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May I begin by thanking the Committee for it's report. I know that I speak on behalf of all the CSAs when I say that we welcome the Committee's work to improve the use of science by government and we are grateful for the unfailingly courteous way in which they discussed our work with us. The present report follows the three case studies they carried out, two of which were on the Home Office - not, of course, that we were anything but flattered by this disproportionate attention. However, this evening I do not want to address those narrowly Home Office issues but instead to respond to the broader issues raised by this latest report. I should perhaps make clear that my comments are purely my own and may not represent the views of the other CSAs.

The report raises a number of important issues. Although it is generous in its praise it understandably focuses on areas where it would like to see change or where it believes that improvements can be made. And it is on those issues that I also want to focus.

However, before doing so let me start by pointing out the very real progress that has been made recently. To list some of the more important. First, many departments now have Chief Scientific Advisors in post. Second, many departments have now published Science & Innovation Strategies. Third, the

Office of Science and Innovation are in the middle of carrying out external and independent reviews of the scientific work of each department. Fourth, we have a framework for cross-departmental horizon scanning in place and a series of influential Foresight reports have been completed. Fifth, we have a ten year investment framework for science. Sixth, the full economic costs of research are now being given to the universities so improving the long-term support for the science base. Finally, in spite of some set backs we have managed to have public debates on important issues of scientific policy and on some of these we have led internationally. Having just returned from a trip to the USA, the latter point should not be underestimated. The credit for most of these successes belongs to Professor Sir David King and all of us working in departments are grateful for the leadership he has provided.

However, of course there are things that could be improved and it is to those that I now want to turn.

Let me begin by stating the obvious: scientific advice in government is just that - advice - because Ministers decide. And Ministerial decisions will not necessarily only depend on such advice, because not all issues are contingent and, in a democracy, Ministers should quite properly take other issues into account for which non-scientific advisors may be more relevant.

However, in recent years, there has been pressure to increase the range of issues that are decided on the basis of systematic evidence and to explain and

justify if this is not the case. For example, when the present government came to power it made a commitment to evidence-based policy; the Treasury has insisted that alternative policy investment decisions should be based on rigorous evaluation of evidence and at one stage they wanted each department to explain publicly what evidence lay behind their policies and where that evidence could be found; and the government has argued that the future well-being of the UK depends on us being able to compete internationally as a scientific knowledge-based economy and society and that the government has a role in enabling and fostering that development. To that extent the government has accepted that its success will depend on its ability to exploit science and technology, to develop the knowledge base of the UK, and its skill in using science to manage future risks and exploit future opportunities. Science in government has moved from being a potentially useful tool to being one of the key aspects of government responsibility, alongside defense, social order and the provision of a stable structure of economic exchange.

Such a shift does nothing to change the primacy of Ministerial decision making but does raise the question of whether the scientific arrangements of the civil service to support ministerial decision making are adequate to the task? I will not address the question of non-scientific advice except to note that alongside a shift in the importance of science has been a gradual recognition of the need for other specialist staff (such as accountants or project managers) and a push, by the present Cabinet Secretary, to increase the skills and specialisation of the generalist class. This is relevant to our discussion in that the ability of the civil

service to marshal and use scientific advice in part depends on how well the generalist class is able to act as intelligent customers for scientific expertise. We not only have an interest in this but also a role to ensure that the new professional skills for government training significantly increase such science relevant skills.

Turning directly to the question of the structure for providing scientific advice to Ministers I want to briefly address a number of issues. Before doing so let me make clear that I will use 'science' to refer to all advice which is based on the systematic analysis of empirical evidence and the testing of explanations or theories. I take that to include advice based on natural science, social science (including economics) and perhaps also statistics. Indeed, an important issue at present is how able departments are to mobilise such a range of evidence in a systematic and coherent way. This is important because real problems usually cut across scientific disciplines. For example, the physical science base for DNA was well established but to successfully harness that for criminal investigations needed significant social science research on how police can effectively collect evidence. I have long thought that the organisation of universities is a conspiracy against the production of new knowledge - because their structures have largely been determined by the need to pass on the solutions to yesterday's problems to neophytes. Which is why so often the best research can only be done in cross-disciplinary teams. However, we have the same problem in government. We have separate professional groups and structures for natural science, social research, economics, statistics and operational research. It is not always clear at

either a departmental or government level how these different sources of evidence are brought together so that Ministers are not left with conflicting and potentially confusing advice. Nor is it clear what mechanisms exist for the different heads of profession to work together. I think that I am the only CSA whose responsibilities span this range. I do think that we ought to find a way to bring more coherence to the range of scientific advice.

Furthermore, the departmental organisation of government also does not reflect coherent evidence needs. Given today's problems and what we know about the interrelationships of the risk factors behind them then I doubt anybody would come up with the current structure of government. Much of the current structure reflects a nineteenth century understanding of problems and how to organise to deal with them. The result is that many issues need cross-government solutions and the marshalling of cross-government scientific evidence and advice. The CSA network has informally helped in this regard but we still have not found a successful formal solution. The Committee's suggestion that there should be a cross-government research fund is interesting since so far other recent attempts of this kind, such as the CRAG initiative, have yet to prove their success.

Clear advice to Ministers ought to be based on a systematic review of the available published and peer reviewed evidence that is widely accepted within the relevant scientific community. The government has long had a Chief Scientific Adviser to ensure that such advice is available. However, the appointment of departmental CSAs is more recent – they, like the government's

CSA, are seconded for a fixed term from the universities to ensure they bring to their role the evidence standards of the broader scientific community and inject some periodic fresh thinking. The Committee's support for this structure of CSAs is welcome but I think we need to expand it to cover all departments and give CSAs oversight of all science.

In order to ensure that Ministers do receive appropriate scientific advice the CSA needs to have access to the range of departmental decision making in order to identify when such advice is needed. In my experience the lack of such advice is often because non-scientific colleagues have not identified the need early enough in the decision making process. This can be achieved if the CSA sits on the departmental Board or if departments have a systematic process for policy decision making which includes a scientific gateway (which the Treasury advocates). However, neither of these is currently common – for example my estimate is only about a third of CSAs sit on their Board.

Departments vary greatly on how far they fund science. As a percentage of total resource this varies from almost 18% in FSA (perhaps a special case), or 6.5% in Defra, 1.8% in MoD to just 0.5% in HO or 0.2% in DfES – that is of the spread of the main science spending departments. In terms of amount MoD spent £595M (excluding development), whilst HO spent £64M in an equivalent year. I wonder if the variations between departments have a rational explanation? If I may make a self-serving point: given the problems addressed by the Home Office, from counter-terrorism, to police technology, prison security, border control,

offender tracking and global crime networks then does our science spend seem proportionate? We do not seem to have a mechanism at present by which departments explain and justify their science spend. Indeed, in most departments the science spend is not even a separate budget line and in some there is no science budget just science spend that can be identified retrospectively.

Identifying future science needs is, of course, not easy. There are structured ways to try and do so, such as horizon scanning and scenario planning to narrow down likely future need. Here my experience is not so much the difficulty of such using such techniques (although they are not easy) but rather of getting a department to think beyond immediate issues or even crises management. I acknowledge that this could be a peculiar problem of recent Home Office experience but I doubt it. The OSI has been encouraging such work by setting up an horizon scanning centre of excellence and Foresight has had some success in this regard but the effective use of horizon scanning in many departments is in its infancy. We ought to require that forward risk-focused science plans exist and that the use of such techniques is a part of the new professional skills for government training. This in fact is simply one element of the need for government to get better at risk management. Unless we do so then departments will only have risk strategies based on already known and active risks and will not be prepared for future risks.

Scientific advice, of course, does not and indeed should not be based only on

research carried out by a department. One could argue that since departments will never be perfect at predicting their future needs then it is better simply to rely on the rich diversity of research carried out in the broader scientific community. There is some truth in this and I have tried to encourage research councils to fund work in Home Office areas of interest, which I knew we would not fund, in part as a hedge against our ineptitude in planning. I ought to record that they have been very helpful in this regard. I also regard this as a continuation of what I used to know as the 'Rothschild principle'. However, there are situations where government needs an internal scientific resource in order to be able to respond to crises. University research on chemical or biological threats is most valuable and can be the source of advice during a terrorist attack but we also need scientists available as part of our front line response and crisis management. In other words, there is a need for a strategic scientific resource in government. During the next few years budgets are going to be very tight or reducing. We need to be clear sighted to ensure that apparently easy budget saving by reducing science spend do not inadvertently remove this strategic resource, or, indeed, remove the scientific work on which future advice will depend.. We do not want to find ourselves facing, say, a future foot and mouth crisis without the scientific resources under DEFRA's command to be able to respond quickly and effectively.

More generally departments need to draw on the work of the broader research community and one role of the CSA is to foster external research links. We need to ensure that departments are open to external scientific advice and do not just

rely on their CSA. The Committee rightly praised DEFRA's Scientific Advisory Committee. We, in the Home Office, also have such a committee but ours is chaired by the Permanent Secretary because we wanted to ensure that the most senior departmental official had directly available external scientific advice. All departments ought to have a range of independent scientific advisory committees reflecting their current needs and we have committees advising on biometrics, animal experimentation, the misuse of drugs and CBRN counter-terrorism as well as ad hoc groups and regular exchanges with the Learned Societies. (I note, incidentally, the Committee's criticisms of the ACMD and we will react to those criticisms.) However, such structures are not yet universal (in government) but should be.

External advice can be seen as problematic because it may not agree with internal non-scientific advice or political imperatives and may be made public. I have found, during my period working in government, an interesting cultural problem. As scientists we know that scientific knowledge is never certain but probabilistic, that the only way we have of learning truth is by a process of openly sharing our arguments and evidence and subjecting them to rigorous peer criticism. Scientists are trained to argue with each other and to challenge and be sceptical of any claim to truth. This culture does not always sit comfortably in government. My first experience of the problem was when a colleague told me that it was no good getting a group of scientists in to advice because they would almost certainly argue with each other! Similarly the demand for certainty actually has to be resisted. Mostly this is no more than a problem of cultural

interpretation but it can mean that things that we take for granted – such as the need for external and independent peer review and the publication of research – can be problematic for our colleagues. Here there are issues of principle – of what fundamentally makes science possible – that have to be fought for. These principles are reflected in Guidelines 2000 and 2005 on the use of science in government and the Committee pointed to their importance. There is an interesting comparison here with statistics. In today's Queen's speech the government announced its intention to legislate to reinforce the independence of statistics and statistics already have significant protection for their independence and publication.

Scientists find truth by challenge and argument and that is why science is essentially a public activity. In the end you can't have secret science. However, there is some scientific activity in government that at least for the moment we do need to keep secret and we have to manage that need against the fact that good science comes out of open challenge. It can be too tempting not to have peer review on grounds of confidentiality but we must find ways to make sure peer review does happen. What we must not allow is that need for secrecy to spread beyond what is necessary because if we do then the quality of our work will be damaged.

But more broadly there is a bigger problem. We live in a world more dependent on science and technology than ever before but in a culture that is often scientifically ignorant, not just of particular scientific findings, but often of the very

nature of scientific knowledge. Indeed, there is a strange paradox that the more scientifically dependent we have become the more non-scientific or even anti-scientific arguments gain currency in public debate. A society with mass multiple communications and popularist democratic politics is a difficult forum in which to engage in sometimes complex debates. We all have to spend time learning the skills of how to do so and not allow occasional frustration to justify retreat from public debate. As Robert Lowe said after the Great Reform Act in 1867: 'I believe it will be absolutely necessary that you should prevail on our future masters to learn their letters' – or in other words - "We must now educate our masters". We are part of a political process that wants to harness and plan science for our future advantage but does not always seem to understand the structures of governance that are needed to ensure that happens successfully. Not only do we have to do good science and provide well-founded scientific advice but we also have to help our government colleagues understand how science in government needs to be supported and resourced. In that purpose we clearly have common cause with the Committee which is why I began by thanking them. I even promise that the next time the Committee criticizes some aspect of Home Office science I will remember that criticism is an essential part of science!