal Society
- consultancy firms.

Examples of governments' use of science

Over the last few years, the Government has shown increasing interest in improving the quality of the scientific information and advice it receives. The box on the next page considers three high profile cases which illustrate successes and shortcomings in the Government's use of science: BSE, foot and mouth disease (FMD) and climate change.

Science and government – three examples

BSE

BSE was first identified in 1986. Between 1986 and 1996, controls on cattle and on meat entering the food chain were gradually tightened but the possibility of a link to human health was not considered significant. In March 1996, the Government announced that there was a distinct likelihood of a link between BSE and a new human brain disease – new variant CJD. An independent judicial inquiry, chaired by Lord Phillips of Worth Matravers reported in 2000. A key finding was that the Government needed to improve radically its use of scientific advice. In particular the Ministry of Agriculture Fisheries and Food (MAFF) had underplayed the low probability of a link between BSE and CJD and understated key uncertainties that had been revealed by one of its scientific advisory committees.

Foot and Mouth Disease

The 2001 outbreak was the first major FMD epidemic since 1967-68. The post-epidemic inquiry found that neither MAFF nor the farming industry was prepared for another large-scale outbreak. The information base and contingency plans were found to be inadequate: changes in farming practice, particularly the scale of animal movements were little known in government, and mathematical models, were outdated. Initially, the FMD outbreak was treated as an agricultural issue, with MAFF taking the lead. However, the wider impacts on tourism and the rural economy indicated that this assumption was invalid. Early advice on the likely progress of the disease was poor, and not informed by a wide range of expertise. However, after the first stages of the outbreak, the Government recognised the need to bring in a broader range of knowledge and expertise, and the epidemic was brought under control earlier than expected. Nevertheless, the risk management measures taken were found to be inappropriately rigid – in particular with regard to culling versus vaccination.

Climate change

In 2001, the House of Commons Science and Technology Committee examined the Government's use of science in developing policy on climate change. It found that the quality of the evidence provided to the Government from the Hadley Centre for Climate Prediction and Research was excellent, and that it formed a good basis for policy. However, it found some concerns over the fact that the advice was essentially coming from one dominant source.[5]

Taken together, these cases illustrate the need for government departments to be able to:
- identify where there is a need for advice
- frame appropriately the questions that follow
- commission research and advice of high quality
- access a broad range of expertise and knowledge
- understand and critically review the advice given
- take proportionate action, ensuring that strategies for managing risks are well thought out and flexible.

In 1997, responding to the events surrounding examples such as the BSE crisis, the Government published, for the first time, guidelines for departments on using science in policy-making. These guidelines were revised in 2000, and in December 2001, the Government published a code of practice for scientific advisory committees (see box opposite). The guidelines advised departments to identify early the issues on which they need scientific advice, to seek a wide range of advice from the best sources and to operate openly.

Scientific advice and policy making

In July 2000, the Government's Chief Scientific Adviser published ***Guidelines 2000*** which sets out key principles applying to the development and presentation of scientific advice for policy making. These principles are consistent with the drive for evidence-based policy. The guidelines are primarily aimed at individual departments, but are seen as being applicable elsewhere in academia and the public sector. The key messages are that departments should:
- **think ahead** – this will require departments to embark on some form of horizon-scanning work
- **broaden their advice** – acknowledging uncertainties and different perspectives by obtaining advice from a wide range of sources covering natural and social sciences, and (where necessary) non-scientific disciplines such as philosophy, theology and ethics
- **act with a presumption of openness** – e.g. publishing their scientific advice and all relevant papers.

The ***Code of Practice for Scientific Advisory Committees*** was published in December 2001. By mid-2003, 84 advisory committees and bodies were following the code. The code of practice is not mandatory, and its implementation has not yet been reviewed. The Government has not yet reviewed its implementation by those signed up to it, nor established why other scientific advisory bodies have not signed up.

The code covers:
- **role and remit** – particularly making sure that the terms of reference for the committee are very clear (e.g. that they are not asked to make political decisions as to what levels of risk would be acceptable)
- **transparency –** publishing information, making explicit uncertainties in the committee's advice, communicating with others (including consultation and dialogue)
- **governance of the committee –** particularly the responsibilities of the chair, the balance of representation among members, committee working practices, and the duties of the secretariat and other government officials involved with the committee
- **responsibilities and duties of the members –** including conflicts of interests
- **using research** for early warnings and risk assessment
- **procedures** for arriving at conclusions, and exchange of information with other committees.

More recently, in July 2002 the Government published its strategy for science, engineering and technology.[6] A year on, a system of external scrutiny of government science is being set up to help departments learn from each other and to develop good practice. This is being led by the Government's Chief Scientific Adviser (CSA) through a dedicated Science Review Directorate within the OST. This directorate will undertake a rolling review of research carried out by departments and will provide independent external assessment of the procurement, management, quality and use of both natural and social scientific research used by government departments. It will also be expected to review the implementation of the guidelines and code of practice.

Acquiring scientific expertise

The supply of scientific expertise in departments

Over the last 30 years, there has been an increasing separation between research providers and departments. Similarly, reorganisation of the civil service has led to the dissolution of the separate career stream for scientists.

These processes have reduced the number of specialists directly employed by government and the size of the potential pool from which departments could recruit researchers into policy areas. The 2002 review of science, engineering and technology concluded that departments had "*lost an important source of supply of experienced scientific talent, and little effort is now made to take a systematic view on the areas of policy that need scientific input, or the critical mass of scientists needed at the science/policy interface.*"[1]

Recruiting appropriate personnel

In addition to the Government's (CSA) based within the OST, many other departments also now employ their own CSAs. The 2002 review recommended that these people "*will need active experience at the cutting edge of science*" and that they should keep "*at least a foothold in an active research group, so that they do not lose touch with the latest developments*." It also urged that departmental CSAs should be supported by suitably scientifically qualified officials.[1] The Government accepted, and is acting on, these recommendations.[6]

However, while these support staff need knowledge within their scientific specialisms, they also:

- embrace and work across a wide range of disciplines
- procure and manage high quality research and advice
- work with policy makers to identify their research needs, and interpret the outcomes
- respond to wider policy demands such as broadening consultation and following rules on financial planning and freedom of information (where scientific research that feeds into advice to ministers is already open).

Some senior officials in government point out that finding people with the adequate mix of skills and experience to meet these needs is problematic. The review stopped short of recommending the reintroduction of the scientific civil service but found that departmental CSAs should ensure that research managers participate in continuing professional development and that there should be opportunities to enable career progression for scientists across the civil service. Some departments are now:

- offering secondment and short-term contract schemes
- creating a record of staff qualifications and experience
- providing opportunities for scientifically experienced staff to move into related areas in other departments.

Such concerns are less prominent for social scientists, economists and statisticians, who already work under a more structured specialist regime.

Setting priorities for research and advice

Determining research needs

Traditionally, departments have followed a range of models when procuring research – from a devolved system where research managers work alongside policy managers, through to a centralised one where research is provided from a pool of expertise that sets its own research agenda and disseminates it to potential users. As an example, the Department for Transport (DfT) operates a devolved model and has specific guidance on managing scientific evidence to meet the standards laid down in the OST's guidelines for the use of science in policy making. In contrast, MAFF provided its scientific research centrally, but its successor, the Department for Environment, Food and Rural Affairs (Defra) is adopting a devolved model, coordinated overall by its CSA.

While the devolved approach can deal with issues that are well characterised and where policy customers have already recognised the need for scientific input, questions arise over how far it can deal with:

- issues that span disciplinary or policy boundaries (such as air pollution and health)
- new policy areas, where emerging issues mean that research needs are unclear (e.g. on nanotechnology, which also spans disciplines and departments)
- areas which traditionally have not relied on a scientific evidence base (e.g. rural affairs)
- areas that have not yet 'appeared on the radar' – i.e. where there is a need for effective horizon scanning.

The Government's strategy for science, engineering and technology requires departments to set out science and innovation strategies that will determine how they will set their research priorities and how they will procure and manage research of high quality. For example, Defra has recently published its strategy for 2003-2006 and is also is examining its scientific requirements for the next decade.[7] This will cover likely priority requirements, future developments and uncertainties. It is also developing its horizon-scanning capability, which will fund research to challenge current thinking and help develop policy. Defra's efforts in this area are widely regarded as exemplary in government, but are still in their early stages. Their effectiveness and ability to promote wider learning will be kept under scrutiny.

Balancing short and long-term needs

While departments tackle immediate day-to-day policy needs, BSE and FMD showed the importance of also being able to take a longer-term view and that research and advice should be available when needed. However, these cases also revealed the danger that short-term priorities can obscure longer-term issues that may emerge. This can be addressed in one of two ways:

- **anticipatory** – using horizon-scanning and scenario planning to pre-empt policy needs so that research and contingency strategies are available when needed. Maintaining long-term relationships with researchers builds confidence, quality and learning (particularly to allow departments to keep policy options open and to challenge conventional thinking)
- **reactive** – procuring high quality research at short notice geared to immediate policy needs.

Linking science and policy

Using a broad range of sources

The BSE and FMD experiences illustrated (among other things) the limitations of relying on too narrow a basis of scientific evidence in setting and delivering policy. However, drawing on a broad range of advice and research is time-consuming and resource-intensive and may conflict with short-term needs to tackle pressing day-to-day issues. While little can be done to take account of this for issues of immediate concern, the Government has recognised the benefits of drawing on a broader range of expertise and knowledge and embracing horizon-scanning to maintain a longer-term focus.

Co-ordinating science across government

Many issues in science cut across not only different academic disciplines, but also across the responsibilities of different government departments. The 2002 review found that coordination of research across departments on cross-cutting areas varied according to need. In response, the Government's Chief Scientific Adviser will explore the scope for increased use of merged research budgets in cross-cutting areas of research.[6]

The role of science in policy

Governments ostensibly use science to enhance the evidence base for policy; identify, analyse and manage risks in formulating and delivering policy; and ensure that the public perceives this advice as authoritative and trustworthy. But academic reviews have pointed to more political factors that lead to shortcomings in the use of science in policy making.[8,9,10] These include using science selectively or to:

- justify predetermined decisions or positions
- erroneously frame issues as predominantly scientific (e.g. in substituting for moral or value judgements)
- act as a scapegoat when things go wrong
- offer undue certainty and reassurance while critical uncertainties are downplayed
- delay making contentious or complex decisions.

The box on page two shows that BSE and FMD were two examples where the government scientific advisory system did not achieve its stated objectives. However, the example of scientific advice on climate change shows that qualified successes are possible. Moreover, it is widely recognised that a linear chain running from defined policy needs, through research, to clear policy answers is overly simplistic. Indeed, policy needs, research outcomes and scientific advice are often ambiguous and unpredictable. Also, policy is rarely made on the basis of a single piece of scientific evidence. Rather, this forms part of the wider body of scientific knowledge and is examined alongside other forms of evidence and political, social and economic factors. Often, this takes place in a policy-making environment characterised by adversarial advocacy by particular groups. Some see such tactical uses of science as not necessarily a bad thing, as long as the research knowledge is widely available to interested parties.[11]

Against this backdrop, the NAO report pointed out that there is little understanding of how science is actually used by policy-makers in their day-to-day work. As such, there are no established criteria that can be used to judge how well research is used. Despite this, the NAO identified barriers to the effective use of research:

- **motivation** of researchers to contribute to policy: they may see no advantage in engaging and peer pressure may actively discourage them from this. Policy makers may also not be motivated to engage with evidence
- **communication** by researchers to make their research more relevant for policy and use less technical jargon
- **understanding** by policy makers of the detail of the research and its inherent uncertainties, including how to take these into account in formulating policy.

Overcoming the barriers

The establishment of the Science Review Directorate within OST provides an opportunity to explore the causes of, and solutions to, many of the issues identified above. It will seek to "*maintain and improve the quality and use of science in government, leading to better advice and more effective decision-making*."[12] However, underpinning these issues, there is still a lack of basic understanding of how policy makers actually use research. The NAO has suggested that a network of research managers be established to share experiences. Also, a range of incentives could be developed to stimulate interest in the exploitation of research for the public good; particularly for engaging scientists with policy makers and the public. Finally, improving communications, and enhancing mutual understanding, between policy users, managers and providers may help ensure the effective use of science in policy.

Endnotes

1 *Cross-cutting review of science*, HM Treasury, Department for Education and Skills, Department of Trade and Industry and the Office of Science and Technology, 2002.
2 *Getting the evidence: using research in policy making*, National Audit Office, HC 586, Session 2002-03, April 2003
3 The NAO found that the quality of data on R&D expenditure is poor.
4 *Science, Engineering and Technology (SET) Statistics*, Table 3.6, Office for National Statistics, www.ost.gov.uk/setstats/3/t3_6.htm
5 *Scientific advice on climate change*, Third report of Session 2000-01, Science and Technology Committee, HC 14, March 2001.
6 *Investing in innovation: a strategy for science, engineering and technology*, Department of Trade and Industry, Department for Education and Skills and HM Treasury, July 2002.
7 www.defra.gov.uk/science/S_IS/strategy/03-06/Delivering_the_Evidence.pdf
8 Public attitudes, scientific advice and the politics of regulatory policy: the case of BSE, Frewer, L. and Salter, B. *Science and Public Policy*, vol. 29, No. 2, April 2002, pp 137-145.
9 Politics of expert advice: lessons from the early history of the BSE saga, Millstone, E. and van Zwanenberg, P. *Science and Public Policy*, volume 28, number 2, April 203, pages 99-112.
10 *Science and Society*, House of Lords Select Committee on Science and Technology, Session 1999-2000, Third Report, HL Paper 38.
11 *Bridging the policy/research divide*, Nutley, S., Research Unit for Research Utilisation, University of St Andrews, 2003.
12 *The Office of Science and Technology: Scrutiny Report 2002: Government response to the Committee's seventh report of session 2001-02*, Third special report of session 2002-03, House of Commons Science and Technology Committee, HC 293, 2003.

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology. POST is grateful to Alister Scott from SPRU at the University of Sussex for his assistance in preparing this briefing note. A longer paper on this subject is available on POST's website.

The Parliamentary Office of Science and Technology, 7 Millbank, London SW1P 3JA Tel 020 7219 2840

www.parliament.uk/post