S&T Communications Tactics and Related Best Practices in Select OECD Governments (UK, United States, Netherlands and Norway)

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1 Introduction

1.1 Structure of the Report

The first chapter of this report provides a short overview, explaining in more general terms international approaches and policy in science communications. Here we also highlight issues from the four country studies.

Chapters 2 presents an oversight of the activities in the fours countries, and a comparison of their approaches to science communication.

Chapters 3 to 6 report our research in each of the four countries concerned. These chapters are structured to provide

- a brief introduction of the recent policy developments which are relevant to science communication
- a description of the main actors, their roles and responsibilities
- a description of the overall science communications picture in each country, structured according to the communications cycle model proposed by CSTA
  - Foresight/planning for engagement
  - Dialogue/ maintaining engagement
  - Dissemination/Reporting findings – inc. risk communication
  - Evaluation

Finally, in the four Appendices, we provide information on a selection of initiatives from the four countries, highlighting the experiences and, where possible, the lessons learnt.

2 Commentary on findings from the four countries

Historically the concept of 'communicating about science to the public' rested on the model of 'educating the public', which had assumed that public acceptance of research and technological development would increase with greater understanding of the science and engineering principles involved. This concept is not based on the need for dialogue and does not necessarily engage the public in policy-making process. This was referred to commonly as "public understanding of science" – (PUS). References to "public understanding of science" are taken to mean the 'broadcasting' of information intended to *educate*, rather than to create a dialogue.[1]

In many areas in Europe, there has been a strong swing away from this so-called 'deficit model' towards a 'democratic model' which includes the public in decision-making about science. Indeed the term 'public understanding of science' is now so condemned in some countries that it is *politically incorrect*, and practitioners prefer

[1] We do not intend to make value judgements about the PUS work which has been (and still continues to be) done, but to make a distinction between it and 'science communication'. Indeed the need for both types of activity is noted more than once during this report.

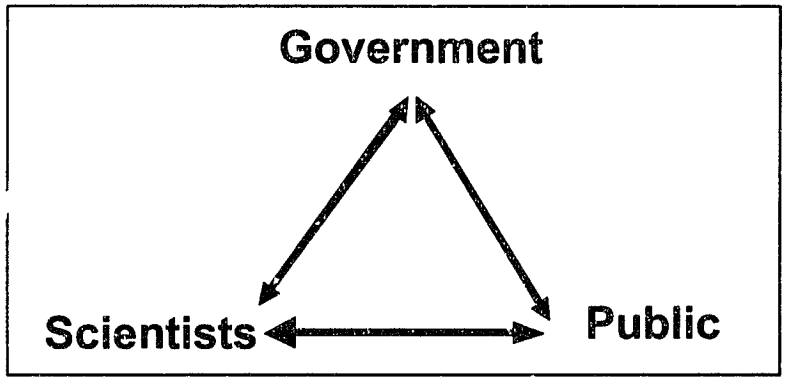
the term 'science communication' or 'science and society'. This is particularly noticeable in the UK.

Often we found that the term 'science communication' is taken to mean any activity, which involves the transmission of information about science, regardless of the extent to which the activity involves dialogue.

The model of communication involving dialogue is not always clarified by the organisations responsible for science communication. Thus it is not always clear just what they understand by 'communication'.

One notable exception is the Environmental Protection Agency in the USA, which has written a number of papers concerning public participation and engagement. Their document, *Guidelines for a Successful Public Participation Program*, proposes the following model of the relationship between parties in an effective programme (Exhibit 1).

Exhibit 1 EPA model of 'successful participation programme'



The document clarifies the relationships and how they should work:

> "In the best case, stakeholders interact well, lines of communication are strong between all parties, and information flows in both directions around the triangle"

This model is used by many EPA departments (it is advice, rather than a requirement). The 'public' here can be taken to mean any group of stakeholders, the principle being that the policy making body has to identify who are these stakeholders. The document presents four reasons why public participation should be pursued:

- the **legal requirement** to conduct public participation activities
- "good government." – controversial **decisions should not be made by technical expertise alone**
- public input can **help agencies reach better technical solutions** and make better policy decisions
- actions are more likely to be accepted and supported by community members who can see that they have **an active role in shaping the decision**

2.1 The Four Countries

The main characteristics of each country can be summarised as follows

2.1.1 Netherlands

The Netherlands claims to have a relatively open system of government, which lends itself to greater dialogue with the public. Thus there is a comparative lack of regulation with regard to science communication.

The Netherlands has a broad-based policy on science communication, covering citizenship and culture, public debate on social issues and the economy. The Netherlands invests in communication activities at a much higher rate than most EU member states.

Recent significant activity has been the restructuring of the agencies responsible for science communication - as outlined in the 2000 Science White Paper. This brought about a refocussing of the responsibilities of each agency to try and ensure that greater coherence was achieved between agencies, with other parties.
In practice, according to our respondents, this has not always been easy to achieve. In some instances, there has been a reluctance on the part of the science community to acknowledge the proposed increase in advisory input from these agencies. Despite attempts to portray them as 'independent', hey are viewed by many as being too close to Government. This is a challenge which the agencies themselves are working to overcome.

2.1.2 Norway

Like the Netherlands (which is similar in terms of population) Norway claims to have an open and transparent system, with a generally high level of public engagement in political debate. For this reason it is claimed that specific policies to increase engagement are not high on the agenda: people already know what is happening.

In Norway, a major focus is on dissemination of results of research, seeking to legitimise scientific research and addressing in particular a perceived lack of understanding by the general public of the importance of scientific research to the economy.

Most of the responsibility for science communication lies with the public relations division of the Research Council of Norway. Their main activity is directed to supporting education and awareness activities – such as the *Nysgjerrigper* project and the *Forskning.no* website.

The recent formation of agencies to address ethical issues and to anticipate future concerns, perhaps demonstrates that Norway does not wish to experience the same crises of trust as for example the UK.

2.1.3 UK

Science communication in the UK continues to be dominated by the scientific establishment's concern to secure public trust in science, which has been rocked by a succession of food scandals during the 1980s and 1990s. Recent Government reports have encouraged the scientific community to increase outreach activities for wider economic reasons, and to experiment with methods to capture public opinion and use it in decision-making.

The most significant Government activity has been the introduction of Guidelines concerning Scientific Advice and Public Participation. These are being implemented across all Departments and Agencies, and deal with fundamental principles of 'good practice'.

There is also a shift in the approach of the long-standing bodies which have usually been responsible for science communication. It is recognised that more work needs to be done on engaging the public –the primary agency (COPUS) is currently undergoing significant restructuring.

2.1.4 USA

The US focuses on scientific literacy. This reflects a concern about future competitiveness of the US due to poor scientific competence (on various international benchmarks) amongst the public and school children in particular. The US has also, hitherto, not had to face the same crisis of public trust in science and its regulation, which has plagued most countries in Europe in the last decade.

Much scientific information is made publicly available by virtue of various transparency laws. Under these all agencies are required to make certain information available to the public, although some are more active in their interpretation of these requirements.

Public participation is generally low, but there are noticeable exceptions. In particular, environmental work demonstrates a higher level of engagement, as well as significant attempts to determine how best to achieve public participation (as evidenced by the EPA model above).

2.2 How do they approach science communication?

If we consider the lifecycle model proposed by CSTA, there are striking differences between the approaches taken by each country. **Exhibit 2** shows how each country is attempting to engage their public through science communication activity, at each of four stages:

- ***Foresight*** - identifying emerging S&T issues, engaging stakeholders in early debate of these issues
- ***Ongoing Dialogue and Consultation*** - engaging stakeholders in an ongoing (and reciprocal) dialogue
- ***Communicate findings/results*** - accessible to a broader audiences, including risk communication and scientific results,

- *Review and identification of new issues* - encourage feedback from stakeholders, evaluating and improving communication practices accountability in S&T communication

Exhibit 2 Activity in each of the four countries at each stage of the science communication 'lifecycle'

	Foresight/ Priority setting	Engagement	Communica-tion	Review
Netherlands	✓		✓	
Norway	✓		✓	
UK	✓	✓	✓	✓
USA		✓	✓	✓

The UK is the only country of the four where we identified policies directed at all four stages. With a mixture of regulation and guidance in place, departments and agencies are expected to demonstrate their attempts to engage their public. Whilst there are often no targets involved, mechanisms exist at both the departmental level and in Central Government to monitor the success of engagement activity.

Similarities exist between three of the countries (Netherlands, Norway and the UK).. In all three, we recognise attempts to engage the public in the identification of longterm scientific concerns. The USA lacks a single forum at the national level for foresight activity, let alone one involving the public. The Office of Technology Assessment (OTA) once performed such a function, although this was disbanded in 1995.

Whilst both Netherlands and Norway have vested responsibility for science communication in single agencies (Weten Foundation and Research Council of Norway respectively), neither has attempted to formalise engagement activity at the later stages of the lifecycle – involving the public in the direction and review of science and technology activity. This may be explained in part by the size of the countries involved. Interviewees in both cases argued that the size of the population meant that S&T activity was more 'visible' than in larger countries. It was suggested that the public in general was more likely to be aware of debates, and more likely to give attention to media coverage on issues that arose. We do not have any evidence to support these anecdotal observations, nor could any be provided. Whilst science communication activity in both countries is relatively high, this tends to be more of the 'broadcast'/education variety than that engaging people in decision-making.

Scale may also be a factor in the USA. This is the only country where we found no strategic, centralised attempts to engage the public at the earlier stages of science

policy development. There is some evidence that individual departments have addressed this: the Environmental Protection Agency (EPA) and indeed these represent some of the best examples of public involvement in policy-setting. However at the state level, there is evidence of community- based research, which is intended to involve a wide range of stakeholders, especially members of the public. As with federal activity though, this tends to be concentrated on a few agencies, particularly those dealing with environmental concerns.

The only area where all four countries demonstrate significant activity is in communicating the results of science. This is perhaps not surprising since such activity predates the more recent trend towards dialogue and engagement. This longstanding tradition has been driven mainly by the desire to maintain public support for state-funded S&T work. This in turn is seen as a factor in defending the financial commitment to research. Consequently the content of the information that is communicated tends to focus on the achievements and successes of the organisations concerned.

The focus on review in the UK and USA highlights two different approaches. The USA is characterised by a legislative approach with a number of legal requirements placed on departments to make their findings available to the public. This does not however extend to a requirement to *engage* the public(i.e. in a dialogue), and there is no requirement to demonstrate that any impact has been achieved through such activity. The mechanisms used in the UK are a mixture of regulation and guidance. The UK Guidance has generated much interest in other countries – a number of interviewees mentioned this to us as a model of something they would like to employ.

2.3 What makes 'good' science communication?

We found a number of approaches to developing mechanisms for public engagement, and many of these are relatively new. The success or failure of any of these is therefore difficult to predict with certainty.

One might consider the factors which already exist in a national system, which may facilitate (or hinder) attempts to broaden public engagement in science communication. These are presented below, and are based on observations made during our research and interviews. This list is by no means exhaustive: one may find other factors in other countries. At the very least, they represent an attempt to take these observations out of the national context, to test against the experience of other countries. First, we present a list of these factors, and then each is discussed in more detail, supported by observations from our interviews and research.

Factors which can facilitate public engagement in science communication
• Coherence of S&T governance
• Good links with media
• Effective communication skills
• Links between science and other concerns
• Use of a range of tools

Factor 1: Coherence of S&T governance

Observations: We observed some disfunctionality in the countries we assessed: there is more than one instance where one department is ignorant of the work of another in a very similar area. If Governments are attempting to improve communication about its science work, then they must also work to ensure that the information being communicated is coherent across agencies.

The recent developments towards better science communication in the UK have achieved a good degree of coverage. This can be attributed, at least in part, to a coherent system of S&T governance, where each party knows their responsibilities, and there are agencies to guide them in their work.

In Norway, despite the presence of a single authority with responsibility for science communication (RCN) and an explicit strategy, there is little coordination of science communication initiatives. Apart from the national strategy, the initiatives are in a large part dependent upon the separate institutions' own initiative and resources.

Respondents in all four countries made reference to the use of legislation as a means to allow the public to remain informed of developments. Legislation may not in itself achieve coherence. More importantly, it may not always ensure an engaged public. All but the UK have "Freedom of Information" legislation (the UK Parliament is currently debating the issue), but in the UK we found some of the highest levels of activity designed to promote engagement. In the US, in particular, this legislation is used to ensure that Departments make information available to the public. (This assumes that the public will seek out the information, in practice this does not always happen.)

This might suggest that *coordination*, rather than regulation, is a more effective means to encourage departments to engage with stakeholders.

Factor 2: Links with media

Observations: The science community in the Netherlands enjoys good links with the media, and trust is science is felt to be high. In the UK where the relationship between the two is generally poor, the media tends to mistrust the views of the science community and in particular that of Government.

The use of media however is a key element of all four countries strategies to improve science communication. In particular the increase in potentially interactive media (the Internet, digital TV) presents opportunities for Governments to engage with the public, with comparatively low cost overheads. Initiatives such as the online consultations in the UK represent a start in this area.

Electronic media also opens up the issue of accountability, as it allows a distance between the policy-maker (o scientist) and the public. For example, the majority of online consultations do not take place in real time – submissions are gathered over a specified timeframe and there may be no obligation on the agency/person responsible

to respond to these. For this reason, these types of consultation might not be the best way to claim an increased engagement (or understanding on the part of the public).

Factor 3: Effective communication skills

Observations: There are differing views between the four countries (and indeed within individual countries) on who are the people best placed to communicate the public about science. One view suggests that the scientists are the best communicate. Conversely it was argued that 'media people' know how to engage audience and that scientists often do not possess "media skills".

This second view highlights the importance of the media in any discussion about science and technology. One might argue that they have a role additional to the tripartite relationship illustrated in the EPA model above – that is, they are not necessarily aligned with any party in the 'triangle'. In practice however, they are likely to be aligned with at least one group, and this depends on the recent experience of the country concerned. The UK is one example of the media challenging much of the Government's information and advice, largely due to the recent public health scares.

In recognition of this , every country offers media training to their scientists – a very few have even become 'media celebrities' (this is arguably a very positive step towards a wider trust of scientists)

Factor 4: Links between science and other concerns

Observations: The need for dialogue in science communication ultimately explodes the "myth" that science can offer an "absolute truth". The debate raises ethical questions about whether certain areas of science should even be pursued, (and if so, to what end?) and that there are risks involved in any decisions made. Both Norway and the Netherlands have instigated fora to facilitate such discussions, and these are linked into the wider system of policy making. This has been the subject of numerous articles in both the general media and science journals

> "Public distrust or opposition to new technologies is often attributed to 'extra-scientific' concerns, and in particular to 'ethical issues', not merely to ignorance. In these ways, governments and other official bodies speak as if value-free scientific knowledge was readily available, as if scientific evidence were separable from values, and as if expert advice could thereby stand separate from 'other concerns"[2].

and is also considered in the UK Guidelines

> "Scientific advice is only one element among the considerations which may need to be taken into account by decision makers, which might also include social, political, economic, moral or ethical concerns. Departments will need to judge how and at what stage the scientific and other concerns are to be brought together in the decision making process. Where it is intended that those offering the advice should take such

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2 *"Science and Governance in Europe: lessons from the case of agricultural biotechnology"* Levidov, L. and Marris, C. Science and Public Policy (28:5) (2001)

concerns into account, departments should make it clear at the outset that this is the case."[3]

More dialogue ultimately represents a move away from the 'linear' model of science communicating with public *through* Government. 'Communication' suggests that each party has access to the other (ref. EPA model). Thus scientists are required to present (and explain) their ideas to the public.

Factor 5: Use of a range of tools

Observations: None of the countries we assessed has what could be called a "fully-developed" system to facilitate public engagement in science communication, and each has different views on what it believes is desirable. The move towards public engagement is a relatively recent phenomenon, and Governments are still learning how to deal with the demands of meaningful public involvement.

Governments are still learning

- *Why* to engage – what is the purpose of the activity
- *Who* to engage – how representative should be the sample, the scale of audience
- *How* to engage – what media to use, what information to share
- *When* to engage – at what stage of the S&T process (agenda-setting, activity, evaluation)

All of these factors have potential repercussions 'downstream': the current perceived lack of trust in part being due to a lack of *participation* in the decision making process, and also a lack of *ownership* of the results.

The prevalence of education/dissemination activity amongst the four countries indicates the legacy of 'public understanding of science' activity. But this legacy may play a part in fostering communication. Organisations in the UK are moving to integrate consultation/engagement into their 'portfolio'. Furthermore, it might be expected that much of the work aimed at educating the public will have contributed to higher levels of scientific literacy (UK/NO).

This suggests a need for a *balance* of activity, between education/promotion ***and*** dialogue. Moves towards engagement should *enhance* rather than replace the existing work.

[3] Guidelines 2000: Scientific Advice And Policy Making: OST (2000)

2.4 Conclusions

All four countries are aware of the need for greater public awareness of science - although different rationales are driving this. Essentially, governments are *experimenting* with ways of engaging, but there is no clear idea of what works. We found very few attempts to evaluate the success of initiatives. One of the main difficulties is the qualitative nature of many measures of success – changes in public opinion etc.

This highlights the need to decide what is to be achieved by any activity *before* it is carried out. The move towards greater public engagement may have its own intrinsic benefits for the operation of government. As seen in Norway, the most scientifically reputable researchers are the ones who are most actively engaged in disseminating their knowledge to the general public.

The suggestion that communication aimed at creating a dialogue should enhance rather than replace existing 'awareness' activity does of course imply a greater financial commitment. In the UK, in particular, the Government has been clear that the cost of deliberative consultations will be a major factor in deciding when such exercises should take place. The risk here is that such an attitude operates against the principles of more transparency; finding reasons *not* to consult might be interpreted as a lack of willingness to consult.

Moreover it may be hard to argue that a small proportion of the (sometimes substantial) budgets involved in much public-funded S&T programmes, cannot be directed towards consultation and engagement. If the long-term goal is greater trust (as is the case in the UK, arguably more than any other country).

Ultimately, it may be enough to recognise that the policy-making process has been informed by the public. The increased sense of 'ownership' of the results may engender greater support for the results. The challenge for government is to be willing to accept that greater openness does not necessarily mean greater support for their approach, and for them to recognise the mandate provided through a more participatory process.

3 Country Report – The Netherlands

3.1 Science Communication in The Netherlands

The Netherlands Government regards public communication or science as an integral part of its science and technology policy. It promotes and financially supports activities in this area for three reasons

- The citizen's right to be informed about developments that may influence their everyday lives, or that may have implications of ethical concern
- The need for a good infrastructure for education, scientific research and technological development as a basic requirement for retaining economic strength
- The importance of science and technology as a vital aspect of national culture

In the Netherlands there has been a shift towards the greater involvement of scientists themselves in communicating science to the public, reducing the dominant role of intermediat institutions and individuals. At the same time, one of the key considerations in this change is the belief that "science must remain independent of Government". The organisations responsible for science communication are currently searching for a comfortable balance between the need to promote Government policy and the desire for the scientific community to retain its autonomy.

In 2000, the Ministry of Education, Culture and Science issued a new White Paper[4], formulated with the Ministry of Economic affairs (EZ) and the Ministry of Agriculture, Nature Management and Fisheries. This paper set out specifically to promote public understanding of, and support for, science and technology and focused on three main ambitions

- Broaden reach of science communication through stronger media involvement
- Greater emphasis within all activities on the needs of young people - driven both by the need for better science education and to recruit people to S&T occupations
- Increased coherence of manifold science communications initiatives

The White Paper also contained an evaluation of the effectiveness of the public agencies responsible for science communication. This evaluation resulted in a refocusing of the roles and priorities of these organisations - particularly with regard to public engagement.

Uniquely the Netherlands has a single body responsible for the communication of science. The Weten Foundation for Public Communication on Science and Technology coordinates Government initiatives on science communication. Usually these are generated by either the Ministry of Education, Culture and Science (MinOCW) or the Ministry for Economic Affairs (MinEZ), but Weten will also carry

[4] "Boeiend, Betrouwbaar en Belangrijk" (referred to as "the three B's") - translates as Interesting, Reliable and Important

out work on behalf of the Dutch Parliament. Other organisations involved in S&T policy making are also expected to engage with stakeholders and the public (see Section 2)

Public engagement in debate is, however, not a common feature of science communication in the Netherlands. The situation reflects that of the UK in recent times, where the majority of science communication activity has typically been about dissemination or 'public interest'. Data compiled by the Weten Foundation suggests that the goals of communication activity are presently

- providing information (70%)
- education (70%)
- changing attitudes (30%)
- behavioural change (20%).

Target audiences for these initiatives are mainly the general public (grown-ups), or children, youngsters and students (e.g. science theatre). Debate activities are partly directed at adults, e.g. campaign on biotechnology and food, but also at young people, e.g. science theatre, which dramatises hot topics. These activities are directed mainly at raising awareness of science issues, and engaging the public in decision-making and priority setting about scientific research, and especially in emerging (and therefore often controversial) fields such as biotechnology. One approach has been to increase the level of scientific content of these activities, in the hope that they will better educate the public, thus enabling them to engage in debate. Some organisations have very specific target groups, e.g. girls in the age of 8–15 (Technika10).

The most significant recent activity in the Netherlands involving dialogue with the public was the Consensus Conference on Cloning, carried out by the Rathenau Institute, which took place in 1999. This was initiated by the Dutch Parliament, which felt the issue was sufficiently contentious that it warranted a broader consultation to solicit public opinion. The model of Consensus Conference - pioneered in Denmark - was used (and adapted for the purposes of this debate). The impact of this work was to declare a moratorium on cloning research until a consensus could be reached.

More recently, Weten conducted a survey on genetics and biotechnology. This adopted a number of mechanisms, including the use of public survey through the media.

Although they addressed similar issues, there was no involvement from either Weten or Rathenau in the others' project. It is notable that the Weten survey was conducted *after* the publication of the 2000 White Paper - which proposed better co-ordination and collaboration between the agencies involved in science communication.

The desire to educate young people in science issues is also demonstrated by the creation of a compulsory course in "Science for Public Understanding", to be taught in senior secondary schools. This was begun in 1999, and covers the following key areas

- science and its impact on society
- the reflective nature of scientific activity
- historical and current developments in S&T

This course has been designed partly to cater for those students who do not take additional (optional) science courses. The compulsory nature of the course is intended to provide all students with some basic understanding of the issues around science and technology, and ultimately to promote a better understanding of science amongst the general public.

3.2 Actors

3.2.1 Public Agencies with responsibility for science communication

The Weten Foundation for Public Communication on Science and Technology

The Weten Foundation is an independent organisation, funded by the central government with an annual budget of Euro 4.5 million. It is the co-ordinating body for national and regional activities in public communication on science and technology. Part of its mandate is also to advise Government and Parliament on science and technology policy issues. It is not a member-based organisation like, for example, the Royal Society in the UK, nor does it operate a specific forum for other organisations, such as COPUS.

Consultation with scientists is on an ad-hoc basis and working groups (which include administrators and scientists – though not the public) may be formed when issues arise.

In addition to its core activities, Weten has a budget to stimulate mass media programming on science and technology. This was intended to fund the creation of a 'pool' of science editors which could be used by researcher and programme makers to advise on the design and content of science programmes. This approach was rejected (by both the science and media communities) as it was believed to represent an attempt to impose the Government's view of what should be covered. Instead a more informal and collaborative approach was taken, but the initial experience has meant that relationships have had to be rebuilt.

Other activities include

- organising the National Science Week, held each year since 1986, including some 200 participating institutes, 400 activities, and 175.000 visitors.
- providing institutes, science journalists, and others with professional information and advice on science communication practice, and stimulates media training for scientists
- financial support for science communication initiatives with sufficient quality and public reach, that would otherwise not be realised

Weten also organised a debate in which it intended to understand public attitudes to biotechnology and GM Foods. A 'stakeholder body' was set up to coordinate the survey. However, there was disagreement about the questions that would be asked,

and as no consensus could be reached a number of participants left the group. When the survey was conducted in the Dutch press, these disenfranchised groups organised campaigns opposing the survey- explaining why they felt it was flawed, and therefore why people should not respond. Eventually, a total of 2,100 responses were received –the population of the Netherlands is around 16 million. The low response could not be directly attributed to the 'spoiling' campaign, but this experience illustrates the importance of engaging stakeholders, particularly those with differing views, in order to achieve the widest audience for a debate. (This initiative is covered in more detail in the case studies in Appendix A).

The Rathenau Institute

Rathenau is a fairly small organisation that contributes to societal debate and political opinion forming on issues connected with technological and scientific developments. It organises public debates and studies, and reports conclusions and recommendations to the Netherlands Parliament. Its annual budget from the government is around Euro 2 million.

The Rathenau work programme runs for two years, and consists of a number of themes. The work programme for 2000-2001 has four themes:

- Biomedical Technology
- Information and Communication Technology
- Food and Food Chains
- The Exploitation of Animals

The programme is decided by the Rathenau itself, and is independent of Government. Since its last review, the Institute has included external organisations a consultation group to assist in the process of identifying themes and new questions to be discussed.

In addition, Rathenau has established a "Science and Ethics think tank" which operates 'horizontally' across all the programmes. This focuses on normative issues concerning science and technology, by researching how citizens and the parties involved see the ethical issues that arise as a consequence of scientific and technological developments. These are fed back to the projects and where appropriate can result in public debates (in which lay-people can also participate).

Since the 2000 White Paper, Rathenau has been working to increase its visibility with the public. It will next be evaluated in 2004.

3.2.2 External Agencies engaged in Science Communication

The Royal Netherlands Academy of Arts and Sciences (KNAW)

KNAW advises the government on matters related to scientific research (councils and committees). It also judges the quality of scientific research (peer review, academy fellowship programme, accreditation committee for research schools in the Netherlands), and provides a forum for the scientific community and promoting international scientific co-operation (international contacts, congresses, funds and endowments). Finally, it acts as an umbrella organisation for institutes engaged in basic and strategic research, scientific information services and biological collection management. KNAW obtains an annual budget of around Euro 35 million for its

activities from the central government, though its science communication activities would amount to something less than 5% of this.

The activities of KNAW in science communication include a variety of events, public lectures and prizes for scientists for popularising science. KNAW has also runs an annual evening for 'science and society', which involves scientists, companies and politicians etc.

Universities and research institutes
Most research institutes nowadays provide the media with general information related to new research developments on a regular basis. A number of universities in addition organise public debates, lectures and courses for the general public on a regular basis. A large number of institutes participate in a national science week, held annually.

Science shops
Science shops are another notable feature of the Dutch system. They have generated a great deal of interest in other countries and been reported upon already[5]. They provide a local base for members of the community to commission research based on their own concerns. In theory, anyone can make a request for research, which is then considered for funding. If successful, the local Shop will carry out the work, if necessary with help from others in the National network. In addition to the science shops, most universities provide Transfer Points and Liaison Units to stimulate knowledge transfer activities with private companies. In the past, Shops have been started solely on the initiative of local students – and sometimes against the advice of the host university. Some of these have since gone on to become significant sources of income for these universities.

3.2.3 Research Funding Bodies

The Netherlands Organisation for Scientific Research, NWO
NWO is the major government sponsor of scientific research at Dutch universities and research institutes. Most of its funding comes from the Ministry of Education, Culture and Science (OCW), though other ministries also contribute. NWO covers all fields of research activity: much like the Research Council of Norway.

The organisation of the research at NWO plays some part in the extent to which communication is possible. Around 40% of NWO-funded research is organised into research themes[6]. These themes are determined through consultation with stakeholder groups, including many who could be viewed as representatives of 'the public' - such as Trade Unions. Research themes run for a period of four years

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[5] For example, the Loka Institute in the USA carried out a comparative study of Science Shops and community based research in the US: see *Community-Based Research in the United States: An Introductory Reconnaissance, Including Twelve Organizational Case Studies and Comparison with the Dutch Science Shops and with the Mainstream American Research System.* http://www.loka.org/pubs/pubs.htm

[6] The remaining 60% of research effort is based on unsolicited applications from researchers to conduct 'leading edge' science. This open programme is not subject to the same management as the thematic work, although applications are peer-reviewed and suitable projects may be encouraged to promote their findings. The share of thematic work is expected to increase in the coming years, such that it will represent around 50% of NWO's research commitment.

(previously themes ran for only two years). This forward planning enables NWO to consider

- which elements of the themes might lend themselves to public communication (i.e. what are the interesting questions)
- how the research can be communicated (through which media, and which audiences might be targeted)

NWO has an active communications department whose main priority is to disseminate the results of research it funds. The main method for disseminating results is via the media – primarily via specialist media. They also issue posters of particular work from time-to-time, which are then distributed to schools. The objective is primarily to safeguard public opinion, and indeed that of policy-makers, to ensure continued funding.

NWO also runs other 'public understanding of science' activities in collaboration with other organisations such as Weten, or organisations abroad such as the British Council. The most well-known event is the Christmas science quiz, for young people and adults, which is broadcast on television and attracts around a million viewers (a significant audience in a country of 16 million).

The lack of concrete mechanisms for engaging the public is explained (by NWO, at least) as indicative of a " Dutch approach" to decision-making. That is, they are continuously organising events (both formally and informally) which bring scientists into contact with the public, and this level of engagement creates an atmosphere of mutual trust. One cited example was the relatively low opposition to research in biotechnology; we were told that "the debate in Netherlands is much more moderate than in the UK".

NWO does request that grantholders submit annual 'media-friendly' summaries (only around 250 words) of their work. Approximately a third of submissions are promoted to the Dutch media, with the hope that enough interest will be created to warrant a news story/ article/ programme about the project - the remaining two thirds are either "too specialist" or "not interesting to the public". This is not a requirement (as in the UK, for example) and it is only partially successful: some projects may not submit, others may submit material which is not immediately suitable for communication. The latter point is being addressed by the circulation of a "media pack" to all researchers: this outlines issues such as the benefits of communication, when it should be done, and to whom.

Technika 10

Technika 10 is a private initiative, partly subsidised by the government, via Weten. Technika 10 organises technical clubs and courses especially for girls in the age of 8 – 15 years of age. The clubs and courses help girls develop their interest in technical matters, and encourage them to incorporate technology in their (future) choice of training and careers. Hundreds of group activities are now organised in all parts of the country, reaching some 10,000 girls each year in these courses and clubs. Similar networks have since been set up in other countries, following the success of the Dutch model. (This initiative is covered in more detail in the case studies in Appendix A).

3.3 Organisation of Science Communication

3.3.1 Early identification of issues

The Rathenau Institute is the main agency responsible for technology assessment/foresight in the Netherlands - it was formerly the Netherlands Office of Technology Assessment. Although it was based on the model of the OTA in the US, the Rathenau has a specific role to engage the public in its activities.

Additionally, within the Science and Ethics Think tank it convenes an Advisory Group – whose member are drawn from other public bodies with some responsibility for TA (these include KNAW, Board of Public Health, Consultative Committee for Sector Councils.

Commenting on Dutch public administration in general, a recent OECD report[7] noted that:

> Interactive government is a distinctive approach in the Netherlands, calling for citizens' participation in the preparation of decisions. Here, decisions are to be made in co-operation and consent between authorities and citizens. So far, however, experience in general is limited and mostly exists as experiments at the local level. There are few elements for a legal, policy and institutional network, apart from traditional rights granted to citizens.

There are a number of examples of public participation being used to inform S&T policy-making (the consensus conferences, a referendum on the environment in 1994), and while not a common feature of policy-making, they have achieved a respectable profile (in both public and policy circles) in the Netherlands.

Weten has the primary responsibility for science communication, but (as stated above) there is a desire for it to be seen as independent of Government. Where this creates a conflict of interest the promotion of Government S&T will fall to the Ministry concerned – usually OCW.

3.3.2 Consultation and Dialogue

There are no national standing committees in which the public can advise on S&T matters. It is possible for individual organisations to arrange stakeholder groups thought these are more common in transport and local Government. As such ongoing dialogue with a particular group is rare[8]

> Interactive government is a distinctive approach in the Netherlands, calling for citizens' participation in the preparation of decisions. Here, decisions are to be made in co-operation and consent between authorities and citizens. So far, however, experience in general is limited and mostly exists as experiments at the local level. There are few elements for a legal, policy and institutional network, apart from traditional rights granted to citizens.

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7 *"Promoting Public Understanding of Science and Technology"*: OECD (1997)

8 *ibid.*

3.3.3 Communication

More than one of our respondents spoke of a Dutch tradition of "openness". Perhaps initiatives such as the Science Shop have been so successful because of this attitude. The Netherlands has pursued the European trend toward greater communication with citizens. It is therefore surprising that the infrastructure for science communication has recently required such a comprehensive overall. This could be explained by the fragmented, but nonetheless effective, use of initiatives at the local level. For example, Science Shops work for their local community, and also have a responsibility to publicise the results of their work.

The Dutch Research Database (Nederlandse Onderzoek Databank - NOD) contains information on current research projects, researchers, and research institutes. The NOD provides research information to scientists, knowledge intensive industry, media, publishers, information services institutes, and the general public.

The Netherlands Observatory of Science and Technology (NOWT) publishes a bi-annual Science and Technology Indicators Report, but unlike the US counterpart, it does not address any issues like public attitudes to science.

3.3.4 Evaluating the effectiveness of science communication

Among the bodies responsible, Weten and Rathenau, each has their own approach to ensuring accountability: there are no central guidelines (as in the UK, and to a lesser extent the US) by which they can be measured.

Ultimately both are answerable to Parliament for their performance and, in the case of the Rathenau - which provides advice to Parliament - judged on the quality of their advice.

Administration law in the Netherlands Laws requires that Departments and agencies be evaluated by independent evaluators every five years. Both the Weten Foundation and the Rathenau Institute will next be evaluated in 2004.

4 Country Report –Norway

4.1 Science Communication in Norway

Norway, like the UK, appears to exemplify the so-called "knowledge paradox": levels of knowledge about science are high in Norway, but the public is sceptical about the benefits and safety of advances in science.[9]

Involvement of the public in priority setting and the direction of future scientific research is lower than would be expected when compared with the UK, which has a similar profile in terms of scientific literacy but higher levels of scepticism of science. Science communication also tends to be rather traditional in form and content in Norway. It is largely based on lectures, television programmes and press articles, and researchers tend to prefer to meet the public in the safety of their own institutions rather than in public arenas.

A 1992 White Paper led to a significant restructuring of the public research infrastructure in Norway. The White Paper also included recommendations on science communication. All Research Councils were merged into one body, the Research Council of Norway (RCN), which was also given the main responsibility for public communication regarding research.

The Paper also called for the development of a national strategy on research communication. This was developed by RCN as an extension of its overall 'Research for the Future' (*Forskning for Framtiden*) strategy, and its goals are described in Exhibit 3 below.

[9] PUS-studies conducted in Norway in the 1990s (NSD Rapport 118) show that the Norwegian public in general harbours a more concerned attitude on S&T and gene technology in particular compared with most other EU-countries. The Norwegian public is however in general better informed on S&T matters according to NIFU report 2/2000 measured with a battery of 21 knowledge items in the 1999 survey).

Exhibit 3 RCN Strategy on Public Understanding of Science and Technology 1996

The public should have

- Access to, and interest in, the results of research, the opportunities they provide, knowledge of their limitations and the working methods involved
- A positive appreciation of the importance of research for democracy, the economy, welfare and culture.

Subsidiary goals:

To generate

- Relevant common actions for disseminating research to the general public
- Understanding and interest in the value of research for its own sake
- Recognition of research-based knowledge and technology as important socio-economic drivers
- Acceptance of the contribution of research to the understanding of culture and identity
- A good, research-based foundation for a critical understanding of social relations

To achieve these goals, the RCN planned to

- Increase its overall effort in the dissemination of research to the general public
- Ensure that its own projects and programmes include an element of dissemination and public understanding
- Encourage all institutions receiving base funding to develop a dissemination strategy and to report this to RCN
- Monitor existing activities
- Take the initiative to launch a nationally co-ordinated electronic information system for research projects
- Establish arenas for researchers, the media, public research brokers and the general public to consider dissemination techniques

Our own recent review of progress on this strategy found that in all but one area, the RCN had made good progress. The only planned action not so far addressed was to *"establish arenas for researchers, the media, public research brokers and the general public to consider dissemination techniques"*

Consequently, it was recommended that

> Greater involvement of the public in debating science and setting priorities is likely to be helpful in increasing the public's sense of the accountability of science and scientists. Lessons can be learnt by studying examples of consultation methods in Denmark or the UK's research councils[10]

[10] *"RCN in the Public Understanding of Science: Background report no 9 in the evaluation of the Research Council of Norway"* Technopolis (2001)

Further recognition at the Government level that there should be greater cohesion between science and the public. In its submission to the debate on the development of the EU 6th RTD Framework Programme, RCN stated:

> The relationship between science, society and the citizen ought to be given increased attention in FP6. Social sciences should be better integrated across a larger number of research activities.

Two further developments illustrate recent moves towards engagement and accountability in S&T policy development

- The establishment of a Norwegian Technology Assessment Board
- The creation of the Norwegian National Committee for Research Ethics in Science and Technology

Both of these are required to engage directly with the public in their work. Each is discussed in more detail in Section 4.2 below. The government is also currently working on Guidelines for ministries on the way in which they commission research.

There is also awareness that more people need to be encouraged to pursue scientific research as a career. Norway's commodity-based economy needs to become more knowledge-intensive. Consequently, a lot of communication activity is intended to raise awareness of science and technology.

4.2 Actors

Research Council of Norway (RCN)
The Public Relations and Information Division has special responsibility for both the co-ordination and setting of priorities within the RCN and for national projects in public understanding of science activity at the RCN.

The RCN has made good progress in achieving the goals it set out in the strategy in 1996. Three main activities illustrate progress to date (see **Exhibit 4** below)

Exhibit 4 RCN activities aimed at the public

Initiative	Description
Nysgjerrigper	*Nysgjerrigper* is a very popular club and competition for children in primary school which aims at increasing their understanding of science and technology, thus improving the recruitment to research Teachers use *Nysgjerrigper*-related material extensively in their work. The club has now 100,000 members and the annual budget is NOK 4 million (EUR 0.5 million).
Norwegian Research Week	Research Week (launched in 2000) is an annual festival involving many of the country's universities, colleges, institutes and companies. Its objective is to promote interest in research, and help people appreciate its content, purpose and importance for Norway. the programme involves events such as lectures, debates, demonstrations, exhibitions, cultural events, shows and fairs. Activities target schools and pupils, science centres, and the development of Web pages, TV

	programmes, videos and books. In general there are 150 local organisers involved in around 850 individual events. The National Research Week Total has a total budget of approximately 3million NOK
Forskning.no	A new website (launched 2001) aimed at the general public, *forskning.no* devoted to popular research and the transfer of science-based knowledge. This aims to present ongoing research and research results to the general public. *Forskning.no* is a national activity with its own staff of approximately 4 man-labour years and an annual budget of 4–5million NOK at the outset.

The Research Council is also involved in *Stiftelsen ungdom og forskning* (The Foundation for Youth and Science). Through this foundation – and in co-operation with *Forbundet Unge Forskere* (an independent youth-organisation for science-related activities) – it arranges the annual competition *Unge Forskere* (Young Scientists).

The Council's Science and Technology Division has implemented a programme (RENATE) aimed at increasing the interest for mathematics and natural science in all levels of the educational system.

The Science and Technology Division however, has a special programme for dissemination of research results and recruitment, which supports different activities with 2–3million NOK a year from 1996–2003.

The RCN report making limited use of involvement of the public in priority setting and decision-making on funding.

One concern is that although many scientific researchers are willing to participate in dissemination of research results to the public (primarily out of good citizenship) they are not given any formal credit for their engagement in such activities. Science communication also tends to be rather traditional in form and content (e.g., largely lectures and press articles) and researchers tend to prefer to meet the public in the safety of their own institutions rather than in public arenas.

The Norwegian Board of Technology *(Teknologirådet)*
The Norwegian Board of Technology was set up as an independent office for technology assessment by the Norwegian government in 1999. It has 12 members, appointed for 4 years, initially funded through RCN. The Board reports to Parliament.

The role of the Board is to

- further a human- and environmentally friendly technological development
- address technological challenges and the possibilities of new technology in all areas of society.
- to stimulate public debate
- to support the political opinion and decision-making processes.

It has been involved in a number of lay- and expert panel investigations in issues such as energy use and genetically modified foods.

The Norwegian Biotechnology Advisory Board
The Norwegian Biotechnology Advisory Board is an independent body (appointed by the Norwegian government.) consisting of 24 members, each with background in modern biotechnology. Eight members of the board represent other public organisations.

The main tasks of the Norwegian Biotechnology Advisory Board are

- to evaluate the social and ethical consequences of modern biotechnology
- to discuss usage which promotes sustainable development.

The Norwegian Biotechnology Advisory Board has approximately ten regular board meetings and organises two or three public conferences annually. The Board also publishes a free, quarterly journal "Genialt" - in Norwegian, and it produces information pamphlets on various topics regarding modern biotechnology.

National Committee for Research Ethics in Science and Technology
Formed in 16 May 1990 by the Ministry of Education, Research and Church Affairs. National Committee for Research Ethics in Science and Technology, is an independent body which advises on research ethics in the natural sciences and technology, in industrial, agricultural and fisheries research, and in research into those areas of biotechnology and gene technology which are not covered by medicine.

The nine members of the Committee include two lay representatives. Committee members are appointed - for a three year tenure - by the Ministry of Education, Research and Church Affairs (on the recommendation of the RCN).

The Committee holds an open meeting at least once a year, and in whatever ways it finds suitable promote informed discussions in society of ethical questions relating to its area of responsibility. The Committee's reports and proceedings are available to the public.

4.3 Organisation of Science Communication

4.3.1 Early identification of issues

The Norwegian Board of Technology (Teknologirådet) aims state a "special emphasis on lay-people's judgement, in assessment of new technologies".

Consensus conferences have been used. In 1996 GM foods were debated (the conference was given the engaging title "Fast Salmon and Technoburgers"). Around this time – and perhaps inspired by the success of the GM Conference – it was suggested that RCN might hold other Conferences, perhaps as often as every six months, but this was not pursued. There were plans for a consensus conference in 1997 on the issue of "Energy production and energy balance", but this was not carried

out due "in part to a change in government and to uncertainty among civil servants responsible for policy in this field."[11]

4.3.2 Ongoing Dialogue and Consultation

The1996 Consensus conference was followed up in 2000, in order to assess changes in public attitudes since the first conference. Although smaller in scale (and financial commitment) this demonstrated that high-profile mechanisms can be followed up with some success.

The Technology Board may contribute to the creation of public debates in the future (its aims certainly suggest that this will be one of it's functions) but it is not yet embedded enough in the system to demonstrate this function.

4.3.3 Communicate findings/results

Communication of results focuses on providing information about research projects, rather than opening them to debate. As from 2001, all programmes must include a dissemination strategy. Many of the other Divisions also have their own communication plans, which include the dissemination of research results. These activities are primarily aimed at potential users of research.

RCN has its own quarterly publication Tell'Us which is available both in print and online. This is printed in Norwegian and English, and is now in its second year.

The most recent and high-profile development has been the creation of a website - **www.forskning.no** - (separate from the RCN's own site) dedicated to the promotion and dissemination of information about current research. This is presented in a user-friendly way without being 'dumbed-down' and has claimed a successful online presence in it first few months.

Additionally the Norwegian Research Week provides an opportunity for scientists to present their work to the public. In fact the "week" last much longer, and uses a wide range of activities, including debates in public places (such as cafés).

In 1999, the Norwegian Institute for Studies in Research and Higher Education (NIFU) conducted a full-scale survey on public understanding of science on behalf of RCN[12]. Daily newspapers were found to be the most important sources of information for the public (newspapers are widely read by the general public in Norway. The survey also noted that the internet is expected to become a major information source on research in the future. The "forskning.no" website can be seen as a response to this.

Results of research are made available through Norwegian Research Database (NFI) which is developed by The Norwegian Social Science Data Services (NSD) on behalf of the Ministry of Education, Research and Church Affairs and The Research Council of Norway. Institutional strategies for dissemination of research results to the general public have been adopted at a number of institutions (for example, Oslo, NTNU,

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[11] *"Using Consensus Conferences on Genetically Modified Food in Norway"* - Morkrid, A. - report for the PUMA 'Strengthening government-citizen connections' project. OECD (2001)

[12] First documented in the National Indicator Report of 1999, issued by the RCN

University of Bergen and a few state-funded colleges). The dissemination of research results in the Institute sector is primarily directed towards the users of the applied research, rather than to the general public. However, the institutes also generally employ information officers who also engage in dissemination activities directed towards the general public.

4.3.4 Review and identification of new issues

The Public Relations Division at RCN is responsible for the communication of scientific information. Given the organisation of research into one single council, this consolidates the main responsibilities in one place.

The RCN also finances studies of public understanding of science and technology done by the Norwegian Institute for Studies in Research and Higher Education (NIFU). NIFU found, in their publication *skriftserie nr* 15/2001, that the most scientifically reputable researchers are the ones who are most actively engaged in disseminating their knowledge to the general public.

There is little scientific documentation of the status for/ impact of dissemination of research directed towards the public. Under the Freedom of Information Act, all ministries are required to report on requests for documents, from all parties – including the public.

5 Country Report - UK

5.1 Science Communication in the UK

Science communication in the UK continues to be dominated by the establishment's concern to secure public trust in science (and the public administration in general), which has been rocked by a succession of food scandals during the last two decades.

The long tradition of "public understanding of science" activity in the UK also means that there is a strong base of channels of communication on which to build. Typically much of this activity has been about promoting the benefits of and interest in science. Consequently the UK enjoys a comparatively high level of scientific literacy amongst its population.

In addition, the most recent government science and technology White Paper[13] encouraged the scientific community to increase public engagement

> ...science is too important to be left only to scientists. Their knowledge, and their assessment of risks, is only one dimension of the challenge for society. When science raises profound ethical and social issues, the whole of society needs to take part in the debate. *Excellence and Opportunity - a science and innovation policy for the 21st century (June 2000)*

and to experiment with methods to capture public opinion and use it in decision-making

The recent 'Science and Society' Report by the House of Lords Select Committee on Science and Technology, provided a further catalyst to introduce communication with the public as a key element of UK S&T policy.

The report identifies five general issues:

- the need to create a **new culture of dialogue** between scientists and the public
- the need to heed public values and attitudes
- a **perceived crisis of public trust** in scientific advice to Government
- the need for all advisory and decision making bodies in areas involving science to adopt an **open and transparent** approach to their work
- the need for scientists and the media to **work constructively** with each other

One of the main recommendations of the report is that Government should accelerate the move away from *one-way provision of information* to the public and towards increased *engagement and dialogue* with the public on SET and the issues it raises for individuals and society. While acknowledging that some significant changes were already taking place (particularly in the Research Councils) the Report also called for better coordination in the science communication field.

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[13] *Excellence and Opportunity - a science and innovation policy for the 21st century*

The Government's response to the report has been largely positive, but there are few innovations proposed to deal with the problems raised. For the most part their response highlighted aetivity that was already taking plaee. In praetiee this activity is largely aimed at informed stakeholders with only a few examples of real *public* dialogue or attempts to broaden aeeess to the deeision-making proeess. The over-riding reason for not pursuing wider dialogue is said to be eost:

> "consultation in whatever form has costs in both time and financial terms. Expenditure on consultation and public debate should be proportionate to the issue concerned.[14]
>
> Deliberative techniques are costly, and are not always the right way to tackle all issues of scientific uncertainty. Public bodies need to draw on available research and decide what form of engagement meets their needs, and their public"[15]

The final elause of this statement "and their publie" betrays (perhaps unintentionally) a view that seience ean still deeide how best to serve the publie's interest. Arguably, this view would be more understandable if one were starting from a position of strong engagement and trust in seienee - and publie administration in general. There is enough evidenee to suggest that this is not the ease.

Only a few months after the Government response, the Parliamentary Offiee of Seienee and Teehnology (POST) produeed a briefing, whieh seemed to challenge this view:

> "There are many cases where it has been shown that the length of time to develop an idea and see it through to satisfactory completion can be considerably lengthened when decisions are taken with little or no public engagement"[16]

Goverнment argues that the Internet will be a signifieant means for eneouraging dialogue with the publie. Aeeordingly, it has initiated a number of programmes to enable use of online eonsultations. One sueh measure is the inclusion of all Government eonsultations on the Internet. These provide the opportunity for anyone with Internet aecess to eontribute their own comments to any aetive eonsultation. Closed eonsultations are kept in an online arehive. Of eourse, these do not in themselves inerease the partieipation of the public. Whilst internet use in the UK is inereasing rapidly, there is a danger that, without a signifieant inerease in seientifie awareness and a wider media eampaign to support them, such initiatives will be lost amongst the vast array of (often heavily-promoted) online content.

Government has undertaken publie eonsultations which themselves have led to substantive developments. The reeently formed biotechnology commissions (see Seetion 5.2.2 below) were themselves based on findings from the OST-led "Public Consultation on Publie Attitudes to Developments in the Biologieal Seiences and their Oversight"

Other UK developments inelude

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[14] *Government Response to the House of Lords Select Committee on Science and Technology Third Report: Science and Society* (2001)

[15] *Government Memorandum in Response to Select Committee on Public Administration Sixth Report on Public Administration: Innovations in Citizen Participation in Government* (2001)

[16] *"Open Channels: Public Dialogue in Science and Technology"* POST (2001)

- A review of the work of OST, which includes an evaluation of their Public Understanding of Science initiative. This is with a view to encouraging more co-operation and collaboration[17].
- A review of public attitudes to science - which will be used to inform Government
- the introduction (in 2000) of an AS-level[18] examination course: *Science for Public Understanding*. The syllabus covers issues in the life sciences and physical sciences, and also "ideas about science", these include

- Data and explanations
- Social influences on science and technology
- Causal links
- Risk and risk assessment
- Decisions about science and technology

As this is a relatively new subject, no data are available (e.g. for number of students or number of schools offering the course), but the identification of this as a subject for study can be seen as a positive reflection on the attitudes to the issue.

5.2 Actors

Organisations active in science communication in the UK fall into four main categories

- Government Departments
- Non-Departmental Public Bodies (NDPBs)
- External Agencies (part public-funded)
- Public Research Funding Bodies

There are a number of 'private' and commercial organisations, typically charitable trusts (e.g. the Wellcome Trust) and special interest groups (such as Interact) but here we will concentrate on the public sector.

5.2.1 Government Departments/Agencies with responsibility for science communication

Office of Science and Technology OST

Within Government, responsibility for cross-departmental promotion and coordination of science communication activities lies within the Office of Science and Technology (**OST**), and is delivered through the Public Understanding of Science, Engineering and Technology (**PUSET**) programme. The objectives of the PUSET Team are to

- Demonstrate the **relevance** of SET to people's daily lives and its importance to the economy

[17] A reporting date has not yet been set, as the review has been incorporated into a larger review of DTI activity

[18] AS level courses are usually taken by students in post compulsory (16+)secondary education

- **Generate interest in SET amongst young people** in order to develop and encourage lifelong interest in these subjects and the consideration of science based careers
- Create as many opportunities as possible for people to learn about recent scientific developments and **debate** their value
- Ensure that there is **dialogue** between the scientific community and the public, particularly on issues which raise profound ethical and social issues
- Raise the general level of **technical literacy** so that the public are in a better position to play a more informed role in this dialogue. Equally important is to enhance the **scientific community's understanding of the public's** interest in and legitimate concerns about SET.

Activities undertaken by PUSET include

- Administration of a grants scheme
- Provision of publications such as best practice guides and resource directories
- Encouraging activities that engage a wider audience such as consensus conferences (e.g. the Public Consultation on the Biosciences)
- Monitoring science communication and gauging public attitudes to science.

As well as a number of small dissemination and awareness raising projects, OST also provided core funding for the British Association for the Advancement of Science (BAAS) and for COPUS (formerly the Committee on the Public Understanding of Science).

The PUSET team has a budget of £1.25million a year from which it provides grants to a number of organisations to facilitate science communication.

A further consequence of the recent debate has been the implementation of a Code of practice on how Government Departments should obtain scientific advice (see Section 5.3.1 below). As a result, all government departments who have a remit for funding research now are actively engaged in explaining the purpose and findings of that research. Two Government Departments have their own policies in this area

- Department of Health (DoH)
- Department of the Environment, Food and Rural Affairs (DEFRA)

5.2.2 Non-Departmental Public Bodies (NDPBs)

In order to increase the transparency of consultation, Government has begun to set up high-profile non-departmental public bodies and agencies. These have been formed to oversee developments in controversial areas of science and to act as a portal for public opinion into the policy-making process.

There are three relatively new committees to deal with concerns about genetics biotechnology (both of which were the result of public consultation) and food

- Human Genetics Commission (HGC)

- Agriculture, Environment and Biotechnology Commission (AEBC)
- Food Standards Agency

These bodies conduct most of their meetings in public, conduct consultations and publish minutes and reports of scientific advice and the policy decisions depending on them. Their membership is drawn from stakeholder groups (including commercial organisations). They are often used by their relevant Government Departments to provide advice and consultation. From January 2001, **all meetings of the HGC will be held in public** and minutes of sub-group meetings will be published and attributable. The other Agencies are expected to communicate with the public and operate in an 'open' way.

The Food Standards Agency in particular has produced a number of booklets on food standards and safety, and is often required to provide advice to the public about food safety issues (see UK Case Studies). There has so far been no formal evaluation of the effectiveness of these organisations, either generally or with reference to science communication.

One example of their interface with other Government departments is the creation of a Food Nutrition Panel at the Food Standard Agency. This followed a report from the DTI's Foresight Panel on Food and Crops[19], highlighting the need for greater public awareness of food and health issues (see Appendix C for a more full description).

5.2.3 External Agencies engaged in Science Communication

COPUS

COPUS (formerly the Committee on the Publi Understanding of Science) was established in 1986 as a joint committee of the Royal Society, British Association for the Advancement of Science and the Royal Institution. Its principal activities are in networking and consultation. A recent self-evaluation resulted in a refocusing of the Committee as a "national focus" for science promotion activities, without seeking to direct them. Membership of the COPUS Council will be broadened to include Government and other stakeholders. Other planned activities include

- the establishment of a "media watch service" for science organisations
- the possibility of introducing a 'quality-labelling' science communication activities

To reflect this fundamental change the committee has also been renamed **Copus—The Science Communication Partnership**. COPUS has bid to the OST for more resources and full-time staff to support these new activities.

Royal Society

As well as hosting COPUS, the Royal Society itself provides a number of science communications activities. These are largely directed at the science and media communities, although the Society also conducts its own research into science communication methods. The majority of public engagement is carried out through

[19] *Feeding the Debate: A report from the Debate Task Force of the Food Chain and Crops for Industry Panel"* DTI Foresight (2002)

support for education and information activities such as Science Week, and support for science exhibitions in museums.

One significant recent activity was a series of nation-wide public meetings, entitled "Do We Trust Our Scientists?" culminating in the National Science Forum in March 2002. The purpose of the meetings was two-fold

- to understand and agree upon the underlying causes for the lessening of public confidence in areas of science and in scientists
- to advise what should be done by whom to reverse this trend.

All meetings were open to the public and aimed to "allow a balanced exchange of views between scientists and non-scientists with the guarantee that everyone's views are heard". The meetings were organised as the main element of the Science in Society programme, and more are expected to be held on other topics in the future. As with other consultations, the Society will use the experience of these meeting to inform its future engagement in policy-making.

British Association for the Advancement of Science (BAAS)
BAAS (also referred to as "the BA") exists to promote understanding and development of science, engineering and technology and their contribution to cultural, economic and social life. It receives funding from OST, (and also from the Wellcome Trust and the Royal Society). Its activities include collaboration with Royal Society on Science Year and National Science Week. BA also organises its own discussion meetings and exhibitions, including SciBar (where meetings are held in bars to discuss scientific topics)

The largest BA activity aimed at engaging the public is the programme of "Science and Public Affairs Forums". These discussion meetings seek to promote dialogue between scientists and the public on a topical issue of interest. Meetings are held at venues around the country (thereby increasing access) and entrance is often free-of-charge. Sessions are organised in collaboration with organisations such as the Research Councils – partners depend on the topic for discussion.

Expert panellists lead the discussion before the debate is opened begins. In the words of the BA "Everyone is equal at a Science & Public Affairs forum. Nobody is right or wrong, and everyone is a potential contributor with a valid viewpoint." Earlier forums have covered stem cell therapy, food standards, medical databases, radioactive waste and climate change, the future of agriculture and the government's scientific advisory committees.

Like other organisations previously mainly engaged in educational activities, BA is now beginning to address the issue of identifying the most effective means of engaging the public in scientific debate.

5.2.4 Research Funding Bodies

The Research Councils each have their own programmes designed to support communication with the public. All Councils recognise the importance of making the public aware of their work (through a mixture of dissemination and dialogue). Much

of this activity is relatively new, following as it does the recommendation of the 2000 *House of Lords Select Committee Report: Science and Society*. The Research Councils were urged to do more to involve stakeholders and the public in the wider task of setting priorities against which grants are made, and to publicise the process more widely. Suggestions for achieving greater openness included the use of open forum meetings in different locations. (It is worth noting that the Government's decisions to create the position of Director General of Research Councils in 1993[20], has done much to assist the communication between Government and Councils, and achieve greater co-ordination between the Councils themselves.)

Each Council has taken its own approach, ranging from standing committees on public dialogue to online consultations, the common factor being the desire to make their activity more visible. Some programmes are more mature than others, but there has been a clear increase in such activity in recent years. The most notable initiatives based on the principle of public engagement are

- Biotechnology and Biological Sciences Research Council's (BBSRC) Online consultations around specific issues
- Medical Research Council's (MRC) Consumer Liaison Group

Both of these are described in the case studies below (Appendix B).

The majority of science communication work is undertaken through outreach activities. Exhibit 5 illustrates the requirements and support for grant holders to conduct outreach work.

Exhibit 5 Research Council policies on outreach by grant-holders

	BBSRC	EPSRC	ESRC	MRC	NERC	PPARC
Grant-holders have to supply project summary in plain English	✓	✓	✓			✓
Grant applicants questioned about approach to outreach activities	✓		✓	✓	✓	
Grant-holders have to develop dissemination strategy	✓	✓	✓	✓	✓	
Annual report must cover outreach activities	✓	✓ if required			✓	
Final report must cover outreach activities	✓	✓	✓		✓	✓
Grant-holders offered extra funds for outreach activities	✓	✓	✓		✓	✓
Grant-holders offered free media and communication training	✓	✓ on pilot basis	Senior researchers only	MRC Unit staff only	✓	✓
Grant-holders given written advice on media and communication			✓	MRC Unit staff only	✓	✓
Council has networks of specialist staff on school liaison and communication	✓	✓		✓	✓	✓

[20] The office of Director General of Research Councils is located with the Office of Science and Technology (OST), at the Department of Trade and Industry – i.e. within Government.

Grant-holders can get help from Council's information and press staff	✓	✓	✓	✓	✓	✓

Source: House of Lords Select Committee on Science and Technology: Third Report - Science and Society (1998)

This table was originally compiled by the Select Committee on Science and Society, which recommended that

> "...grant-giving bodies should give researchers every encouragement to share their research with the public which, one way or another, is usually paying for it, and should support and reward those who do so; and that universities should for their parts see this as a shared responsibility."

Most grant holders choose to spend their time in schools, some others give talks to community groups. It is seen as an important precedent, however, for funders to recognise the importance of the activity in this way and not to penalise scientists for spending time on something other than research. One example of the growing willingness on the part of scientists to promote their work to the public is the demand for initiatives such as media training.

There is some attempt by OST to provide guidance to scientists on their work, but both parties emphasise the importance of an *independent* scientific community, notwithstanding the fact that public money is used for much of their research.

With this in mind, any advice is usually drawn up in consultation, rather than top-down (from Government). A current review of public dialogue is being carried out by OST and the Research Councils. Furthermore, in our interviews, OST stated its belief that the people best placed to carry out science communication are the scientists themselves.

In practice, there is a relatively active dialogue between agencies and Government departments. Further advice to Research Councils is provided through bodies such as the Royal Society and the BAAS. As well as these (more formal) mechanisms there are strong informal networks evident between the various parties. Again this is a reflection on the history of some of those involved (BAAS was set up in 1831, the Royal Society in 1660).

5.3 Organisation of Science Communications

5.3.1 Early identification of issues

The main UK Government mechanism for foresight activities is the DTI Foresight Panels. These Panels are organised into Rounds, usually lasting for a couple of years, wherein a number of priority sector-based panels will be set up. First set up in 1994 there have been various Panels, each commissioned to consider questions around an emerging area of S&T.

The outputs from these Panels inform (rather than dictate) decision making and planning in Government Departments. While public consultation (beyond immediate stakeholders) has not always been a factor in these panels, more recently there have been attempts at early engagement with the public.

The Food Chain and Crops for Industry Panel (1999-2002) recently used a range of techniques to engage with various groups (stakeholders and different public target groups). Deliberative consultation, Internet consultation, postal questionnaire and focus group discussion were all used to assess the effectiveness of each activity in public consultation. Some important conclusions were drawn – **Exhibit 6** presents a summary of the panels findings. The work is described in detail in Appendix B.

Exhibit 6 Summary of findings of Debate Task Force of the Food Chain and Crops for Industry Foresight Panel [21]

The Issue
Emergence of significant consumer concern **after** food applications of technology have been developed (e.g. GM Foods)
The Question
Can consumers concerns be raised **before** investment in the technology and product is made?
The Answer
YES , and you can do so at a **very early stage** in the application of the technologies **BUT...** You will need to ask questions around a **hypothetical** product, not the technologies to be used, if you are to **stimulate debate** You will need to use a **variety** of consultation mechanisms You will find that the answers will be **informative** rather than **conclusive**
Conclusion
People can engage with the **hypothetical** You can use standard consumer survey techniques You should **take account of all the views expressed** – the views that appear to be at the margin may have the potential to have a major impact The views expressed will add to the body of information that will **inform your investment decisions**

Government prefers the use of Guidelines to assist Departments in their planning. Several such documents exist which are relevant here, and Exhibit 7 illustrates these and their main principles.

Exhibit 7 Government-sponsored Guidance relevant to Science Communication

Title	Main Principles
Code of Practice on Scientific Advice (2000)	• involve consumer groups and other stakeholder bodies in the development of scientific evidence-based policy. • be open about the degree of uncertainty attached to a piece of advice is also highlighted. • think ahead and identify early the issues on which they need scientific advice • obtain a wide range of advice from the best sources • publish the scientific advice and all relevant papers
Guidelines on Public Participation (1998)	Aimed primarily at Local Government, but cited by others as a resource, these offer advice on • why participation is important in the policymaking

[21] *"Feeding the Debate: A report from the Debate Task Force of the Food Chain and Crops for Industry Panel"* DTI (2002)

	process • how to plan participation activities • communicating with stakeholders • building capacity for participation- within an organisation/amongst stakeholders
Risk Communication: A Guide to Regulatory Practice (2000)	See **Section 5.3.3** below

5.3.2 Consultation and Dialogue

As well as the activity undertaken by the Research Councils (described above), Government has occasionally organised or supported other means of dialogue

There have been two consensus conferences in the UK. The first, held in 1994, discussed plant biotechnology and genetically modified (GM) foods. The conference was organised and sponsored by the BBSRC and the Science Museum. Issues covered included

- the benefits and risks of biotechnology,
- the impact on the environment consumer and developing world and
- the moral implications of such a technology

Unfortunately, many of the recommendations from the lay panel were not given significant attention in Government. It has since been argued[22] that more consideration of these recommendations might have anticipated the recent concerns over GM crops.

The second Conference was supported by OST (and NERC) and debated the issue of disposal of radioactive waste (a current problem, rather than one yet to be experienced). On this occasion, the recommendations of the panel achieved direct impact on Government policy: changes were made to the regulations concerning disposal of waste.

Both conferences were seen as a positive experience by all (both experts and lay people) who participated in them.

One attempt by the Government to form its own deliberative panel from members of the public was the Peoples Panel (discussed in detail in Appendix 2). Although it was conceived to support the full range of Government policy-making, not just scientific issues, it did represent the first committee of its kind in any country. The panel was asked to consider scientific matters on two occasions during it three-year existence

[22] Referring to the later 1999 conference, Durrant notes that "Interestingly the citizens panel convened in 1999 commented that in its opinion, many of the difficulties currently being experienced in the UK debate on GM foods might have been avoided if only more attention had been paid to the recommendations set out on this subject five years earlier in the citizen panel report on biotechnology": in Science and Public Policy(25:6) (1999)

- for the Human Genetics Commission, on the benefits offered by human genetic research, but some misgivings about the regulation of such developments in the future.
- for the Office of Science and Technology, as part of public consultation to examine attitudes towards the wider (including ethical) implications of recent developments in the biosciences

5.3.3 Communication

Communication of risk by Government departments is coordinated by the **InterDeparmental Liaison Group on Risk Assessment (ILGRA)**, a cross-departmental committee chaired by the Health and Safety Executive. ILGRA has published guidelines[23] for risk communication. These guidelines

- Set out **four principles of effective risk communication** (Integrate Risk Commu..ication - Listen to Stakeholders –Tailor the Message – Manage the Process)
- Provide a framework of questions to assist in the integration of risk communication into policymaking
- Offer guidance on **good practice approaches** to engaging wi' 'akeholders

Although originally designed to assist in the regulatory plannin; ess, these guidelines have become more widely used in Government as th. 'er a clear understanding of the imp' ance of risk communication. Moreover, they are based on the principle of *stakehola. involvement.*

The Research Councils all have a remit to provide public access to current research and to enhance awareness of its potential applications and implications. Findings from research are required to be published (as illustrated above).

5.3.4 Evaluating the effectiveness of science communication

From our research, it would appear that there is little work in the UK directed towards establishing the effectiveness of measures in engaging the public. This is claimed to be partly due to the difficulty in measuring the impact of the largely qualitative indicators that might demonstrate such effectiveness – changes in opinion/ awareness vary from person to person.

Accountability within Government rests upon the implementation of the Code of Practice for Scientific Advice. Departments will be judged on the extent to which they employ the Code. Departments will have to make clear why it has not been followed, and they should monitor its effectiveness in assisting the advisory process. Furthermore, OST will monitor implementation of the principles across departments, and report annually to the Ministerial Science Group. These reports will be published. No specific targets exist, although these have been discussed.

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[23] *"Risk Communication: A Guide to Regulatory Practice"* IGLRA, Health and Safety Executive Risk Assessment Policy Unit (2000)

COPUS is currently investigating how one might test for impact of science communication. The current manager of COPUS presents the problem as being the

> "...need to recognise that earning public trust is a longer and more complex activity than undermining it. And thus evaluating the success and impact of these activities is difficult - it isn't about testing people's knowledge of science, and it shouldn't be about gauging their support for it."
> At the moment, it is difficult to illustrate the long-term implications, be they social or financial, of not communicating science, but we do still need to find ways of evaluating its impact.'[24]

Part of COPUS's investigation has involved organising a Science Communicators Forum. The first conference was held in May 2002 and attracted speakers from the academic community and the media. This was felt to be a successful initiative as it engaged a wider group than had originally been expected. The conference was open to the public, although attendance fees had to be paid. It is expected that the Forum will become an annual event.

[24] Natasha Martineu, COPUS Manager, Royal Society; speech to the British Association for the Advancement of Science, November 2001.

6 Country Report - USA

6.1 Science Communication in The USA

In the last few years there have been moves in the USA to communicate more with the public about the science which Government funds. As in the UK, there is a tradition of 'public understanding of science' work, but little on engagement or dialogue.

The main catalyst in this debate was a 1998 report to Congress by the Senate's *House Committee on Science*, Unlocking Our Future: Toward a New National Science Policy, which recognised that:

> "...science must maintain a solid relationship with the society that supports it... to fortify the ties between science and the American people. Whether through better communication among scientists, journalists, and the public ..strong ties between science and society are paramount. Re-forging those ties with the American people is perhaps the single most important challenge facing science and engineering in the near future."

A year later, this was supported by the National Science Foundation:

> "While the scientist may expect the lay citizen, by dint of interest and initiative, to educate her or himself to the mysteries of the natural world, the public has a reasonable expectation that scientists will contribute to demystifying for others what is so personally and professionally engaging to them. The challenge to do so is the essence of what former NSF Director Neal Lane has called "civic science."[25]
>
> "are no longer satisfied with waiting patiently for the uncertain and unpredictable "spin-offs" in basic research. This is in part the scientists' fault for failing to communicate effectively the many ways scientific research creates value and opportunity."[26]

There are voices in both the legislative and scientific communities, who recognise the need for the public to be more involved in decisions taken about the direction of S&T research. The so-called "Jeffersonian model" for basic research believes that in order, for research to truly benefit society, it must be actively supported by the public[27]. This would require some attempt to inform or engage the public in discussion about what research should be conducted, but – outside a few active Departments – there is little evidence of this.

Legislation is the primary means of ensuring that the policy-making process remains open and accessible to the public. All public bodies, whether departments or advisory

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[25] "*Toward The 21st Century: The Age of Science and Engineering*": National Science Board Strategic Plan (1998)

[26] "*Science for Society: Cutting-Edge Research in the Service of Public Objectives: A Blueprint for the Intellectually Bold and Socially Beneficial Science Policy*" Branscomb, L. Holton, G. and Sonnert, G., (2001)

[27] "*Science and Society*": Branscomb,L. Holton, G. and Sonnert, G. AAAS Yearbook (2000)

agencies - such as NAS and NSF are governed by a number of 'freedom of information' acts. The most significant of these are listed below

- **The Government Performance and Results Act** (1993)- seeks to shift the focus of government decision-making and accountability away from a preoccupation with the activities that are undertaken - to a focus on the results of those activities, such as real gains in safety, responsiveness, or program quality. Under the Act, agencies are to develop strategic plans, annual performance plans, and annual performance reports.
- **Government in the Sunshine Act** - balances the right of the public to participate at meetings against the rights of individuals from unwarranted invasion of personal privacy or to protect confidential trade secrets or commercial property.
- **Federal Advisory Committee Act** (FACA) - requires Governmental bodies to submit proposals for scientific advisory panels (their remit and membership) for central approval. Although originally this requirement only related to Federal departments, it has now been extended to includes NAS and NSF (but was resisted at first). Notice of meetings must be made public[28]
- **The Freedom Of Information Act** (FOIA)- requires agencies to record and make available to the public, information regarding the organisation and management of its work

According to the findings of the National Science Foundation's 2001 S&T Indicators Report, despite a high level of support for S&T research (81%), the public is not generally well informed about S&T, nor about the federal funding of S&T research (few could identify the organisations responsible).

6.2 Actors

6.2.1 Federal Agencies with responsibility for science communication

Most funding of science in the US is dealt with via the Federal Agencies. The largest share of funding for science is biomedical and is dealt with by the National Institute of Health. The other main funder of science is the National Science Foundation. Other important governmental research funders include NASA, the Department of Energy and the Department of Agriculture. It is a prerequisite of receiving Federal funding that the organisation concerned must have an outreach programme.

Department of Energy (DoE)
DoE has an Office of Science Education, which operates a number of schemes designed to encourage interest amongst students.

Additionally the DoE Office of Field Management prepares Good Practice Guideline on Public Participation, which all officers and programme managers are expected to observe. The Guidelines also present a Public Participation Tool Box, which suggests mechanisms for engaging with the public.

[28] Any 'ad hoc' committees are not governed by FACA legislation – these are typically used to gather information to be fed into the Advisory Committee.

- Public Meetings and Formal Public Hearings
- Citizens Groups
- Envoy Programs
- Newsrooms and Information Data Bases
- Additional Public Information Tools, including
  - Exhibits at public events and in public buildings.
  - Visitors bureau and tours of the facility
  - Public information centers, which provide access to a full range of print materials, including technical reports.
  - A speaker's bureau to provide speaker services to the community.
  - Mailings to interested individuals notifying them of public comment periods or the availability of documents.
  - Audiovisual materials, including videotape to provide visual information about the site activities.
  - Public reading rooms.

The Public Affairs office provides assistance on communicating with the public.

Environmental Protection Agency (EPA)

EPA was set up in 1970 specifically to address concerns over abuse of the environment, and a specific part of its mission is to engage with stakeholders and the public on decisions regarding environmental programmes. As such it has many public participation programmes -- mainly operating on a regional basis. There are good practice guidelines for programme managers, which stress the importance of public involvement. Meetings are open to the public at the regional and national level.

One notable programme is the Tribal Science Council, which was set up specifically to address the problem of engaging Native American tribes in setting research priorities and planning programmes of work. This was borne out of a recognition that existing mechanisms for tribal issues did not often deal with scientific questions. Although relatively young (it was set up in late 2001) the Council has already led to the creation of a specific programme, which involves tribal members as partners in its projects. One interesting spin-off from this is that teams are encouraged to include 'tribal science' methods in their work. (This is dealt with in more detail in Appendix D).

EPA will shortly complete an extensive review of its 'public participation' policy.

National Aeronautics and Space Administration (NASA)

NASA in particular has a very large outreach programme, including educational activities. Public participation tends to be used when NASA work has an environmental impact, and then at the local level. For example, when planning new launch sites all communities are invited to public meetings to discuss the plans.

NASA has a working group undertaking a study of how science can best be communicated to the public. The Research Roadmap for Communication of Science and Technology for the 21st Century, is collecting evidence of good practice from other institutions, and investigating what further research can be done in the area of science communication.

National Science Foundation (NSF)
The National Science Foundation (NSF) is an independent US government agency responsible for promoting science and engineering through programmes that invest over $3.3 billion per year in almost 20,000 scientific research and education projects in science and engineering. The NSF also funds research in to the public understanding of science and public outreach. It sponsors the largest and longest ongoing survey of public understanding, publishing annually a science and engineering indicators report, referred to earlier, demonstrating the level of scientific literacy in the public at large.

In its 1998 Strategic Plan, the National Science Board – the governing body of the NSF - identified public understanding and appreciation of science and technology and public outreach by the science and engineering communities as "essential for successful science and technology policy that will benefit society".

As a result, NSB set up a Committee on Communication and Outreach to investigate "the role of NSF/NSB in expanding public awareness of science and technology" in1999. In its report Communicating Science and Technology in the Public Interest". It made a number of recommendations

- the science and engineering community should establish a broad-based public information group to increase the American public's appreciation for science, engineering, and fundamental research
- The National Science Board urges increased collaboration among NSF programs that focus on communication, research, education and training, and information dissemination.
- National Science Board members should expand their roles as "personal ambassadors" of fundamental science and engineering and of the NSF mission.

The ***Office of Legislative and Public Affairs*** organises NSF participation in public events. These tend to be concentrated on educational activities, such as exhibitions and science fairs. A series of "Research Highlights" meeting, which present significant aspects of NSF-funded research, are open to the public.

The Office of Science and Technology Policy (OSTP)
Established in 1976, OSTP advises the President on policy formulation and budget development with regard to science and technology. Apart from the legislative requirements outlined above, the OSTP does not directly solicit public opinion, but may refer to reports from other agencies who have consulted the public.

Presidential Committee of Advisors on Science and Technology (PCAST)
When it was originally created, PCAST was suggested as having some responsibility for public understanding of science. However this was not pursued as it was felt that there were sufficient existing organisations and initiatives already in place. It did intend to maintain some oversight of these activities, in order to advise on its implications for future policy.

National Institutes of Health (NIH)
The NIH is one of eight health agencies in the Public Health Service, which in turn, is part of the US Department of Health and Human Sciences. The NIH is a research organisation: its budget for 1999 was over $15.6 billion.

The NIH set-up the Council of Public Representatives (COPR) in response to a report by the Institute of Medicine in 1998, which recommended that the NIH have greater public participation in setting its research priorities. COPR members have been chosen to be representative of all stakeholders, including "the public". They are drawn from patients, family members of patients, health care professionals, scientists, health and science communicators, and educators.

COPR meets at least twice a year, its role is to

- Discuss issues and exchange viewpoints that are important to NIH programs, activities and policies.
- Assist NIH in enhancing the participation of the public in the numerous NIH activities that impact the public
- Increase public understanding of NIH and its programs
- Bring important matters of public interest forward for discussion with NIH leadership in public settings

COPR is a fully chartered Federal Advisory Committee, and under FACA regulations, all its meetings are held in public.

6.2.2 Other organisations

American Association for the Advancement of Science (AAAS)
The AAAS is the main body in America responsible for promoting public understanding of science. Through its Science and Society programme, AAAS supports a number of initiatives focused on areas where science, society and government intersect. These include organising a number of public forums on sensitive scientific issues. AAAS's programme encouraging "Dialogue on Science, Ethics and Religion" has held public meetings.

Other AAAS activities include:

- Public Understanding of Science and Technology Programmes
  - science/technology programming for print, radio, television, electronic media
  - non-traditional mechanisms that communicate science to the public
  - lifelong learning in science and technology through formal and informal education
  - assistance to public science and technology sites such as museums and zoos
  - programmes that help scientists and engineers communicate with the public
- Human Resources Programmes
  - women, minorities, and people with disabilities in science
  - in-school programmes
  - materials connecting science and technology to under-participating communities
  - support for community networks to advance SMT education and literacy
- Careers initiatives

- Fellowships placing PhD scientists or Masters engineers into Congress for a year, to learn about the policy-making process, and to bring technical backgrounds and external perspectives to decision-making in the US government.
- Media fellowships programme placing final year students in to news rooms
- Science careers web-site

AAAS publishes *Science* magazine, which has a wide circulation, and also organises EurekAlert! an Internet resource of science stories for journalists, similar to the European AlphaGalileo site.

National Academy of Sciences (NAS)
The NAS incorporates the National Research Council, the National Academy of Engineering, and the Institute of Medicine (all known as the National Academies). The National Academies provide science advice to Congress and the White House, but operate outside the framework of Government, assembling committees of experts to produces reports.

Within the NAS, the Office on Public Understanding of Science (OPUS) coordinates activity on science communication. OPLA was set up in 1996. Its role is "to foster the mutual responsibility of scientists and the media to communicate to the public, with accuracy and balance, the nature of science and its processes as well as its results". OPUS aims to concentrate on explaining the processes and methods of science, as well as the facts. A large part of its effort is directed towards improving the science literacy of American students and the public.

OPUS's flagship project is 'Beyond Discovery', a series of publications that trace the development of well-known inventions to demonstrate the value of curiosity-driven research.

6.3 Organisation of Science Communication

6.3.1 Early identification of issues

Since the US Office of Technology Assessment was disbanded in 1995, there has been no politically independent government organisation dedicated to technology assessment. Instead the task of 'horizon-scanning' has been nominally devolved to individual Departments. (PCAST) also carries out some degree of 'foresight' work.

The majority of groups engaged in foresight activity do not engage the public directly. The engagement of stakeholders is common, though, particularly at a National level. DoE's Good Practice Guidance advises programme leaders to identify the stakeholders early in the development of their programmes.

Environmental concerns prompt the most visible engagement of the public

- EPA and DoE both commonly invite public comment on proposals, often this is organised at a regional/State level.
- the Department of Transport also invites public input into transport initiatives

Open public meetings are the most common means of inviting public comment. Stakeholder groups can be supported by technical expertise (both internal and external to the Department). The use of citizens' juries is more common in private organisations.

NASA has a working group undertaking a study of how science can best be communicated to the public. The Research Roadmap for Communication of Science and Technology for the 21st Century, is collecting evidence of good practice from other institutions, and investigating what further research can be done in the area of science communication.

6.3.2 Consultation and Dialogue

The need for openness in Government tends to guide most of the attempts to communicate with the public. In large part this assumes that the public will seek out the information which is made available, but there are few examples of active dialogue.

Issues of safety and health (public and environmental) tend to result in the most visible consultation. DoE's Office of Safety Management advises "regular and frank communication" with stakeholders and the public.

> This approach will allow the public to understand the operations, the risks, and the measures taken to ensure the operations are conducted in a technically sound, safe, and environmentally acceptable manner" *"Science and Safety: Integrated Safety management" US Dept of Energy, Office of Science.*

Stakeholder groups are common amongst Government Departments, but each has its own definition of 'stakeholder' – in some cases this is limited to private companies with some commercial interest in the issues concerned.

Those organisations that are active in communication, engage stakeholders as early as possible. EPA is a good example, where public and stakeholders are engaged at the planning and programme design stage (e.g. in its ProjectXL programme). NIH's COPR involves its public members in priority setting for future research topics.

6.3.3 Communication

There are particularly strong links between scientific organisations and the media. NSF claims to reach 100 million through radio, television, and film, although these activities are managed as "public understanding of science" rather than as part of structured strategies tied to specific goals. The strong educational focus of this activity is further evidenced by the prominence of links to 'children's sections' on the homepages of many Departments and Agencies.

All Government Departments undertake some form of communication with the public about the work that they do. The primary source of information appears to be the Internet – all Departments have an online presence, and all officials can be contacted by email.

Certain Departments have taken other steps to engage with their stakeholders. One example, The Federal Committee on Science (part of the White House) broadcasts its hearings online, and also holds archives for previous hearings[29]

The National Library of Medicine's online database **PubMed**, which was developed by the National Center for Biotechnology Information (NCBI) at the National Institutes of Health, serves this purpose for the biomedical sciences. This is mainly directed at the research community, but is accessible to the public

[29] http://www.house.gov/science_democrats

The RAND Corp's RaDiUS database lists all research projects and programs underway in the federal government and thus provides a useful starting point for on-line dissemination of this information.

6.3.4 Evaluating the effectiveness of science communication

Evaluation of the effectiveness of communication is concentrated in those organisations who have the most developed channels for stimulating dialogue. For example, EPA has been particularly active in assessing their own public participation mechanisms. On the whole, these have been found to be successful – largely due to their localised nature. Actively involving the public in decision-making and even in the collection of data to support research has fostered a sense of 'ownership', and the results of this engagement are visibly directly in the local environment. This has had 'spin-off' impact in more contentious areas such as nuclear energy. The Nuclear Regulatory Commission's new Strategic Plan recognises the need to "improve communications with the public, thus providing a pathway to increase public confidence".

At a national level the bi-annual, Science and Engineering Indicators Program Report includes a chapter on public attitudes toward and understanding of science and technology. This report provides a fairly extensive view of public awareness of S&T research, but does not investigate actual *participation* by the public. It investigates

- Public Interest in and Knowledge of S&T
- Public Understanding of S&T
- Public Attitudes Toward Scientific Research
- Public Image of the Science Community
- Public Confidence in Leadership of the Science Community
- Where Americans Get Information About S&T

There is no central body responsible for ensuring accountability (as in the UK or Norway). With regard to advisory groups, FACA requires all Federal advisory committee meetings to be open to allow the public to participate in the decision making process of the Government. There are exemptions, which may be invoked when individual privacy issues or proprietary information will be discussed.

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Appendix A Netherlands case studies

A.1 Genes on the menu debate

Brief History

Initiative	Genes on the Menu debate, Netherlands.
Parent Organisations	• Temporary Committee on Biotechnology and Food • Minister of Agriculture, Nature Management and Fisheries
Dates	2001
History	Government desire to broaden debate about biotechnology and food
Target Audience	Cabinet of the Dutch Government

Impetus for Establishing The Initiative

Starting Point	• The debate was part of a long-running discussion about biotechnology and food. However, the government tasked the organising committee to 'bypass the usual group of outspoken supports and opponents' and to 'seek out the common man' and the 'average consumer'. The commissioning government department wished the debate to cover wider themes as well as the usual food health issues, so environment, citizenship, consumerism and global food supply, were all themes for discussion • The exact assignment of the committee was – To increase and exchange information on biotechnology and food production on a large scale; – To offer possibilities for discussion and the forming of views on the use of modern biotechnology in food production, under which conditions and to which limits; – To record the results of the public debate and to present its own recommendations if desired.

Implementation Mechanisms

Meetings	Multiple meetings with public and interest groups
Partners	• Netherlands Nutrition Centre • Consumer & Biotechnology Foundation affiliated with the Consumer Organisation • *Stichting Weten*, a foundation aimed at increasing the dissemination of knowledge to the public. It acted as the project manager • An Institute for Communication Research
Events	• Press conference to launch the debate • Regular meetings with special interest groups
Other	• A 150-strong representative panel of the public was formed

Engagements	from which 25-strong groups discussed the substantive issues. • A secondary level of engagement was developed with 80 organisations and 200 schools. These were presented with a debate toolbox containing readers, background articles, videos, and guidance and response forms. • Schools could also host a special commissioned play illustrating the debate and issues. • A third level of engagement was pursued via a media campaign consisting of press ads, radio ads, magazine inserts and a public hearing
Other	• Committee web site featuring reports of the sub-group debates • A student-specific site • Schools could also host a special commissioned play illustrating the debate and issues.

Problems Encountered
The committee highlighted a Small budget and a tight schedule.

Membership of the temporary committee was mostly drawn from insiders, e.g. academic, industry representatives and worthies. No true lay representation on it despite its remit to engage with a lay audience.

Engaging the environmental and development organisations proved problematic despite planned efforts to do so. They challenged the committee's terms of debate by calling on it to record whether the public were for or against GM food rather than assessing the level of intensity of the public's arguments about the issue.

A video included in the debate tool kit drew particular criticism from these organisations. The content of it was a description of the Dutch biotechnology industry and was felt by the organisations to be biased.

Eventually the organisations withdrew support for the committee.

Lessons Learned
The use of a three-tier system of engagement produced a large sample of opinion. More than 8,000 pupils had seen the play performed, about 2,000 citizens and a minimum of 10,000 pupils have participated in an activity related to this debate. The Internet debate on the student site yielded about 1500 reactions.

An institute of communications research also studied the committee's effectiveness. Most people, 86 per cent had heard about the committee and the debate via a supermarket magazine insert. While traditional media attracted only 1.4 per cent outshone relatively by online communication which attracted 1.8 per cent.

Despite the breakdown in relations with the environmental organisations, it was wise of the committee to develop a parallel engagement of these groups while it conducted

its main task of engaging with the public. For nearly half the debate's life span there was positive engagement.

Feasibility Of Applying In Other Departments Or Across Government

Genes on the menu was a large consultation involving multiple methods of engagement with different groups within society. Thanks to its use of the multiple methods, it can address the issues of consultation-fatigue among the public.

However, it is probably in danger of being an unwieldy format for consultation if deployed below a national level or to assess an issue that is not generating national concerns.

A.2 Technika 10

Brief History

• Initiative	• Technika 10, Netherlands
• Parent Organisations	• Independent organisation
• Dates	• Commenced 1986
• History	• Within Europe, The Netherlands has the lowest level of girls attending technical high schools. It follows failure to attract this age group despite government construction of more attractive technical schools (Technikas) and a 'Choose Science' campaign.
• Target Audience	• Girls 10-12 years old considering which high school to choose

Impetus for Establishing The Initiative

Starting Point	A grass-roots approach to stimulate girls by making science and technology not only attractive but accessible

Implementation Mechanisms

Meetings	Regular club meetings in locations close to home that are associated with leisure-time. Learning is to be associated with creativity and pleasure not school.
Partners	Local authorities, youth centres, teachers and lecturers, women working in science and technology.
Events	Concept introduced by a National Network Day, bringing together interested parties from three towns.
Other engagements	Course are weekly running for six to ten weeks covering subjects such as material work, bike repair, photography, computers, electronics, Internet, energy.

Problems Encountered

Course are kept to six to ten weeks duration as participants and their parents couldn't see themselves concentrating for a year on a subject. The short courses lead to greater exposure to technology.

Lessons Learned

Course content has not fossilised. Internet was introduced in 1999 and, more recently, a solar energy course has been trailed.

While core principles are firmly adhered to – "women teach girls because girls taught by men can learn about technology but do no aspire to be technologists" – some operating principles are flexible. Clubs have started to take place in school premises and in school time. However, the organisers still encourage clubs to be founded in neighbourhood locations before exploiting educational resources

Feasibility of applying in other departments or across Government

With 450 women working with 10,00 girls in 300 locations across 80 cities, the Technika 10 model is successful. But it is a grass-roots success at a neighbourhood level. Whether a government department can mandate women in technology to set-up similar schemes in their own time is debatable.

Appendix B Norway case studies

B.1 Fast Salmon and Technoburgers

Brief History

• Initiative	• Fast Salmon and Technoburgers Consensus Conference
• Parent Organisations	• The National Committees for Research Ethics and The Biotechnology Advisory Board.
• Dates	• Commenced 1996
• History	• Where the introduction of complicated new technologies is concerned, elected representatives often seek expert advice. The numbers of experts being small, the same people tend to be consulted on a variety of issues. By virtue of their technological expertise, a small group of people consequently exercise great influence on social developments. Where interdisciplinary questions are concerned, moreover, it is difficult to decide which are the most relevant specialists.
• Target Audience	• Elected policy makers seeking public opinion

Impetus for Establishing The Initiative

Starting Point	The aims of the work were to give co-ordinated advice on genetically modified food to politicians, authorities and the food industry, to establish a forum for dialogue between experts and non-experts, and to contribute to an all-embracing and well-informed public discussion of the subject.

Implementation Mechanisms

Meetings	The event was a four day 'lay person' consensus conference that was preceded by two preparatory meetings
Partners	• The lay panel was advised in its work by a professor of educational research • An expert panel was also assembled for the lay panel to interact with.
Other	The conference generated substantial engagement with the media

Problems Encountered

Invitations to apply for membership of the lay panel were advertised in newspapers and subsequent applications were assessed according to the following subjective criteria

- degree of attachment to the food and science sector
- demography

- location

Once 40 suitable candidates had been identified there was a 'partly random draw' to pick members.

While this subjective process did produce a balanced panel, it does open the organisers to criticism of 'picking' membership.

Lessons Learned
Consensus conference issues should politically topical, but should not have been so thoroughly debated that the parties have settled their standpoints. Problem areas which are suitable for layperson's conferences are typically ones over which opinions are divided and which raise normative questions which concern large sections of society.

The model for the consensus conference was taken from the experiences of the Danish Board of Technology.

Use of a professor of educational research as a facilitator was helpful. His role was

- be neutral where the theme of the conference was concerned
- ensure that the lay members had good working conditions
- ensure that they panel functioned well as a group
- ensure participation in the panel on an equal footing.

The lay panel had influence in the assembly of the expert panel. It gave instructions as to the kind of expertise it wished to interact with. This may help balance criticism that the panel was handpicked.

Media coverage went beyond the form of news reports and also generated a series of longer documentaries about the conference

Feasibility Of Applying In Other Departments Or Across Government
The strength of the original Danish consensus conference concept is witnessed by the success of the Fast Salmon and Technoburger's conference in Norway. Its strength is in addressing the criticism levied at science policy that it is the preserve of a coterie. Not only do the consensus conferences engage the public but also they allow the public to decide in the nature of expert witness presented to them.

However, the media impact of conferences may be dulled by frequent repetitions. The consensus conference has a role as very useful tool in the science communicator's toolbox, but one that should be used only for major occasions

RCN now runs a number of very successful schemes, including *Nysgjerrigper* and the National Research Week, and the commitment and involvement of all Divisions at the RCN in the new national website, *forskning.no* is very encouraging.

B.2 "Nysgjerrigper"

Appendix C United Kingdom case studies

C.1 BBSRC Public Online Consultation

Brief History

• Initiative	• Public Online Consultations, UK
• Parent Organisations	• Biotechnology & Biological Sciences Research Council
• Dates	• Online consultations date back to early 2000
• History	• BBSRC has a history of innovation when it comes to consultation. In 1994 it was the first UK council to organise a consensus conference
• Target Audience	• General public and specialists

Impetus for Establishing The Initiative

Starting Point	• Part of the policy to promote public debate about advances in biological research and public input into research programme planning. • All new funding initiatives by BBSRC are announced through a statement of intent, which is accompanied by a public consultation through the BBSRC web site.

Implementation Mechanisms

Events	Public Online Consultation is not a stand-alone method. 'Town Meetings' are also held in various locations
Other engagements	• Each topic for consultation has a separate micro-site within the greater BBSRC web site. The site can also stand-alone logically if entered directly. • Online consultations occur at a general and topic level. Within the introduction to a topic there is an option to comment more generally about bio-sciences. • Detailed comment about a topic can be added via a Web-form. • There is a clear explanation of how the comment will be processed and published. • The micro-site includes an email to an actual team member to facilitate greater involvement. • Consultation periods are clearly indicated and flagged if closed. Some last about a month.

Problems Encountered

The consultation topics are prescribed by the BBSRC. While a general bio-sciences topic is open for discussion there is no free-form flak forum that can be used as a

lightening rod to attract very general comment from those who are not directly associated with bio-sciences

Lessons Learned

Good use of standard format for consultation sites. Good use of Web forms to capture comment. Well integrated with other media for consultation.

Feasibility Of Applying In Other Departments Or Across Government

BBSRC's web site seems well set to field and handle a volume of consultations per year. Regular throughput of consultation topics means there is a higher chance of someone somewhere wanting to comment on a topic.

C.2 People's Panel

Brief History

• Initiative	• People's Panel, UK
• Parent Organisation	• UK Government's Cabinet Office
• Dates	• 1998 – 2002
• Target Audience	• Government departments and agencies

Impetus for Establishing The Initiative

Starting Point	• To demonstrate the value of establishing the views of citizens and the users of public services in policy-making and service delivery. • Part of the Modernising Government Agenda • The first national panel for assessing attitudes to government

Implementation Mechanisms

Partners	• MORI – a market research company • School of Public Policy, Birmingham University
Events	People's Panel discussed at the Panels in Practice conference organised by the Cabinet Office, Local Government Association and Local Government Information Unit.
Other engagements	The Parliamentary Select Committee on Public Administration carried out an inquiry into innovations in public participation. This involved scrutinising the People's Panel
Other	• Panel consisted of 5,000 people, representative of the UK population, surveyed using telephone market research methods. • Sample Finding: People's Panel research commissioned by the Human Genetics Commission found broad support for the benefits offered by human genetic research, but some misgivings about the regulation of such developments in the future

Problems Encountered

During our interviews, some respondents commented that there was a feeling that members of the Panel became 'cynical' about the way in which surveys were carried out. The market research-led approach to questioning led some to feel that, while a particular issue may be valid for debate, the "right questions" were not being asked.

Lessons Learned

The Panel was abolished early in 2002. The improvement by government departments and agencies in their efforts to consult customers and to assess satisfaction with services was cited as the reason. Similar panel-based research will

be carried out at departmental or agency level e.g. Department of Health's Through the Patient's Eyes survey.

An independent final evaluation of the Panel reported the following strengths and weaknesses.

Strengths include:

- The project has produced a number of useful research reports
- It has stimulated consumer research by providing a vehicle for use by departments and agencies which was felt to be quick and easy to use
- It demonstrates the government's intention to better engage with citizens
- It has provided a high level feel for public opinion on a number of issues

Weaknesses include:

- A lack of clarity on the sample design and size
- A need for more extensive qualifying information on the quality of data
- Perceptions that the newsletters reported the findings in a superficial way
- The relatively high level of attrition
- Some saw the Panel as symbolic rather than genuinely useful

(Many of these weaknesses can be found in any panel survey and thus throw into greater highlight the primary benefit of the panel.)

With any panel that aspires to be a nationally representative sample, the number of people who must be contacted, persuaded to be enrolled in the panel and then contacted with specific questions is huge. Within the UK, up to 30,000 people need to be contacted annually to maintain a panel from which 1,000 statistically representative members can be drawn for polling

The ultimate lesson is that it has exposed policy makers to end user opinion and given them practice of gathering such views.

Feasibility Of Applying In Other Departments Or Across Government
The ability to produce a snapshot of opinion from a representative sample of the population can assist policy makers in understanding the end user or voters attitude to an issue. However, a rolling three-year comparative survey allowed the snapshots to be compared and progress to be identified and examined.

C.3 Feed the Debate

Brief History

• Initiative	• Feed The Debate
• Parent Organisations	• Foresight Programme, Office of Science and Technology
• Dates	• Mid 2000 through to Mid 2002
• History	• Public consultation seeking consumer opinions regarding the future application of technologies such as GM and smart labelling to food.
• Target Audience	• Informing science community as to consumer attitudes and methods for ascertaining them

Impetus for Establishing The Initiative

Starting Point	• Foresight is a nine-year old programme that aims to increase UK exploitation of science. The Foresight programme will identify potential opportunities for the economy or society from new science and technologies, and actions to help realise those opportunities. • Feed The Debate was part of a large programme examining the food chain. • In particular it aimed to engage with the issue of emergence of significant consumer concern after food applications of technology have been developed, e.g. GM foods. It raised the question: can consumer concerns be raised before investment in the technology and product is made? • An additional reason for the programme was to assess the utility of consulting consumers about technologies before investment in them started.

Implementation Mechanisms

Meetings	Consumer focus groups that assessed product/benefit rather than technology/feature issue
Events	Deliberative conferences between lay participants and experts.
Other engagements	• Internet consultation • Postal survey

Problems Encountered

Focus Groups

- Required two trial meetings in order to tune product definitions and questions.

Deliberative conferences

- Featured star experts who were all pro-technology.
- Consumes more resources than standard focus group

Internet Consultation

- Self-selecting users
- No moderation of postings leaves room for manipulation by groups.

Postal Questionnaire

- Required response-chasing
- Involved a separate questionnaire for each product
- Provided only a snapshot of opinion, no ability to track changing responses

Lessons Learned

Focus Groups

- Members of the public do have the capacity toe generate assessments 'from a standing start

Deliberative conferences

- Could benefit from inclusion of 'anti' experts
- Engages decision-makers interactively with consumer opinion rather than reviewing the passive reported opinions gathered from the focus group.

Internet Consultation

- Online promotion of the site more effective than promotion via print media
- Site design avoided 'Science and Society' clichés and used cartoon-style illustration to make it attractive

Postal Questionnaire

- Include a feedback system that would allow respondents to learn more and re-evaluate their responses

Overall Findings

- It is possible to engage the public using a range of methodologies before major investment in new technology and products.
- The controlling Task Force included a professional consumer advocate, a director of a consumer council. Including someone with experience of regular and systematic consumer consultation, market research and consumer representation helps.

Feasibility Of Applying In Other Departments Or Across Government

Foresight panel covers many science sectors and therefore can gather knowledge and generate significant experience and economies in the techniques of anticipatory public engagement

C.4 MRC Consumer Liaison Group

Brief History

• Initiative	• Consumer Liaison Group
• Parent Organisations	• Medical Research Council
• Dates	• Established March 2000
• Target Audience	• Enlighten MRC as to consumer opinion

Impetus for Establishing The Initiative

Starting Point	• To advise MRC on ways of promoting effective and appropriate • Consumer involvement in its activities. • To ensure MRC is aware of and able to respond to consumer interests and concerns about research. • CLG is constituted to complement existing channels for taking consumer views into account and to give in-depth consideration and dedicated time to considering topics that would benefit from group discussion.

Implementation Mechanisms

Meetings	No details are given as to when and how often the CLG meets
Partners	• The group consists of the chairman of the MRC and 14 members drawn from two groups: the medical sector and lay people. • Medical Sector members include a parliamentary researcher, a former manager of a pharmaceutical company, a nurse and a psychologist. • Lay members have backgrounds in engineering, media and teaching • A Department of Health observer is also a member
Events	No details are given on CLG involvement with external events
Other engagements	• Has commented on corporate publications and on patient information leaflets submitted as part of proposals for clinical trials • Contributed to MRC responses to Government consultation documents; • Attended MRC board strategy meetings • Participated in the Lay Group of the review of autism research.

Lessons Learned

Rather than being a public-face of the MRC to the general public, the CLG is an internal body. While it does provide consultation to MRC activities, it is not soliciting consumer comment and input beyond that of the 'consumers' who constitute it.
This is no criticism, as it is very well embedded into the activities of the MRC, contributing to issues ranging from strategy to actual research.

The topics it consults on range from some that are very consumer-orientated, the utility of patient information leaflets, to some that are removed from the end-user, e.g. government consultation. This may overlap with existing lines of communication between the MRC and Government.

Feasibility Of Applying In Other Departments Or Across Government
In order for such internal representation of consumer opinion to be effective, the receiving organisation needs to be large enough to provide multiple forums for the opinion. The maintenance of a 15-member panel may also be costly.

Appendix D USA case studies

D.1 Tribal Science Council

Brief History

Initiative	• Tribal Science Council, US.
Parent Organisations	• Environmental Protection Agency • Native American Tribes
Dates	Initiative planned Mid 1999, kick off conference held late 2001
Target Audience	Science community and native Americans involved in science, in particular environmental managers

Impetus For Establishing The Initiative

Starting Point	The council's aim is to provide a forum for interaction between Tribal and EPA representatives of mutual benefit and responsibility to work collaboratively on environmental scientific issues in Indian country: • research • monitoring • modelling • information • technology • training The council also supports the subsistence, cultural and ceremonial lifestyles of Indians and the safe use and availability of a healthy environment for present and future generations. The relationship between the tribes and EPA in the Tribal Science Council will not substitute for, but rather augment the government-to-government relationship between EPA and tribal governments.

Implementation Mechanisms

Partners	EPA and tribes
Events?	The council is event-driven using conferences to bring together the partners.
Other	A Web site exists as a sub-domain of the larger EPA site.

Lessons Learned

The council is an interesting approach to reaching out to a group within society that is defined not by its scientific or anti-scientific interest (or lack of it) but by race and legislation. As there is a complicated political and legislative relationship between the Tribes and the US government, the council's boundaries have been explicitly stated.

From a scientific point o f view, the Council has created a specific programme designed to fund research projects addressing specific issues faced by Native

American tribes. "Lifestyle and Cultural Practices of Tribal Populations and Risks from Toxic Substances in the Environment". The programme invites applicants to demonstrate how 'traditional' (as opposed to 'Western') science can solve some of the problems faced. Potentially this could even have an impact on how mainstream research approaches these problems.

Feasibility Of Applying In Other Departments Or Across Government
Due to the legislative nature of the relationship between federal government and tribes the council model is probably not applicable to all other situations, but may have potential in countries where special consideration is given to indigenous peoples and where scientific communities wish to interact with racial groups to a greater degree.

A.1 NIH (COPR) Council of Public Representatives

Appendix E List of interviewees/contacts

UK

Organisation	Contact Name	URL/email
OST/ PUSET	Barbara Knowles	Barbara.Knowles@dti.gsi.gov.uk
	Prue Backway	Prue.Backway@dti.gsi.gov.uk
Cabinet Office	James Airey (Peoples Panel)	
Royal Society	Daisy Hearn (Science in Society officer)	daisy.hearn@royalsoc.ac.uk
British Association for the Advancement of Science	Jill Nelson	Jill.Nelson@the-ba.net
COPUS	Natasha Martineau (Manager)	natasha.martineau@copus.org.uk
BBSRC	Chloe Kembrey	chloe.kembery@bbsrc.ac.uk
EPSRC	Geoff Moore/ Kerry Leslie	kerry.leslie@epsrc.ac.uk
NERC	Sheila Anderson	sand@nerc.ac.uk

USA

Organisation	Contact Name	
EPA	Patricia Bonner (public participation)	bonner.patricia@epa.gov
	Jose Aguto (Tribal Office)	aguto.jose@epa.gov
	Claudia Walters (Tribal Science Council)	walters.claudia@epa.gov
NAS- OPUS	Debbie Stine	dstine@nas.edu
NSF- OPLA	Mary Hanson/ Lynne Boutchyard	iboutchy@nsf.gov
AAAS	Scott Hauger	shauger@aaas.org
DOE (Science Office)	Doris Martin	doris.martin@science.doe.gov

Norway

Organisation	Contact Name	
RCN	Paal Almo	
	Liv Mellum	lm@forskningsradet.no
Tecknologiradet (Norwegain Board of Technology)	Tore Tennoe	tore.tennoe@teknologiradet.no

Netherlands

Organisation	Contact Name	
Weten Foundation	Ronald Smallenburg	R.Smallenburg@Weten.nl

	Janneke Voltman	J.Voltman@Weten.nl
Rathenau	Rinie van Est	Q.vanEst@Rathenau.nl
AWT (A&T Advisory Panel)	Veronica Timmerhaus	timmerhues@awt.nl
NWO	Hein Meijers	Hein.Meijers@NWO.NL
MinOCW	YvonneSchaap	
KNAW	Karen Youngblood	

Appendix F Links to data sources and organisations in the four countries

Country	Title	Link	Comment
NL	The Weten Foundation for Science Communication	http://www.weten.nl	Site is entirely in Dutch
NL	Rathenau Instituut-people	http://www.rathenau.nl	The Rathenau Institute is responsible for forsight and public engagement in the Netherlands
NL	rathenau cloning report	http://www.itas.fzk.de/deu/tadn/tadn001/tagungsbericht1.htm	Report on the Dutch Consensus Conference on Cloning
NL	The Rathenau Institute's approach to participatory TA	http://www.itas.fzk.de/deu/tadn/tadn003/vest00a.htm	Paper describing the Rathenau's work on public participation
NL	Science White Paper - 'Boeiend, Betrouwbaar en Belangrijk'	http://www.minocw.nl/wetenschap/wtc/0.html.	OCW white paper 'Boeiend, Betrouwbaar en Belangrijk' (3-B's):
NL	General Secretariat Dutch Scienceshops / home...	http://www.ssc.unimaas.nl/LSW/indexuk.HTM	Information on Science Shops (in English)

Country	Title	Link	Comment
Norway	The Research Council of Norway: Main page	http://www.rcn.no/english/	Information on RCN (in English)
Norway	The Norwegian Research Week	http://www.forskningsdagene.com/om/english.html	Norwegian Research Week (information in English)
Norway	Nysgjerrigper	http://www.rcn.no/fag/andre/nysgjerrigper/index.eng2.html	Nysgjerrigper Project (information in English)
Norway	Teknologirådet	http://www.teknologiradet.no/html/429.htm	Norwegian Technology Board (information in English)
Norway	The National Committees for Research Ethics in Norway	http://www.etikkom.no/E/index.htm	(information in English)

Norway	The National Committee for Research Ethics in Science and Technology (NENT)	http://www.etikkom.no/E/nent.htm	(information in English)
Norway	Fast salmon and technoburgers (1996)	http://www.etikkom.no/NENT/fast.htm	1996 Laymen's Consensus Conference on the genetic modification of food
Norway	Follow-up to 'Fast Salmon' (2000)	http://www.etikkom.no/E/gmf2.htm	Final report from the Laymen's Consensus Conference on Genetically Modified Food Products, November 2000.
Norway	Becoming Visible (1995)	http://www.uit.no/ssweb/dok_series/n02_index.htm	Report from a 1993 conference on indigenous people participation in political process.
Norway	forskning.no	http://www.forskning.no/	Website promoting Norwegian research (in Norwegian only)

Country	Title	Link	Comment
UK	COPUS	www.copus.org.uk	Formerly the Committee on Public Understanding of Science, site contains links to some useful publications on attempts to increase public engagement
UK	Service First: The People's Panel	http://www.cabinet-office.gov.uk/servicefirst/index/pphome.htm	Information on the Peoples Panel - now defunct
UK	BBSRC - Science and society - Bioscience Research and the Public	http://www.bbsrc.ac.uk/society/research/consultation.html	Links to all BBSRC information on public consultation
UK	Consumer Liaison Group	http://www.mrc.ac.uk/index/public_interest/public-consumer_liaison_group.htm	MRC Consumer Liaison Group
UK	Do we trust today's scientists?	http://www.royalsoc.ac.uk/scienceinsociety/data/forum/index.html	The Royal Society's National Forum - links to report on conference

UK	Foresight Food and Crops 'Feed the Debate"	http://www.foresight.gov.uk/servlet/Controller?ver=208&userid=1	Report from the Task Force of Food and Crops - describes techniques used, including public conference
UK	Food Standards Agency - Involving Consumers in Policy Making	http://archive.food.gov.uk/consultations/consumer.htm	NGO responsible for Food Safety, discusses ways in which they can engage consumers -inviting suggestions from consumers themselves
UK	Publications	http://www.esrc.ac.uk/esrccontent/connect/indexpub.asp	Includes links to publications designed to help researchers communicate their work to the wider community
UK	House of Commons - Public Administration – Sixth Report (2001)	http://www.publications.parliament.uk/pa/cm200001/cmselect/cmpubadm/373/37302.htm	House of Commons Select Committee on Public Adminstration – Sixth Report
UK	PUSET	http://www.dti.gov.uk/ost/ostbusiness/puset/puset.htm	Describes the work of the PUSET group in OST
UK	White Paper Excellence and Opportunity – a science and innovation policy for the 21st century	http://www.dti.gov.uk/ost/aboutost/dtiwhite/chap4.html	Chapter of the White Paper dealing with "confident consumers" – increasing trust and support from the public
UK	House of Lords – Science and Technology – Thi…	http://www.publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm	House of Lords Science and Technology Committee – Third Report
UK	ukonline.gov.uk: CitizenSpace – Consultations…	http://www.ukonline.gov.uk/CitizenSpace/CSConsultationList/0,1142,~ZnN%2BZW5%2Bfn5vcGVufn5wdGl0fjJ%2Bfg%3D%3D~511bdb1500ef37d69cf6c883120a6c4b6ffdb256,00.html	UK Government Consultations Online

UK	AQA GCE AS Science for Public Understanding	http://www.aqa.org.uk/qual/gceasonly/sci.html	Information on the new AS level examination on "Science for Public Understanding'
UK	Guidelines 2000: Scientific Advice and Policy Making	http://www.dti.gov.uk/ost/aboutost/guidelines.htm	UK Guidelines on obtaining Scientific Advice
UK	Interdepartmental Liaison Group on Risk Assessment	http://www.hse.gov.uk/dst/ilgra/riskcomm.htm	ILGRA advises Government Departments on Risk Communication
UK	Govt Response to Science and Society	http://www2.dti.gov.uk/scienceind/report3response.htm	The Government's response to the House of Lords Report
UK	British Association for the Advancement of Science	http://www.the-ba.net/the-ba/page.asp	BA participates in COPUS as well as conducting its own work on public involvement
UK	The Royal Society –	http://www.royalsociety.org/	Royal Society hosts COPUS, and carries out various education and engagement activities

Country	Title	Link	Comment
USA	Unlocking Our Future: Toward a New National Science Policy -	http://www.house.gov/science/science_policy_report.htm	A Report to Congress by the House Committee on Science - 1998
USA	Office on Public Understanding of Science	http://www4.nationalacademies.org/opus/home.nsf	OPUS is the NAS body responsible for public awareness and education
USA	EPA Public Involvement Homepage	http://www.epa.gov/publicinvolvement/	Recently reorganised to collect all relevant information in one place. Includes tools for public involvement, case studies and the requirements for public participation.
USA	EPA-XL Publications and Guidance	http://www.epa.gov/projectxl/guidexl.htm	Includes link to "Stakeholder Involvement: A Guide for Project Sponsors and Stakeholder (Helpful ideas and tools for successful interactions) (March 1999)
USA	Tribal Science	http://www.epa.gov/osp/tribes.htm	Tribal Science Council (EPA)
USA	Lifestyle and Cultural Practices of Tribal Populations and Risks from Toxic Substances in the Environment	http://es.epa.gov/ncer/rfa/current/02trib_risk.html	Programme operated by EPA

USA	The NIH Offices of Public Liaison	http://public-council.nih.gov	Information about the NIH Public Liaison Offices
USA	NIH Council of Public Representatives	http://public-council.nih.gov/COPR.asp	Information about the NIH COPR
USA	State Official's Guide to Sound Science	http://stars.csg.org/reports/1999/science_menu.htm	Published by the Council of State Governments in 1999, also deals with issues of public perception
USA	OEM Public Participation Policy	http://www.em.doe.gov/public/doepub.html	Policy document of the Office of Environmental Management at the DoE
USA	DOE Good Practice Guides	http://www.er.doe.gov/SC-80/sc-82/gpguides.html	Includes links to Good Practice in Public Participation
USA	Public Participation in Decision Making	http://www.nae.edu/nae/techlithome.nsf/weblinks/KGRG-58GTCN?OpenDocument	Links to other resources on public participation
USA	Scientific Opportunities and Public Needs - Improving Priority Setting and Public Input at the National Institutes of Health	http://www.nap.edu/readingroom/books/nih/	Discusses mechanisms for public participation
USA	Communicating the Future: Best Practices for Communication of Science and Technology to the Public	http://www.nist.gov/public_affairs/bestpractices/practices.html	Conference held March 6-8, 2002, at the National Institute of Standards and Technology
USA	Defense Programs Pollution Prevention Strategic Plan	http://www.sc.doe.gov/epic/DOCS/17.txt	Discusses public involvement and stakeholders
USA	Basic Energy Sciences Advisory Committee	http://www.sc.doe.gov/production/bes/besac/BESAC.htm	BESAC provides independent advice to the DoE regarding S&T issues that arise in the planning and implementation of the Basic Energy Sciences program
USA	Office of Science Education	http://www.scied.science.doe.gov/scied/sci_ed.htm	Science Education Programs at the DoE's Office of Science
USA	Office of Science	http://www.science.doe.gov/	Office of Science at the Us Department of Energy

USA	The OTA Legacy	http://www.wws.princeton.edu/~ota/	Paper describing the history of the (now disbanded) Office of Technology Assessment in the USA
USA	Media Relations	http://www.nsf.gov/od/lpa/news/media/nlaault r.htm	Open Letter to Scientists and Engineers by Neal. Lane Director, National Science Foundation (1997)