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International Comparison

of Public Dialogue on Science and Technology

BIS
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International Comparison of Public Dialogue on Science and Technology

Executive Summary

Public involvement in how science and technologies are developed and regulated differs markedly between different countries. There is now a wide range of approaches to supporting dialogue on science and technology issues which impact government policy. From the Danish Board of Technology, which has a significant permanent staff and reports to the parliament and pioneers the use of consensus conferences; to the Beijing Institute of Technology which adopts a more technology-led approach; and the Office of Science and Technology Policy at the White House which focuses upon transparency.

This report examines the practice of national-level two-way dialogue on science and technology in eight countries including the UK, and compares these countries across certain key features in public dialogue and engagement. While we recognise the impact of the different socio-political structures in each country, our research indicates that countries with permanent, independent technology assessment (TA) institutions such as Denmark and the Netherlands have a strong basis for embedding public dialogue and participation as a core element in political considerations on the impacts, risks and priorities of science and technology (S&T) development. However, while other countries such as France, the US and Germany may lack such structures and/or a clear government-level emphasis on using public dialogue in S&T policy-making, we found evidence of a wide range of bottom-up dialogue activities driven by academics, research institutes and nongovernmental organisations.

In this context, the UK has benefited from relatively high levels of investment and interest in national level S&T dialogue activities, by a wide variety of actors from the political, scientific, academic and civic fields. While dialogue in the UK is increasingly embedded in the S&T field, its policy impact and the scale of public involvement are limited. There is also a sense that the UK sector in recent years has been strongly influenced by science communicators, social research and consensus builders. There is therefore an opportunity now to place S&T dialogue into the wider context of government transparency and openness. There is also an opportunity to explore more informal citizen-led dialogic processes and focus to a greater extent on social media.

Based on the comparative analysis, we have identified some key recommendations for improving public dialogue in policy-making involving science and technology in the UK. These include:

- Building on the work of Sciencewise-ERC to create a government-backed but independent national S&T engagement institution (in order to further capture best practice, develop resource-efficient solutions, professionalise S&T engagement, and create a link between politicians and the public on S&T matters).
- Framing S&T dialogue as supporting transparency and the opening-up of policy processes.
- Developing more cost effective bottom-up methodologies for dialogue.
- Supporting direct dialogue between government officials and the public.
- Making better use of social media.
- Strengthening international collaboration.
- Statutory commitment to listening to public opinion.

We have also identified some areas that would benefit from further research and exploration.

Acknowledgments

We would like to thank all those who contributed to this research and informed our thinking during the process, including: Alan Irwin, Arie Rip, Armin Grunwald, Clare Marris, David Guston, Jan Staman, Jean-Pierre Alix, Lars Klüver, Naoyuki Mikami, Norbert Steinhaus, Philippe Galiay, Pierre Delvenne, Pierre-Benoit Joly, Richard Sclove, Sergio Bellucci, Simon Joss and Tadashi Kobayashi. We are especially grateful to Robert Doubleday and Amy Mount for their support and input in helping us to develop our analysis. Finally, thanks to Alan Mercer and Sciencewise-ERC for initiating and supporting this research project.

Contents

Executive Summary 2
Acknowledgments 4
Contents 5
List of Tables and Figures 7

1. Introduction 8
2. Methodology 9
3. International Comparison – *Stimulating Debate* 11

4. Country-by-Country Analysis 15
    - Denmark 15
    - France 19
    - Germany 23
    - Japan 26
    - Netherlands 29
    - Switzerland 33
    - United Kingdom 37
    - United States 41
    - European Approaches 45

5. Overview 47
    - National Context and Political Culture 47
    - Policy Impact 50
    - Methodology and Key Actors 51
    - The Media 53
    - Social Media and Online Tools 54

6. Recommendations 56
    - 1. Create a government-backed but independent national S&T engagement institution 57
        - 1.1 Building on the work of Sciencewise-ERC in creating institutional memory to capture experience and best practice 58
        - 1.2 Innovation 59
        - 1.3 Creating and professionalising S&T engagement 59

1.4 Providing a national focus for S&T engagement 60
1.5 Creating a parliamentary link between elected representatives and the public on S&T matters 60
2. Other Opportunities 61
2.1 Supporting direct dialogue between government officials and the public 61
2.2 Openness and transparency 61
2.3 Make better use of social media 62
2.4 Strengthen international collaboration 63
2.5 Investment and innovation 63
2.6 Statutory commitment 64
2.7 Future research 64

References 65

Appendix: Third Generation Engagement (3GE) 71

List of tables and figures

List of tables

Table 1: Public dialogue on science and technology in a selection of countries – Key Metrics 12
Table 2: 'New GM Crops – New Debate' 18
Table 3: 'Le Grenelle Environnement' 22
Table 4: 'Futures of green genetic engineering' 25
Table 5: GM crops in Hokkaido 28
Table 6: 'Small technology - Big consequences' 31
Table 7: 'Nanotechnology, Health and the Environment' 35
Table 8: ‘Human Enhancement through Nanotechnology’ 44
Table 9: ‘Meeting of Minds’ 46

List of figures

Figure 1: Public dialogue on science and technology in a selection of countries 13
Figure 2: Third Generation Engagement 74

1. Introduction

Due to the limited scope of the research, this report should not be viewed as a comprehensive analysis of international public dialogue, but as providing an initial overview of structures and initiatives in each country as well as a projection of how each country scores against a series of metrics (see Table 1). We have included country-by-country analyses that summarise the current characteristics of public dialogue delivery. An overview of general research findings then follows before we conclude with recommendations for Sciencewise-ERC.

While we focus on national-level initiatives, we acknowledge the wide variety of activities that focus on local/regional issues which may function differently from engagement around national policies, but have important implications on how science and technology research and development is managed and perceived. We recognise the difficulty of 'classifying' approaches to public dialogue on S&T policy across countries due to differences in social and cultural contexts, the plethora of actors, levels (upstream/downstream) and methods and objectives involved. Nevertheless, we believe this report offers a useful examination of current international public dialogue practice in the field of S&T. And perhaps most importantly for Sciencewise-ERC, it places UK practice in an international context.

2. Methodology

Data was captured using the following methods:

Desk research

Explorative research analysing a wide variety of published sources on public dialogue in Denmark, France, Germany, Japan, the Netherlands, Switzerland, the UK and the United States, as well as in the European and international context. Research focused specifically, but not exclusively, on public dialogue implemented in the last decade at the national and international level.

Qualitative Interviews

We conducted qualitative interviews with the following key actors:

Professor Alan Irwin, Dean of Research, Copenhagen Business School, Denmark

Professor Arie Rip, Professor of Philosophy of Science and Technology, University of Twente, Netherlands

Professor Armin Grunwald, Director, Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe Institute of Technology, Germany

Professor David Guston, Director, Center for Nanotechnology in Society, Arizona State University, United States

Jan Staman, Director, Rathenau Institute, Netherlands

Dr Jean-Pierre Alix, Research Engineer, National Centre for Scientific Research (CNRS), France

Lars Klüver, Director, Danish Board of Technology

Dr Naoyuki Mikami, Associate Professor in Science Communication, Centre for Research and Development in Higher Education, Hokkaido University, Japan

Norbert Steinhaus, Project Coordinator & Editor, Bonn Science Shop, Germany

Philippe Galiay, Governance and Ethics Unit, Science, Economy and Society Directorate, DG Research, European Commission

Dr Pierre Delvenne, FNRS Post-doctoral Researcher, Scientific and Public Involvement in Risk Allocations Laboratory (SPIRAL), University of Liege, Belgium

Dr Pierre-Benoit Joly, Senior Research Fellow, National Institute of Agricultural Research (INRA), France

Dr Richard Sclove, Founder and Senior Fellow, Loka Institute, United States

Dr Sergio Bellucci, Director, Centre for Technology Assessment (TA-SWISS), Switzerland

Professor Simon Joss, Director of Research, School of Social Sciences, Humanities and Languages, University of Westminster

Professor Tadashi Kobayashi, Centre for the Study of Communication-Design, Osaka University, Japan (response by email)

Workshop

We organised a workshop together with Dr Robert Doubleday from the University of Cambridge to further develop our analysis and the comparative representation based on our research.

3. International Comparison - *Stimulating Debate*

In Table 1 we have scored each country from 0 to 10 using eight metrics: *Investment in Engagement; Embeddedness; Impact; Scale of Participation; Breadth of Participation; Transparency; Formal Engagement; Informal Engagement*. These metrics were developed after in-depth discussion with public dialogue experts on how best to measure public dialogue processes. The scores for each country are based on the desk research and qualitative interviews, and they were sent back to all the interviewees for review and comment. Each score should be viewed as a projection only that supports the synthesis of research data summarised in the Country-by-Country analysis sections.

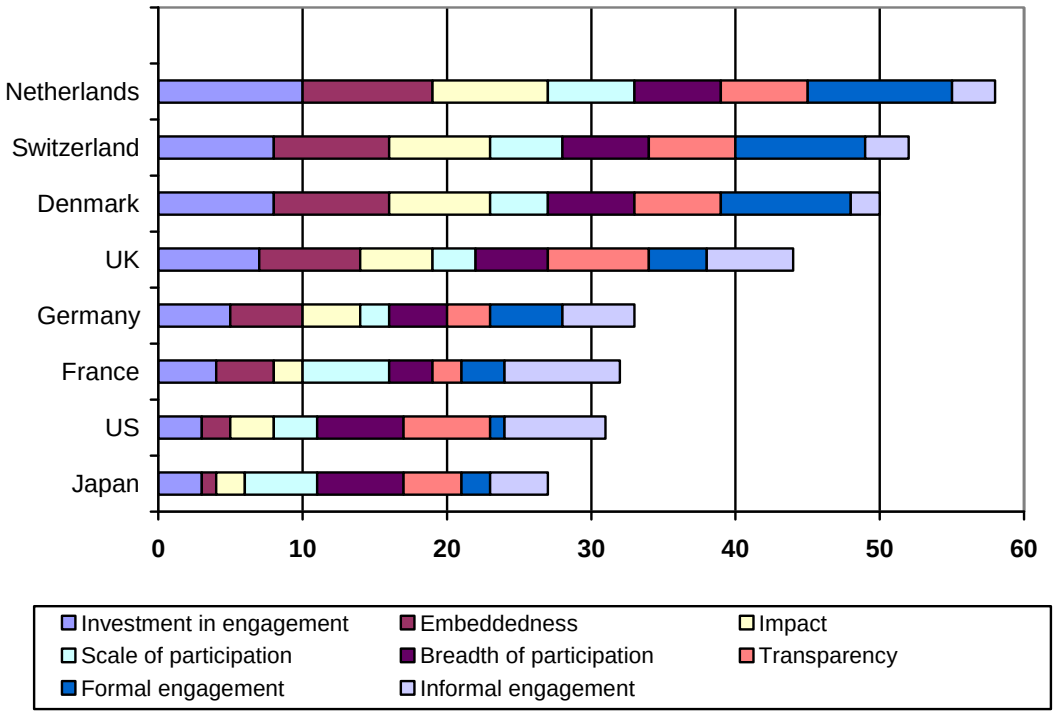
Numerous difficulties exist when attempting to compare public dialogue exercises internationally. Considerations include the current national socio-political and cultural context, differences in structural organisation as well as historical democratic traditions. Applying a rigid set of metrics across borders without adjusting for differing socio-political and economic factors limits their value. In addition, a 'good practice' approach to analysing public dialogue is a naturally difficult concept, as each application of each method will have strengths and weaknesses that are entirely context-dependent. The field is complex: there is a variety of avenues, levels and types of engagement, and one has to carefully discern the function of engagement in relation to the particular sector and level at which it takes place.

Despite these limitations, we believe Table 1 and Figure 1 offer a useful characterisation of each country's public dialogue provision at present as far as the narrow scope of our research allows, while stimulating cross-border debate and discussion at an international level.

Table 1: Public dialogue on science and technology in a selection of countries – Key Metrics

Metrics	Denmark	France	Germany	Japan	Netherlands	Switzerland	United Kingdom	United States
1. Investment in engagement	8	4	5	3	10	8	7	3
2. Embeddedness	8	4	5	1	9	8	7	2
3. Impact	7	2	4	2	8	7	5	3
4. Scale of participation	4	6	2	5	6	5	3	3
5. Breadth of participation	6	3	4	6	6	6	5	6
6. Transparency	6	2	3	4	6	6	7	6
7. Formal engagement	9	3	5	2	10	9	4	1
8. Informal engagement	2	8	5	4	3	3	6	7
Total	50	32	33	27	58	52	44	31
Position	3	6	5	8	1	2	4	7

Figure 1: Public dialogue on science and technology in a selection of countries



Key to Metrics:

1. Investment in engagement: How much resources are invested in public dialogue and engagement, both by government and by private, civil society and academic actors?
2. Embeddedness: How embedded is public engagement in national structures and institutions for policy-making on science and technology?
3. Impact: How large is the impact of public engagement on policy-making or S&T research and development?
4. Scale of participation: What is the scale of population engaged through participatory processes?
5. Breadth of participation: How representative is public participation on science and technology, beyond certain stakeholder groups? Are different parts of the population effectively engaged?
6. Transparency: How transparent and open are participatory processes as well as their impacts and consequences?

7. Formal engagement: How successful[1] is formal engagement, ie engagement organised/commissioned by government departments/agencies with clear links to policy processes?
8. Informal engagement: How successful is informal engagement, ie engagement which takes place outside government structures and policy processes, organised by actors such as civil society organisations or academia?

[1] We use 'successful' as a broad term to cover issues such as the commitment, time and resources given to organising engagement, the quality and transparency of the processes, their reach, levels of deliberation, impact in terms of informing policy-makers and scientists (including informing policy directly) and uncovering and exploring underlying values, assumptions and concerns, as well as follow-up and evaluation.

4. Country-by-Country Analysis

Denmark

Investment in engagement: 8
Embeddedness: 8
Impact: 7
Scale of participation: 4
Breadth of participation: 6
Transparency: 6
Formal engagement: 9
Informal engagement: 2

Denmark is often cited as the exemplar of public dialogue practice, as the strongly established tradition of dialogue and structures for participation are seen as resulting in the public having greater influence over decision-making. This commitment to public dialogue is seen as a crucial aspect of Danish democracy, and consensus seeking is part of the political culture in marked contrast to many other countries. Although engagement initiated by government departments often tends to be expert and stakeholder-based, at the regional/local level it is broader and more systematic and regional governments often act as mediators in policy-making.

In the field of S&T policy, Denmark has a strong, parliament-linked but independent TA institution, the Danish Board of Technology. The mission of the Board is to promote ongoing discussion about technology, to evaluate technology and to advise the Danish Parliament and other governmental bodies on S&T related matters.[2] The use of public dialogue is seen as a core aspect of this mission. The Board receives a government grant of around 12.5 million Danish Kroner per year (ca. £1.4 million). It also receives significant funds from external sources, which is especially relevant, as the current government wants to reduce funding for the Board. The Board has been a leading actor in innovative approaches to public engagement and participation (the 'pioneer' of participatory TA)[3], developing and utilising processes such

[2] See http://www.tekno.dk/subpage.php3?page=statisk/uk_about_us.php3&language=uk&toppic=aboutus

[3] "The Danish (and Scandinavian) tradition of encouraging citizen deliberation on large techno-scientific projects is regularly remarked upon positively by commentators as a counter-point to the highly techno- and bureaucratic procedures used in a number of other countries." See Jensen, C.B. (2005). Citizen Projects and Consensus-

as consensus conferences, large-scale citizens' summits, and local-level citizen hearings. The Board often initiates dialogue on specific topics independently and then shares the results with policy-makers, which is slightly different from the UK approach, where lead government departments are encouraged to undertake dialogue themselves.

Although the 'embeddedness' of S&T dialogue in Danish policy-making is impressive, direct policy impact is less clear. A recent study examining the extent to which consensus conferences influence legislative decisions by the Danish Parliament revealed that while 75% of the members of parliament were familiar with consensus conferences, only 13% of those felt that the conferences sometimes led to parliamentary discussions, debates or initiatives, such as the issuance of laws or guidelines. According to the results of this study, the parliament may not be as receptive to the innovative methods of the Board as might be imagined.[4]

Furthermore, the current government has placed more emphasis on communicating directly with citizens rather than using intermediary organisations and this is having important ramifications for public dialogue providers. Cuts to Board of Technology funding have made it harder to organise participatory exercises and this has created more dependence on external funding, including from the EU.

Despite a stated commitment by government to public dialogue, there is a sense that government may be 'using' public engagement to justify decisions that have already been made.[5] A lack of systematic strengthening of resources or organisational approaches to public engagement means that while Denmark has long been viewed as a leader in the field, it is now considered by some to be behind countries such as the UK in terms of innovative practice. However, public and government interest in participation remains as well as good methodological and intellectual resources, despite funding and other concerns.

Science festivals, centres and museums are very active in raising public awareness of S&T developments. The academic community is mainly involved through participatory research, while consultancies are actively used as facilitators of dialogue activities. However, there is some tension between private and public actors with public institutions having to compete with private organisations for external funding while being based on different principles, a

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Building at the Danish Board of Technology: On Experiments in Democracy. *Acta Sociologica 48*(3), 221-235. Available at: http://asj.sagepub.com/content/48/3/221.abstract

[4] Heierbacher, S. (n.d.). *A study of official Danish technology assessment activities.* Available at: http://www.co-intelligence.org/P-ConsensusConference2.html

[5] Interview with Lars Klüver, June 2010.

trend which can also be seen in other European countries. Industry and civil society actors are mainly involved as stakeholders and there are few signs of nongovernmental actors actively initiating dialogue.

Thus, while Denmark has high-quality and well-developed organised processes of dialogue ('Formal engagement'), it scores lower on the scale of involvement and informal engagement; and there are serious questions around how innovative it is today in its use of new approaches such as online communications.

Dominant Approaches: Consensus conferences; citizens' summits; citizens' hearings; scenario and future workshops.

Key Organisations: Danish Board of Technology; universities (eg Technical University of Denmark); The National Committee on Biomedical Research Ethics; Center for Formidling af Naturvidenskab og Moderne Teknologi; Experimentarium science centre; Danish Agricultural Council; Danish Society for Nature Conservation; Danish Consumer Council.

Main Funders: Danish Board of Technology; government departments (eg Ministry of Food, Agriculture and Fisheries).

Case study: 'New GM Crops – New Debate' citizens jury, 2005[6]

Table 2: 'New GM Crops – New Debate'

Purpose	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
To formulate arguments, conditions and recommendations based on dialogue between citizens and experts for how Denmark should approach the challenges and opportunities offered by new GM crops (especially crops that can produce medicine and industrial products). To explore questions regarding the advantages and disadvantages of new GM crops in relation to health and environmental issues, the economic prospects and consequences and how Danish citizens perceive GM crops.	Organised by the Danish Board of Technology; supported by a project planning group consisting of representatives from academic, scientific and environmental organisations and the private sector.	16 regular citizens were assembled for 5 days, to enter into dialogue with 22 experts from different disciplines. Participants then formulated their arguments, conditions and recommendations regarding GM crops. Participants were not required to reach a consensus, but asked to prioritise the arguments presented and vote for the most important. Concluded discussions by voting. The final document of the jury[7] was presented at a conference in the Danish Parliament to representatives of political parties, the industry, the Danish Agricultural Council, the Danish Society for Nature Conservation and the Danish Consumer Council. This was the first time this method was used by the Board of Technology.	The participants adopted a generally positive stance towards GM crops and their financial potential, which surprised some actors, but they also agreed on specific conditions for growing GM crops in Denmark. Although it is hard to evaluate direct impacts on policy, there are indications that government actors took the results of the jury into account as part of wider considerations of Danish public opinion regarding GMO.[8] That results of the jury were presented to representatives of the major political parties indicates a direct channel between citizens and policy-makers.[9]

[6] See http://www.tekno.dk/subpage.php3?article=1136&toppic=kategori11&language=uk. We tried to find a more recent example of participatory activities by the Board of Technology within Denmark, but it appears that many of its dialogue projects in the last few years have had a more European/international focus, perhaps reflecting increased funding from the EU level.

[7] See http://www.tekno.dk/pdf/projekter/p05_gmp_citizens_document.pdf

[8] See, for instance, a 2009 fact report on GMOs by the Danish Ministry of Food, Agriculture and Fisheries, which refers to the citizens' jury: http://www.fvm.dk/GMO.aspx?ID=42573 (page 20).

[9] Furthermore, as part of standard practice, the results from all dialogue activities organised by the Danish Board of Technology are presented to the Parliament in a newsletter called 'Fra rådet til tinget'.

France

Investment in engagement: 4
Embeddedness: 4
Impact: 2
Scale of participation: 6
Breadth of participation: 3
Transparency: 2
Formal engagement: 3
Informal engagement: 8

Traditionally, the government in France has had a strong role in fields of public interest. In science and technology, the technocratic approach – with close links between scientists and policy-makers – has been dominant. It would appear that public dialogue on S&T is not very well developed as this field is controlled by the central state and elite scientific organisations and is based on the deficit-model of public understanding of science. There have been some attempts at large-scale, 'national' public debates organised by the government (eg 'Le Grenelle Environnement', see the case study below), and the parliament and some government departments have also organised dialogue activities, such as citizens' conferences, but these have not been systematic. Consultancy companies are often recruited by the public sector to carry out 'engagement', but there is strong reliance on the opinion survey-approach.

Although the discourse of dialogue seems strong in France, its practical impacts and results appear limited. The emphasis of science policy is on innovation, productivity and economic competitiveness, causing a lack of understanding of the value of public dialogue. When compared with other countries, France scores poorly in terms of investment in dialogue, its embeddedness in policy structures and especially in terms of policy impact.

The Parliamentary TA Office OPECST (Office parlementaire d'évaluation des choix scientifiques et technologiques), which is made up of MPs, mostly conducts traditional TA based on experts' inquiries in a similar manner to the UK House of Commons Science and Technology Committee – although it has occasionally been involved in initiatives involving public participation. Earlier this year, OPECST announced its intention to create a "societal

commission" composed of stakeholder representatives, but it is not yet clear how this will work in practice.[10]

Large research institutes are not very active in public dialogue, although there are some examples of such institutes organising engagement activities.[11] We found evidence of a lack of systematic evaluation and reflection of previous engagement activities, as well as a lack of incentives, time and training for scientists that would help encourage the inclusion of public dialogue in their work.

Yet at the same time, France has a vibrant civil society and while many groups tend to place themselves in opposition to the government-scientific 'complex', there are also organisations which actively promote more public participation in S&T and organise public debates on societal issues raised by scientific and technological development.[12] Thus it would appear from our research that a significant amount of engagement takes place, but mostly outside of political institutions. We have therefore placed France at the top in terms of informal engagement in comparison to other countries, highlighting the wide gap between formal and informal engagement. Because of this, France also fared better in terms of the scale of dialogue as there are many opportunities for citizens to have their say even if impact on policy is lacking.

Organisations such as the Commission nationale du débat public (CNDP) seek to drive public debate upstream, but their work is mainly focused on planned environmental and infrastructure projects. Participation in this context is mostly justified by reference to 'local democracy', but there is debate about how such local dialogue could link with related national policy-making.[13] Government focus has largely moved to engaging with civil society groups. The Ministry of Ecology, for instance, seeks to involve NGOs as partners in its programmes. It is also felt that the media in France should play a stronger role in public dialogue on S&T.

S&T Dialogue in France may well follow the traditional French trajectory of limited initial involvement, but when commitment is made it is significant. For example, at the time of writing the French Ministry of Ecology has just tendered for a large social media platform to support engagement in its activities.

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[10] Marris, C. (2010). Briefing paper on French and Dutch dialogue initiatives (not published).

[11] Such as the GM vine consultations organised in 2000 by the National Institute for Agricultural Research (INRA); see http://www.international.inra.fr/

[12] See, for instance, VivAgora: http://www.vivagora.org/. One of the organisation's aims is to open up S&T to the wider public, although many of its deliberative activities appear more focused on stakeholder dialogue.

[13] Marris, *supra* note 10.

Dominant Approaches: Expert inquiries; stakeholder consultations; government-organised dialogue processes; opinion research.

Key Organisations: OPECST; High Council for Science and Technology; High Council for Biotechnology; Commisison Nationale du Débat Publique (CNDP); National Centre for Scientific Research (CNRS); National Centre for Agricultural Research (INRA); National Institute of Health and Medical Research (INSERM); Cité des Sciences et de l'Industrie; Conservatoire national des arts et métiers (Cnam); VivAgora; Foundation for the Development of an Active Citizen Research (ADReCA); Fondation Sciences Citoyennes.

Main Funders: Research centres; Government departments (eg Ministry of Ecology); local, regional and national government.

Case study: 'Le Grenelle Environnement' – Environment Round table, 2007[14]

Table 3: 'Le Grenelle Environnement'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
To conduct a large national debate on environmental issues and how to shape society's relationship with the environment. More specifically, to define the key points of government policy on ecological and sustainable development issues for the coming five years, focusing on 8 themes: *Climate and energy; Biodiversity; Health; Production and consumption; Green democracy; Competitiveness and employment; GM products; and Wastes.*	Initiated by President Sarkozy; organised by Minister of Ecology and Sustainable Planning and Development, Secretary of State for Transport and Secretary of State for Ecology.	The Round Table brought together representatives of the State, unions, employers, NGOs and local authorities, thus forming 5 'colleges'. For three months, thematic workgroups met to propose concrete action to be implemented at the national and international level. These proposals were then opened up to public debate through regional meetings, a public internet consultation, a parliamentary debate, and submission to 31 bodies for consultation. Four round tables were organised based on these proposals. Operational committees were set up to define guidelines and objectives for operational programmes, looking at the technical, legal and administrative aspects; assessment and monitoring committees, based on the five colleges, set up to monitor the work of the operational committees.	Considered an important event. One result was agreement on a moratorium on the use of GMOs by the government; led to many other discussions and commitments (such as reducing the use of pesticides in agriculture by 50% by 2015). New advisory body on biotechnology: Le Haut Conseil des Biotechnologies created in 2008 (includes representatives of civil society). 16,900 people attended the regional meetings 300,000 visits to the site, including 11,704 published contributions (this level of participation was considered "unprecedented for an Internet government consultation"[15]). Involved a media campaign to encourage public participation in consultations. Clear links to policy-making as the initiative was strongly driven by government.

[14] See http://www.legrenelle-environnement.fr/spip.php?rubrique112

[15] See http://www.legrenelle-environnement.fr/IMG/pdf/ChiffresConsultation_EN.pdf

Germany

Investment in engagement: 5
Embeddedness: 5
Impact: 4
Scale of participation: 2
Breadth of participation: 4
Transparency: 3
Formal engagement: 5
Informal engagement: 5

In Germany, the policy-making process and culture in general (rooted in the country's specific approach to representative democracy), and in science and technology specifically, is expert-oriented and focused on high-quality scientific research and innovation with a lack of broad public participation or input. However, the current coalition government treaty includes a commitment to creating more public dialogue, and there is wide acceptance of the need to involve citizens, stakeholders and civil society in policy-making. As of yet it is unclear how this intention will translate into practice. As is the case in most countries, there is more engagement in downstream local-level S&T projects, where politicians are closer to the citizens, and where political issues often have a direct impact on people's daily lives.

The Technology Assessment Office at Bundestag (TAB) has a traditional, expert-based approach to TA and there is no public dialogue dimension. The Stuttgart TA Academy was closed down in 2003, which was a setback for TA research in Germany because of the strong public profile of the institution. Currently the Institute for Technology Assessment and Systems Analysis (ITAS) is the largest independent TA organisation, and the operating authority of TAB. Its activities include some participation projects specifically on new technologies. Several of Germany's large research institutes, which traditionally focused on top-down science communication, are now paying more attention to the need for public dialogue.[16] IFOK is a Berlin-based engagement company involved in organising the European Citizens' Consultations on the future of the EU in 2007-09[17], which it used as a springboard to position itself as a key engagement organisation for the European Commission. IFOK, which

[16] In 1999, these organisations, together with the Federal Ministry for Education and Research and the Donors' Association for the Promotion of Science and Humanities, set up *Wissenschaft im Dialog* (Science in Dialogue) as Germany's centre of expertise for science communication, with the goal of strengthening dialogue between science and society. See http://www.wissenschaft-im-dialog.de/en/about-wissenschaft-im-dialog/ueber-uns.html

[17] See http://www.ifok.org/projekt/detail/buerger-beraten-politiker/; http://www.european-citizens-consultations.eu/

was founded in a stakeholder-dialogue tradition, has had a key role in providing an 'institutional home' for engagement on S&T in Germany.

In the past, the S&T industry in Germany was not a very vocal supporter of public dialogue, but in recent years it has increasingly understood the need for openness and transparency. Nongovernmental organisations are often involved as participants in public engagement through the focus group approach, and there are several NGOs which promote and carry out dialogue activities themselves.[18] The Bertelsmann Foundation has had a key role in promoting civic engagement for many years and has increasing interest in S&T. There is also an active network of science shops promoting science communication and dialogue and actively collaborating with partners in other countries.[19] Outside of the formal dialogue processes, there is a fairly strong culture of citizen activism and protest and there have been calls for more direct channels of public participation in decision-making.[20] The media, which has focused more in the past on covering the risks of S&T, has begun to produce more balanced coverage, especially at the local/regional level.

Examining Germany, we find the context to be very similar (although slightly better) to that of France in most aspects. For example, there is a similar lack of effective channels for broad public input into decision-making on S&T, although more dialogue activities are carried out by ITAS and other large research organisations. We have therefore scored Germany higher on investment and embeddedness. On the other hand, civil society and public activism in general appears slightly smaller-scale than in France, therefore we have scored Germany lower on informal engagement and on its scale of participation.

Dominant Approaches: Expert inquiries; stakeholder consultation; independent dialogue.

Key Organisations: ITAS; TAB; Berlin-Brandenburg Academy of Sciences; DECHEMA Gesellschaft für Chemische Technik und Biotechnologie; Institute for Futures Studies and Technology Assessment (IZT); Science in Dialogue; Fraunhofer Institute; Öko-Institut (Eco-Institute); Wuppertal Institute for Climate, Environment and Energy; Dialogik; IFOK; BUND; Stiftung Mitarbeit; Bertelsmann Foundation; Netzwerk Zukunft; Science Shops.

[18] See, for instance: http://dialogic-expert.org/en/; http://www.mitarbeit.de/
[19] See http://www.wilabonn.de/; http://www.scienceshops.org/
[20] According to a recent survey, 76% of Germans want more direct democracy. See http://www.tagesschau.de/inland/dtrend482.html (in German)

Main Funders: ITAS; government departments (eg Federal Ministry of Education and Research); Regional government (eg Baden-Wurttemberg); Research institutes.

Case study: 'Futures of green genetic engineering' scenario-workshops, 2007-2009[21]

Table 4: 'Futures of green genetic engineering'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
To make a contribution to the debate on the future direction of research on green genetic engineering to assess possible future developments and the resulting potential conflicts; to support the forming of opinion of future actors in societal debates; to enhance the methodology of discursive approaches.	Institute for Technology Assessment and Systems Analysis (project leader) in cooperation with the Berlin-Brandenburg Academy of Sciences; funded by the Federal Ministry of Education and Research (Project Management Agency Health Research).	Four scenario-workshops with students from different disciplines and one scenario-workshop with sixth formers. The development and testing of this new discourse approach with lay people was a key element of the project.	Produced a final report with an overview of results of the project; fact sheets with comprehensive information on the topic of green engineering; workshop report with evaluation of the scenario-workshops, including political and methodological conclusions; and a manual for the organisation of scenario-workshops. Was seen to be important as an exploration of the method and for informing further debate; funded by a government department although no direct links to policy. The new concept of scenario workshops with laypeople was successfully tested, and the methodology was developed to enable others to use it independently, including proposals for the implementation and further development of the methodology. The project group have worked out a number of points that were considered to be of high relevance in research and political decision-making on green genetic engineering.

Japan

Investment in engagement: 3

Embeddedness: 1

Impact: 2

Scale of participation: 5

Breadth of participation: 6

[21] See http://www.itas.fzk.de/eng/projects/2007/meye0732_e.htm

Transparency: 4

Formal engagement: 2

Informal engagement: 4

Up until around ten years ago, Japan had an expert-focused approach to science and technology policy-making with reliance on conventional advisory panels combined with public opinion surveys. Over the last decade, government, academics and businesses have begun to emphasise the importance of two-way dialogue, and there have been efforts to introduce public engagement into policy-making processes. However, in practice public dialogue is still quite rare, although the new government is expected to promote public dialogue on S&T issues imminently.

Most funding for participatory activities comes from the Research Institute of Science and Technology for Society (RISTEX)[22], which is part of the Japan Science and Technology Agency (JST). The budget of RISTEX is ca. $20m USD from an overall JST research funding of $800m. There is also competition for private finance.

Several participatory processes, including consensus conferences, scenario workshops and stakeholder dialogues have been organised in recent years, mainly by academic groups consisting of social scientists who are also participation practitioners. Most participatory efforts in Japan are currently based on following US/European approaches, although there is now more focus on '3rd generation TA'[23], with some potential for developing and adapting this to the specific context of Japan. Science cafes have also been increasingly organised since 2005, with almost a thousand now taking place every year nationwide, and a large JST-sponsored Science Agora event is held every year.[24] However, there is evidence of a lack of policy impact.

Participation at local/regional level is viewed as having more impact and some local governments have demonstrated interest in using public dialogue processes (see case study below). Therefore, there is currently "no new style public engagement connected with policy-making process in Japan but one connected with local government".[25] Researchers in some

[22] http://www.ristex.jp/EN/index.html

[23] See http://i2ta.org/files/SPRUseminar_20100115.pdf

[24] See http://www.scienceagora.org/scienceagora/agora2009/index_e.html

[25] Email from Tadashi Kobayashi, August 6, 2010.

areas such as in life sciences appear more active in terms of outreach and dialogue, while scientists in other areas such as atomic energy are 'seemingly serious but in reality cynical'.[26]

In general, civil society organizations in Japan are not strong and in the field of S&T there is evidence of only a few key bodies[27], all of whom struggle to get funding. However, there is evidence that some networks exist, including the private sector and consultancies, but these organisations are focused more on the environment and planning than S&T as such.

In terms of national-level dialogue, Japan is placed well behind other countries on most of our metrics, though there are real indications that the country's dialogue is improving and there is significant potential for development. We considered the committed efforts at organising public dialogue on S&T outside government structures at the regional level in Japan, and therefore, scored the country higher on breadth and scale of participation as well as on informal engagement.

Dominant Approaches: Expert advice; stakeholder dialogue; independent; academic-organised dialogue.

Key Organisations: Centre for the Study of Communication-Design, Osaka University; Communicators in Science and Technology Education Program (CoSTEP) Hokkaido University; Japanese Society for Science and Technology Studies; Citizen Science Initiative; Science Communication Japan.

Main Funders: RISTEX; Regional government (eg Hokkaido).

[26] Ibid.
[27] One example is the Citizen Science Initiative: http://www.csij.org/

Case study: Consensus conference on GM foods in Hokkaido, 2006-07

Table 5: GM crops in Hokkaido

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
The local economy in Hokkaido depends heavily on agriculture; GM crops are thus a prominent issue. The regional government had established strict rules for GM crop cultivation in order to protect non-GM crops from contamination by GM crops. It saw the need to discuss this issue with the people, in order to find out farmers' and consumers' views of GMO and about potential impacts on the image of Hokkaido crops, as well as to gain legitimacy for any related policy. This was seen as part of the "risk communication" with which to ensure "the safety and reliability of food in cooperation with the citizens of Hokkaido".[28]	Hokkaido prefectural (regional) government; group of university researchers recruited to organise public dialogue.	New methods of participation were sought; the consensus conference model was used. This was the first time such a conference has been organized by a prefectural government in Japan.	While there had been previous consensus conferences on GM crops at the national level, this was the first one with clear links to policy-making, albeit at the regional level. The regional government was committed to implementing the results of the conference: "the Hokkaido Government will take the recommendations of the Consensus Conference into consideration in its own policy deliberations. Concerning national regulations, the Hokkaido Government will make a request to the national government to take necessary countermeasures."[29] The Hokkaido government considered the consensus conference as a new tool of risk communication, and as a new route into policymaking.[30]

[28] See http://www.gmo-free-regions.org/fileadmin/files/gmo-free-regions/Hashimoto_speech.pdf
[29] Ibid.
[30] See http://www.tailoringbiotechnologies.com/Kyoto2007/Seiko_Yoshida_Matsui_ppt.pdf

Netherlands

Investment in engagement: 10
Embeddedness: 9
Impact: 8
Scale of participation: 6
Breadth of participation: 6
Transparency: 6
Formal engagement: 10
Informal engagement: 3

The Netherlands has a strong, prominent TA institution, the Rathenau Institute (RI), which is perhaps the largest TA organisation in the world with a budget of ca. €5 million per year (ca. £4.1 million; although just 31% of staff works in TA). The Institute has been an active promoter of various forms of public participation for many years, and it carries out dialogue activities as a key part of its TA function. For example, it was one of the instigators of 'interactive technology assessment' (ITA). However, there is evidence that this strand of its work may have declined in recent years.[31] The role of the institute as the key actor at the interface between science and society has been increasingly emphasised, including taking on science systems assessment and actively experimenting with new methods to connect citizens and science (such as festivals, theatre, TV documentaries, working with media), with less focus on regular participation exercises.

The RI has attempted to integrate direct democratic approaches with the traditional model of representative democracy and has focused on influencing policy-makers through means other than merely participatory exercises. The Institute does have a clear impact on decision-makers, with parliamentarians regularly lobbying the government as a direct result of the Institute's reports, and with government departments often actively requesting help in assessment and engagement activities.

Public debates on S&T are often initiated by politicians and experts together. The government occasionally organises one-off large-scale societal debates on prominent issues, while research organisations, academics and scientists, science museums and specific research programmes often incorporate some element of public dialogue in their activities. NGOs and producer representatives are actively involved in participatory processes and the government

[31] Marris, *supra* note 10. The Netherlands was also at the forefront of developing 'constructive technology assessment' (CTA), similar to iTA, especially through the work of Professor Arie Rip since the 1980s.

is generally supportive of public dialogue. While more and more dialogue is taking place independently of political structures, government departments appear receptive to such changes. There is evidence of some polarisation in the political system but direct channels of participation co-exist within these structures. Unlike Denmark, there is less emphasis on consensus building.

The media plays an active role in supporting public dialogue on the ground by, for example, co-sponsoring science-related engagement activities. The role of social media and digital communities is growing and the importance of engaging with and through them is recognised.

Yet public dialogue in the Netherlands faces challenges including concerns around the effect of new technologies on future generations and the gap between research/academia and the public as two-way communication is still considered secondary by many scientists. In addition, there is a spoken need for participation to be driven at the institutional level within the science community.

Overall, the Netherlands appears to invest significantly in public dialogue on S&T, it is well embedded in policy-making processes especially through the Rathenau Institute, and there is evidence of public dialogue having clear impacts on policy. Therefore, the Netherlands has the highest score in terms of formal engagement, although scores lower in terms of active informal engagement.

Dominant Approaches: Public meetings; focus groups; stakeholder consultations.

Key Organisations: Rathenau Institute; Science Shops; Research institutes (eg NanoNed consortium; National Institute for Public Health and the Environment, IVAM); Parliamentary Theme Commission on Technology Policy; Netherlands Organisation for Scientific Research (NOW); Netherlands Organisation for Applied Scientific Research (TNO); Royal Netherlands Academy of Arts and Sciences (KNAW); Universities (eg Agriculture University); Dutch Society for Nature and the Environment; Dutch Platform for Health and Environment; Science Centre NEMO; Netherlands Study Centre for Technology Trends.

Main Funders: Rathenau Institute; Government departments (eg Ministry of Education, Culture and Science); research institutes and programmes.

Case study: 'Small technology - Big consequences' public meeting on nanotechnology, 2004 (part of an ongoing project since 2003)[32]

Table 6: 'Small technology - Big consequences'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
To inform politicians, other social actors, and the broader public about developments in the field of nanotechnology, and discuss related relevant political and societal questions. To debate the expectations on nano-science and technology; their relevance for the Dutch economy; potential risks and benefits; potential causes for conflict or polarisation; and next steps in terms of research and development. To experiment with new types of dialogue methods.	Rathenau Institute; Parliamentary Theme Commission on Technology Policy.	This was the first large public meeting on nanotechnology in the Netherlands, preceded by research and smaller-scale meetings, focus groups and workshops organised by the Rathenau Institute. Instead of a classical Parliamentary hearing, four interactive debates were organised between stakeholders from different societal domains, such as social scientists, nanoscientists, business, societal organisations, government, politics, and the public. Altogether around 120 participants.	The public meeting indicated that it is difficult to develop a well-grounded opinion on nanotechnology as development in the field is very rapid. A key outcome was the recognition of the importance of involving citizens and NGOs in the debate early, and it was felt that the government should facilitate an open debate between different actors. More involvement of societal organisations was also viewed as beneficial. However, there were reservations about organising an extensive public debate, in light of the lack of awareness of nanotechnology among citizens. The absence of many NGOs, despite efforts to get them involved was flagged as a negative by many politicians.[33] Since this meeting, the Rathenau Institute has carried out research into nanotechnology applications, and is currently focusing on the uncertainty regarding risks to human health and the environment. In 2009, the Dutch government appointed a committee to promote discussion about related social and ethical dilemmas.[34] The Rathenau Institute is now preparing the next phase of the debate, in which the outcome of public discussions will be incorporated into government policy proposals and subject to political debate in parliament.[35]

[32] See http://www.rathenau.nl/en/themes/project/nanotechnology.html

[33] See http://www.itas.fzk.de/tatup/043/eske04a.htm

[34] This is the independent Committee for the Societal Dialogue on Nanotechnology in the Netherlands (CMDN). See http://www.nanopodium.nl/english/

[35] The results of this societal dialogue will lead to an Agenda for Nanotechnology, which will be presented to the Dutch government and used as an important input for Dutch policies on nanotechnology and its applications. Part of this initiative is the online information and discussion platform, Nanopanel: http://www.nanopanel.nl/

			In 2008 the Institute published its 'Ten lessons for a nanodialogue', based on interviews with NGOs, which recommends distinguishing between risk issues and the broader dialogue on applications of nanotechnology: the risk issue should be first dealt with adequately, before a broader nano-debate can be possible.[36] However, there is some doubt whether these lessons have been taken up by the government committee.[37]

Switzerland

[36] See http://www.rathenau.nl/uploads/tx_tferathenau/Ten_lessons_for_a_nanodialogue_-_How_to_be_deadly_serious_and_still_have_serious_fun_-_Rathenau_Institute_2009_01.pdf

[37] Interview with Arie Rip, July 2010.

Investment in engagement: 8

Embeddedness: 8

Impact: 7

Scale of participation: 5

Breadth of participation: 6

Transparency: 6

Formal engagement: 9

Informal engagement: 3

Similarly to Denmark and the Netherlands, Switzerland has an influential TA institution, Das Zentrum für Technologiefolgen-Abschätzung, or TA-Swiss. The organisation's budget in 2009 was around 1,380,000 CHF[38] (ca. £850,000), roughly 20% of which is devoted to public dialogue and participation activities.[39] Despite recognition within the organisation of the limits of public dialogue in terms of representing the views of the whole population, the TA utilises a variety of participatory methods (such as citizens' panels and focus groups) and experiments with new approaches, such as combining public communications, expert consultation and a participatory process to debate and explore the future of the internet[40]. According to Sergio Bellucci, the director of TA-Swiss, such dialogue processes, although limited in scope, often produce very good qualitative results.[41]

Influenced by the Swiss tradition of direct democracy and consultation, it appears there is a responsive climate for participation and dialogue in all policy fields in the country, as well as a broad recognition of the need to carry out public dialogue on new and complex S&T issues at an early stage in order to inform policy-making. Politicians seem generally receptive to the results of participatory TA projects and the media actively disseminates findings by TA-Swiss. There is, however, some difficulty in locating participants for participatory projects.[42]

Independent organisations such as Stiftung Risiko Dialogue and Science et Cite also deliver public dialogue and stakeholder engagement exercises. Outsourcing public dialogue does not happen often as it is seen as important to have publicly funded institutions delivering work in this field that is not influenced by commercial or other interests – a clear distinction with the approaches in the UK. Civil society and industry actors are actively included as stakeholders

[38] http://www.ta-swiss.ch/a/doku_weit_jahr/2009_JB_df.pdf
[39] Interview with Sergio Bellucci, July 2010.
[40] See http://www.ta-swiss.ch/e/them_info_web2.0.html
[41] Interview with Sergio Bellucci, July 2010.
[42] Ibid.

in dialogue exercises, and there is a sense that some sectors of industry, such as the textile industry in relation to nanotechnologies, are very open for public contact while some are more reluctant and view debates on sensitive issues such as GMOs with trepidation.

Research in Switzerland has demonstrated that scientists there are very open to public engagement activities, viewing them in the context of the 'co-production of knowledge' and as a way to promote public debate about science and technology and their role in society. This inclusive attitude may well be because the public often has a decisive say on the agenda of science through direct referenda which 'obliges' scientists into a more interactive relationship with society.[43]

Because of the active role played by TA-Swiss in promoting public dialogue on S&T, and because of the system of direct democracy which often encompasses referenda on science-related issues, we have scored Switzerland close, although slightly lower, to the Netherlands on most of our metrics. Again, formal engagement appears significantly stronger than informal engagement.

Dominant Approaches: Citizens' panels; focus groups; homogenous-group discussions; stakeholder dialogue.

Key Organisations: TA-Swiss; Swiss Academy of Arts and Sciences; The Swiss National Science Foundation (SNSF); Swiss Federal Laboratories for Materials Science and Technology (EMPA); Universities (eg University of Lausanne's Nanopublic Platform); Stiftung Risiko Dialogue; Science et Cite; The Innovation Society.

Main Funders: TA-Swiss; Government departments.

[43] Crettaz von Roten, F. & Moeschler, O. (2008) *Les scientifiques dans le cité* (research report). Lausanne: Université de Lausanne. Available at: http://www.unil.ch/webdav/site/osps/users/oglasse1/public/Rapport_SDCfinal3.pdf. See also http://vitae.ac.uk/272401/Public-engagement-by-researchers.html

Case study: 'Nanotechnology, Health and the Environment' Publifocus events 2005-06[44]

Table 7: 'Nanotechnology, Health and the Environment'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
To inquire into initial public views, concerns, priorities and reservations regarding the acceptability and desirability of nanotechnologies, their regulation, and other open questions. Specifically, to find out how citizens perceive the nanotech debate; where they see opportunities for themselves, their health and the environment; where they see possible risks; what are the ethical boundaries for nano-research; and what is the need for regulation or a standardised declaration. To demonstrate how the use of nanomaterials and the possible social and economic impact of these new technologies are being assessed by "laypersons" who have some knowledge of the subject.	Organised by TA-Swiss, with support from the Federal Office of Public Health (FOPH), the Federal Office for the Environment (FOEN) and the Zurich University of Applied Sciences Winterthur (ZHW). An advisory group of experts from the fields of politics, research, science, business, society, the media and NGOs, was formed to oversee the careful preparation and balanced conduct of the Publifocus process.	The Publifocus consisted of a series of moderated debates by four groups made up of randomly selected lay citizens, covering different linguistic regions. Also one group made up of representatives of specific national stakeholder groups (16 people from 6 organisations in the areas of the economy, industry, the scientific field, trade unions, food production, agriculture, consumer protection, and environmental protection). Research was carried out beforehand to determine the state of nano- development and to initiate the debate on the opportunities and risks (summarised in an info-brochure). A final report of the discussions was produced to inform the public and members of parliament, and support further discussion on new legislation on nanoscience and nanotechnology.[45]	The participants mostly took a critical-positive view of nanotechnologies, but called for more knowledge, evidence of possible risks, transparency (including a compulsory 'nano-declaration'), international regulation, and more independent research to counter industry-funded research, in order to build public trust.[46] Although no direct recommendations were made, the whole spectrum of different interests (including areas of conflict) was represented in the forums. The findings from these discussions have been fed into wider discussions and policy considerations. For example, through presentations for members of parliament and the media, as well as subsequent public meetings and discussions.[47] Feedback by participants indicated that they found the preparatory information, organisation and conducting of the discussions highly satisfactory. The focus group approach is considered appropriate for discussions of unfamiliar and complex topics such as nanotechnologies, as it allows participants in small groups to develop a joint stance on issues, drawing or building on the

[44] See http://www.ta-swiss.ch/e/arch_nano_pfna.html

[45] For more detailed information about the methodology and the results of these forums, see the final report: http://www.ta-swiss.ch/a/nano_pfna/2006_TAP8_Nanotechnologien_e.pdf. In addition to Switzerland, laypeople focus groups on nanotechnology have been conducted in the US, Denmark, the Netherlands, the UK, New Zealand, and Germany.

[46] See http://www.ta-swiss.ch/a/nano_pfna/061211_MI_pfNanotechnologien_e.pdf

		These forums are part of ongoing national dialogue on nanotechnologies in Switzerland (now 10 years).	arguments made by other participants. The events highlighted the value of social dialogue on new technologies at an early stage, as citizens are able to engage in differentiated discussion on new technologies and develop proposals on how they should be handled. A follow-up to the Publifocus conference focusing exclusively on nanotechnology and food has since been conducted.

UK

Investment in engagement: 7

[47] See http://www.ta-swiss.ch/e/them_nano_pfna.html ('Events')

Embeddedness: 7

Impact: 5

Scale of participation: 3

Breadth of participation: 5

Transparency: 7

Formal engagement: 4

Informal engagement: 6

In the last 15 years the UK has witnessed a significant opening up of public dialogue contributing to S&T policy-making and a move away from the deficit-model towards a more democratic model. This has reflected the general 'participatory turn' in British policy-making, with more commitment to engagement from government and parliament, although this change is not completely embedded yet.

According to Jackson et al, the "regulatory failure" in the UK has led to more innovative, open, and informal public engagement processes for science-related issues, including a shift to so-called upstream engagement, involving people in the more strategic stages of S&T research and development, rather than at later project stages. This has been driven by the desire to ensure that the implementation and regulation of new technologies is not left to scientists and industry, but is controlled by responsible government which openly and continuously engages the public in reflection about the values, visions and interests that motivate S&T research and development as the basis of its policy-making.[48]

Therefore, while the UK was for a long time 'lagging behind' countries such as Denmark or the Netherlands, it is now viewed by many to be at the forefront of public dialogue on S&T, especially in terms of innovative approaches, with a wide variety of actors and initiatives driving public participation in areas of science and technology. Yet despite recent developments, many government institutions still often appear 'stuck' in a conventional model of decision-making, with actors such as NGOs and academics attempting to draw the attention of policy-makers to the importance of public participation.

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[48] Jackson, R., Barbagallo, F., & Haste, H. (2005). Strengths of Public Dialogue on Science-related Issues. *Critical Review of International Social and Political Philosophy 8*(3), 349-358. Available at: http://www.informaworld.com/smpp/content~db=all~content=a723615608~frm=titlelink**.** The UK Government's 10 year strategy for science and innovation states that the Government will "work to enable the debate to take place 'upstream' in the scientific and technological development process, and not 'downstream' where technologies are waiting to be exploited but may be held back by public scepticism brought about through poor engagement and dialogue on issues of concern". See HM Treasury (2004). *Science and Innovation Investment Framework 2004-2014.* London: HM Treasury. Available at: http://news.bbc.co.uk/nol/shared/bsp/hi/pdfs/science_innovation_120704.pdf

To a greater extent than the other countries examined in this paper, the UK has witnessed a strong trend towards outsourcing engagement and dialogue to both private and non-profit specialist organisations, with funding provided through government-set-up initiatives such as Sciencewise-ERC.[49] Sciencewise-ERC also seeks to build capacity across Government Departments and to ensure that they have the skills and expertise to be able to lead and to manage public dialogue activities. This approach has proved successful in stimulating the more widespread use of dialogue, and promoting the greater use of the results of dialogue in policy-making involving science and technology.

The involvement of large research organisations such as Ipsos-Mori and Opinion Leader Research is much higher in the UK than in other countries, which have tended to prioritise organisations that are seen to be more 'independent'. In particular, reference has been made to the controversy surrounding the 2007 'Talking Energy' consultation on nuclear power[50], and the failed attempt at an engagement process on genetically modified foods by the Food Standards Agency[51].

The parliamentary TA office, POST, is small and lacks the resources to carry out participatory TA. It should be noted that it is presently unclear how the new government and planned budget cuts will affect public dialogue on S&T.

Beyond government departments, the arena of public dialogue on S&T in the UK is diverse and driven by various actors including research councils, the Royal Society, the Royal Institution, independent research organisations, science museums, universities, civil society organisations, trusts and think tanks. All of these organisations play a role to varying extents through promoting, organising or taking part in public dialogue. The government actively encourages such a diversity of stakeholders and does not view itself as the 'sole arbiter of public debate'.[52] There is also a significant degree of mobility of actors between different organisations.

So while the UK lacks a large, well-funded TA institution with a specific dialogue remit, because of the range of actors and projects involved in public dialogue on S&T we have given the UK a high score in terms of investment and embeddedness. In particular the UK has a

[49] The Budget of Sciencewise in 2009-10 was ca. £2.5 million

[50] See http://www.greenpeace.org.uk/blog/nuclear/breaking-news-another-nuclear-consultation-was-fixed-20081016

[51] See http://www.guardian.co.uk/environment/2010/jun/06/gm-crops-biotech-lobbyists-fsa

[52] Bowman, D. & Hodge, G. (2007). Nanotechnology and Public Interest Dialogue: Some International Observations**.** *Bulletin of Science, Technology & Society 27*(2), 118-132. Available at: http://bst.sagepub.com/content/27/2/118.full.pdf

number of highly influential academics who act as unofficial 'champions' of engagement across the government and academic sectors. NGO activity is viewed as very important in the UK when compared to other countries, and with reduced resources civil society organisations with specific expertise are likely to be increasingly relied on to carry out public dialogue and engagement. We have therefore scored the UK higher on informal engagement as opposed to formal engagement, although the distinction between the two is perhaps not quite as clear as in other countries.

While the value of broad, complex, multi-level participative processes is recognised, there is also some sense of a lack of clarity with regards to the aims of public engagement and the tensions between different functions such as policy advice as opposed to broader public discourse and transparency.

Similar to the Netherlands, the role of the media is also considered very important and the diversity of UK media provides many opportunities for creating public awareness about scientific debates. A number of S&T engagement projects have gained national media attention in the UK, such as 'GM Nation?' in 2003 which was covered by a wide range of both national and local media.[53] However, there may be some apprehension by scientists about potential misinformation and the large influence of media on the public's views on scientific issues (consider, for example, the recent 'Climategate' scandal).

Dominant Approaches: Citizens' juries; public forums; deliberative workshops; focus groups; stakeholder consultations.

Key Organisations: POST; BIS; Research Councils; Royal Society (Science and Society programme; Science Policy programme); Royal Academy of Engineering; Royal Institution; British Council; British Science Association; NESTA; Sciencewise-ERC; National Coordinating Centre for Public Engagement (NCCPE); Nanotechnology Engagement Group (NEG); Science Cafes & Shops; Association for Science and Discovery Centres; Association for Science Education; Science museums; Demos; Involve; Connecting Science; Institute for Public Policy Research (IPPR).

Main Funders: Government departments and agencies (eg BIS, DEFRA, DECC, DH); Research Councils; Trusts (eg Wellcome Trust).

[53] See the independent evaluation report of the process: Horlick-Jones, T. et al (2004). *A Deliberative Future? An Independent Evaluation of the GM Nation? Public Debate about the Possible Commercialisation of Transgenic Crops in Britain, 2003.* Understanding Risk Working Paper 04-02.

United States

Investment in engagement: 3
Embeddedness: 2
Impact: 3
Scale of participation: 3
Breadth of participation: 6
Transparency: 6
Formal engagement: 1
Informal engagement: 7

The United States led the world in the 1960s in terms of Technology Assessment (TA), but has since fallen behind. In recent years, there have been calls to continue the functions of the abolished Office of Technology Assessment (OTA), with a new focus on citizen engagement. Networks of non-partisan policy research organisations, universities and science museums, such as the Expert & Citizen Assessment of Science & Technology (ECAST) have called for a clear commitment to public dialogue from government.

There has been some sign of interest, at the Government Accountability Office (GAO) for instance, in renewing TA capacity with a participatory element which would draw on European experience. The White House Office for Science and Technology has also shown interest in public dialogue but there is no clear indication yet at an organisational level of just how serious this interest is. In the field of nanotechnology, the 21st Century Nanotechnology R&D Act of 2003 states that public input and outreach should be integrated into the activities of the National Nanotechnology Programme, and some dialogue exercises have been organised as a result of the Act, although their policy impact is not clear.

So there is currently some receptivity to the idea of public dialogue in the national government, and the new emphasis on open government by the Obama administration may support this trend. However, there is less evidence of interest in organising public dialogue for the explicit purpose of feeding into policy decisions.[54]

In the US, the S&T field is dominated by four key groups: the government, industry, the military, and universities. Civil society (including the broader public) is largely uninvolved and there appears to be a lack of understanding of how public engagement should fit into

[54] Interview with Richard Sclove, July 2010.

policy-making. The dominance of the political system by powerful, in particular economic, interest groups also presents a challenge to building channels for broader public input into decision-making. We have therefore given the US a fairly low score in terms of investment, embeddedness and impact of engagement.

While highly formalised processes for public input into decision-making exist, they mainly involve specific stakeholders and elites rather than wider publics, and campaigning remains the principal tool used to get the public involved in policy-making. Projects involving participatory methods do exist outside government structures (see the case study below), but they are fragmented and it is unclear if these can/will be integrated to any great extent in the future. Discussing nanotechnology dialogues in different countries, Bowman and Hodge note that in the US, as in the UK, a variety of nongovernmental actors such as the Woodrow Wilson International Center for Scholars and the Meridian Institute, have been at the forefront of public participation processes, making important contributions within the field.[55] A gap exists between 'formal' and 'informal' engagement, similar to that of France, and therefore our scoring reflects this gap.

The large national research-funding agencies place more emphasis on the dissemination of knowledge than two-way communication; however, there is increasing interaction with civil society groups in S&T debates. Yet the challenge remains in linking these initiatives directly to policy-making. Certain organisations such as the National Academy of Sciences are sympathetic to public engagement and there is a sense that they may be able to promote public dialogue within the S&T community.

In general US participation and engagement is driven by civil society actors such as AmericaSpeaks[56] and the National Centre for Dialogue and Deliberation (NCDD)[57] which tend to be funded by foundations rather than 'decision-making' institutions. These organisations also help to promote a culture of dialogue and deliberation in the civic arena.

We found evidence of more dialogue activity in the environmental field (for example, the Environmental Protection Agency has an active public involvement agenda[58]). However, this

[55] Bowman & Hodge, *supra* note 51. For further examples of nanotechnology dialogue projects in different countries, including the US, see Gavelin, K., Wilson, R., & Doubleday, R. (2007). *Democratic technologies? The final report of the Nanotechnology Engagement Group (NEG).* London: Involve. Available at: http://www.involve.org.uk/assets/Publications/Democratic-Technologies.pdf

[56] AmericaSpeaks has been involved in several dialogue projects relating to climate change and health care, see http://www.americaspeaks.org/index.cfm?fuseaction=Page.viewPage&pageId=473

[57] See http://ncdd.org/ (or www.thataway.org/)

[58] See http://www.epa.gov/publicinvolvement/index.htm

tends to often be mainly stakeholder engagement around more specific issues. It would appear that at the local level there is also a clearer understanding of the need for dialogue, often linked to the practical need to be able to implement local decisions.

In terms of resources, we can contrast the total US R&D budget of ca. $400 billion/year with the now-abolished OTA budget of ca. $31 million/year.[59] At present resources mainly come from non-government actors (including trusts and the private sector) and since the economic crisis, private foundations have experienced reduced cash flows for investment into public dialogue programmes. There is no major funder such as the European Commission in the USA.

The media in the US does not appear to autonomously drive dialogue on S&T, but our research indicates that there is some receptivity and willingness to cover public dialogue on S&T issues (such as participatory exercises, reports). In addition, we found several examples of social media (especially blogs) being used to promote dialogue on science.[60]

Dominant Approaches: Open Data; Dialogue (Civil Society Led); Traditional Consultation; Public Outreach.

Key Organisations: The Expert & Citizen Assessment of Science & Technology (ECAST); Nanoscale Informal Science Education Network (NISE Net); University centres (eg Centre for Nanotechnology in Society, Arizona State University; NanoCenter, University of South Carolina); The American Association for the Advancement of Science (AAAS); Loka Institute; Woodrow Wilson International Center for Scholars, GeneForum; Meridian Institute; Foresight Institute; Science museums; America Speaks; NCDD; National Institutes of Health (NIH); Environmental Protection Agency (EPA); The National Academies; The Coalition on the Public Understanding of Science (COPUS).

Main Funders: National Science Foundation (NSF); Universities; Trusts and foundations (eg Alfred P. Sloan Foundation, Rockefeller Foundation, Pew Charitable Trusts).

[59] Interview with Richard Sclove, July 2010.

[60] See, for instance: Science Cheerleader (www.sciencecheerleader.com); Northwestern University Science in Society blog (blog.scienceinsociety.northwestern.edu/); Scientia Pro Publica, a bi-monthly 'blog carnival' (www.kindofcurious.com/2010/07/scientia-pro-publica-35.html); 2020 Science (2020science.org/)

Case study: National Citizens' Technology Forum 2008: Human Enhancement through Nanotechnology[61]

Table 8: 'Human Enhancement through Nanotechnology'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & Key Learnings**
Generate informed, deliberative public opinion and recommendations about the impacts and management of human enhancement technologies for elected officials, policy-makers, business leaders and others who will be making important decisions about these technologies. Demonstrate that average, non-expert citizens can understand complex issues and, with adequate information, come to informed judgments about those issues. Provide information to other concerned citizens about techniques that can enhance the abilities of ordinary citizens to influence public policy on important issues.[62]	Coordinated by the Centre for Nanotechnology in Society (CNS), Arizona State University; funded by the U.S. National Science Foundation**.**	A demonstrative project of large-scale, national-level public dialogue, applying the Danish consensus conference model. 6 local groups (New Hampshire, Georgia, Wisconsin, Colorado, Arizona and California), involving 90 people. Face-to-face deliberative meetings, combined with online interaction; produced 6 regional reports and a combined report circulated to government, industry, and the general public.	Lack of political impact because the project was not initiated in conjunction with government policy-making process. However, it was considered successful in terms of deliberation, critical evaluation of new technologies and opinion-formation. The participants' perceptions of their ability to engage in discussions on complex scientific matters ('internal influence') increased significantly, although their feeling of having influence over these issues in the wider world ('external influence') declined.[63]

[61] http://cns.asu.edu/nctf/
[62] http://www4.ncsu.edu/~pwhmds/
[63] Interview with David Guston, July 2010.

European Approaches

During the last twenty years, Europe has built up profound experience of citizen consultation on science and technology issues. This experience is based mainly on technology assessment activities in member states, while trans-national experiences have been limited. However, during the last five years the national experience has been supplemented with several examples of trans-European activities. These activities have utilised a multitude of participatory methods, tailored to specific issues, situations and contexts.[64]

The dialogue activity driven by the European Commission is large-scale, although the amount of public dialogue that is explicitly linked to S&T R&D appears to be more limited. Brussels is significant both in terms of promoting the Science and Society agenda at the European level, and in terms of funding participatory and research projects in and between member countries. This is currently done mainly under the Science and Society stream of the EU's Framework Programme 7.[65] Some of this funding is also intended to support closer connections between national parliaments and TA activities within countries, especially those with weaker structures in this field, such the Eastern European countries. The UK has also been quite active in supporting this agenda in the European Union.

Collaborative initiatives in public dialogue on S&T at the European level include: the PERARES programme which aims to strengthen the interaction between researchers, civil society organisations and citizens in Europe by organising both transnational and local debates on scientific research, building on the European Commission's continuing support for science shops across Europe[66]; the FUND project that stimulates the use of discussion games and other debate formats in European cities for the development of a scientific culture at the local level[67]; the Deliberative Citizens' Debates (DeCiDe) Project 2004-06[68]; the CIVISTI (Citizen Visions on Science, Technology and Innovation**)** project which aims to identify new, emerging topics for the EU's long-term R&D policy by consulting citizens in 7 European countries for their visions of the future[69]; or the CIPAST (Citizen Participation in Science and

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[64] Jacobi, A., Klüver, L., & Rask, M. (2009). *Relevant Research in a Knowledge Democracy: Citizens Participation in Defining Research Agendas for Europe* (paper for the conference 'Towards Knowledge Democracy, Consequences for Science, Politics and Media', Leiden, August 25-27, 2009). Available at: www.civisti.org/.../n_a_Knowledge_Democracy_-_paper_for_KD_Conf_.doc

[65] http://cordis.europa.eu/fp7/home_en.html

[66] http://www.scienceshops.org/new%20web-content/content/documents/PERARES%20info.pdf

[67] http://www.playdecide.eu/about/

[68] http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=430/; http://www.kopernik.org.pl/decide_project.php/

[69] http://www.civisti.org/

Technology) project 2006-07[70]. Some of these initiatives have focused on specific areas of science and technology, such as the Meeting of Minds project described below.

There are also many permanent networks in this field, such as the European Parliamentary Technology Assessment Network (EPTA), the ECSITE European network of science centres and museums[71], or the Living Knowledge international network of science shops[72].

European level case study: Meeting of Minds - European Citizens' Deliberation on Brain Science' (ECD) 2004-06

Table 9: 'Meeting of Minds'

Objectives	**Sponsors / Organisers**	**Methodology**	**Outcomes & key learnings**
Sought to incorporate opinions of European citizens in the broader political and public debate about neurological and cognitive research and the main social issues likely to arise from any new developments.	Coordinated by the King Baudouin Foundation of Belgium; Partners: the Rathenau Institute, the London Science Museum, Cité des Sciences et de l'Industrie (Paris) and the German Hygiene Museum, Dresden.	Consensus conferences with lay panels in nine European countries, involving 126 people over 2 years. The development of the method was an integral part of the project, aiming to set a standard for transnational public deliberations in other policy areas. Both external and internal evaluation, aimed at immediate learning, adjusting the participatory process and knowledge building.	Proved the feasibility, effectiveness and efficiency of public participation and deliberation activities at the European level (same method used for the European Citizens' Consultations on the future of the EU)[1]; created a valuable base for developing participatory TA at this level. Made recommendations to the Commission and the European Parliament. Meeting of Minds was "innovative and significant for European policy-making and as rewarding for all who had the opportunity to participate."[1] The laypeople who took part consider that "their personal expectations were highly congruent with the outcomes of the European conventions."

[70] http://www.cipast.org/

[71] http://www.ecsite.eu/

[72] http://www.scienceshops.org/index.php. The EC is currently studying ways to internationalise the science-shop model to increase public access to science; see http://www.nae.edu/nae/techlithome.nsf/weblinks/KGRG-55X5R7?OpenDocument

5. Overview

National Context and Political Culture

In any country, the forms and impacts of public dialogue and the institutions and structures naturally largely depend on the specific socio-political context and democratic culture in that country.[73] To a certain extent, an examination of the structure and form of public dialogue delivery organisations in individual countries 'mirrors' the socio-political context in each country.

Clearly, a well-established tradition of public dialogue as a core element of democracy in general will influence the degree of political commitment and investment in dialogue on S&T policy. For example, the tradition of strong local democracy in Denmark has influenced its approach to local/regional-focused debates on S&T-related issues, while at the national level, a single, independent TA institution has a prominent role.[74] Denmark has what Whiteside describes as a "historically rooted predilection for integrative processes"[75], while within the field of science and technology, the notion of 'democratising expertise' drives efforts to include public input into S&T policy-making and is the foundation of the work of the Danish Board of Technology.[76]

Similar approaches based on a large, government-funded but independent TA institution which have embraced deliberation using public dialogue and participatory activities to evaluate scientific and technological developments and prepare policy advice, are found in the Netherlands, Switzerland, Norway and Flanders.[77]

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[73] For the health of democracy in general, see Demos' Everyday Democracy Index (EDI): http://www.demos.co.uk/files/EDI_all%20chapters.pdf?1240939425. For example, Scandinavian countries have high EDI, but quite different practices for public dialogue on S&T. In general however, a distinction can be made between Northern and Western Europe on one hand, and Central, Eastern and Southern Europe on the other.

[74] Andersen, I.E. & Jaeger, B. (1999). Danish participatory models. Scenario workshops and consensus conferences: towards more democratic decision-making. *Science and Public Policy 26*(5), 331-340. Available at: http://www.tekno.dk/pdf/SPPoct99Andersen.pdf

[75] Whiteside, K. (2003). French Regulatory Republicanism and the Risks of Genetically Engineered Crops. *French Politics 1*(2), 153-174. Available at: http://www.palgrave-journals.com/fp/journal/v1/n2/pdf/8200032a.pdf

[76] Blok, A. (2007). Experts on public trial: on democratizing expertise through a Danish consensus conference. *Public Understanding of Science 16*(2), 163-182. Available at: http://pus.sagepub.com/content/16/2/163.full.pdf+html

[77] Seifert, F. (2003). Local steps in an international career: a Danish-style consensus conference in Austria. *Public Understanding of Science 15*(1), 73-88. Available at: http://pus.sagepub.com/content/15/1/73.full.pdf+html

The need for participatory TA seems to be more easily accepted in some countries than others where perhaps such structures are viewed as undermining the role of parliamentarians who perceive themselves as the legitimate representatives of the public. In France, for example, a state-centred approach to scientific governance remains dominant despite growing interest in participatory approaches over the last decade, and politicians themselves, without broader public input, conduct parliamentary TA. Thus, while there have been experiments in public dialogue activities in relation to new technologies, their policy impact has been minimal because of what Whiteside calls imbedded 'regulatory republicanism'.[78] Whiteside published his analysis of participatory processes in France in 2003, yet it would seem that in the proceeding seven years, French government commitment to public dialogue on S&T has remained weak.

Similar to France, in the US there are close links between the federal government, the scientific community and industry, with limited public input at the national level though more at the local level. However, as mentioned previously in the US summary, there is a sense that this may be changing with the advent of the new Obama administration – an example of just how integral the socio-political context is to public dialogue provision. In Holland, there is evidence of close relationships between scientists and politicians, but this does not exclude public participation as politicians often actively seek public input into policy processes. In the UK, despite government commitment to public dialogue, there is a need for more direct interaction between government officials, researchers and the public, even if the organisation of engagement activities is outsourced. When delivering dialogue, it is necessary to make sure activities are carefully framed and the relevant government actors are supportive so that public dialogue is not perceived as driven by private or other narrow interests.

In the UK, central government departments and agencies have often initiated public dialogue processes independently, and a wide variety of delivery organisations exist. As mentioned in the country-specific summary, the science community itself in the UK has also actively promoted increased public participation in science and technology. From our research it would appear that parts of the scientific community and government remain apprehensive about increased public scrutiny and are wary of compromising scientific freedoms. Yet in the UK, more so than in other countries, the push for greater public dialogue has come from within the science community itself.

[78] Whiteside, *supra* note 77.

A comparative study of consensus conferences[79] on genetically modified food in Denmark, France and the United States provides a helpful analysis of the role of the broader political system in defining the democratic potential and characteristics of participatory exercises. In actively inclusive systems such as Denmark, the government and other political actors promote citizen participation and dialogue, while in passively inclusive systems such as the US, the political processes are potentially open to public input but citizens have to find and use any channels of participation and influence themselves. In France's exclusive political system, such public exercises are initiated mainly for instrumental reasons, not because of any underlying commitment to participative policy-making. Therefore, "in actively inclusive Denmark, mini-publics are deployed in integrative fashion; in exclusive France, in managerial fashion; in the passively inclusive United States, in advocacy fashion".[80]

Consensus-based models have been successful beyond Danish borders and have been widely used in several European countries, the United States, Canada, Australia, New Zealand, South Korea, Japan and Taiwan.[81] It will be especially interesting to follow these developments in Asian countries, both in terms of their growing technological and scientific capacity, but also in terms of their potential for developing new and innovative approaches to the democratic governance of science, including participatory TA methods.[82] However there are difficulties, as Seifert has noted in the case of Austria, in the wholesale movement of a practice born in a country with a strong tradition of integrative and deliberative processes to a country with a markedly different socio-political context.[83] While participatory developments may appear similar in several countries, the contexts they take place in and the country-specific understanding and application of democracy, dialogue and decision-making impacts on their relative success.

Policy Impact

[79] Dryzek, J. & Tucker, A. (2008). Deliberative Innovation to Different Effect: Consensus Conferences in Denmark, France, and the United States. *Public Administration Review 68*(5), 864–876. Available at: http://deliberativedemocracy.anu.edu.au/documents/DryzekandTucker2005.pdf

[80] Ibid.

[81] Chen, D.S. & Deng, C.Y. (2007). Interaction between Citizens and Experts in Public Deliberation: A Case Study of Consensus Conferences in Taiwan. *East Asian Science, Technology and Society: an International Journal 1*(1), 77-97. Available at: http://www.springerlink.com/content/q3523j4575488621/fulltext.pdf

[82] Yamaguchi, T. & Suda, F. (2010). Changing Social Order and the Quest for Justification: GMO Controversies in Japan. *Science, Technology & Human Values 35*(3), 382-407. Available at: http://sth.sagepub.com/content/35/3/382.full.pdf+html

[83] Seifert, *supra* note 79.

As mentioned previously, the impact on policy in each individual country is difficult to evaluate. Issues may be framed in different ways, and some impacts may be unexpected or not 'noticed' or measured at all. In Denmark for instance, while the importance of the participatory activities organised by the Board of Technology is recognised, especially from the perspective of democratic deliberation, the actual policy impact of these projects is less clear. Several interviewees also mentioned what they perceive as a tendency in some government departments internationally to view engagement in instrumental terms, as something necessary to be able to implement decisions without an unequivocal commitment to respond to the public's views.

Evidently, while countries such as the Netherlands and Denmark clearly have well-developed mechanisms for engagement and sustained commitment to dialogue at different levels of decision-making, some scope for improvement has been identified, such as systematically embedding engagement across government and S&T institutions, and involving the whole range of civil society organisations in dialogue activities. The risk of complacency, of being satisfied with the status-quo, should always be recognised, as even established structures and commitment do not guarantee the continuation of embedded dialogue.[84]

These issues are closely related to wider questions about the principles and practices of democracy, for instance in terms of representative versus deliberative democracy whereby organised dialogue exercises can only ever include a limited number of participants. Moreover, the difficulty (and cost) of initiating and sustaining large-scale dialogues on science and technology issues which can be said to genuinely represent the views of the general public, and which have clear links to policy-making, is widely recognised.

The key question is not only how to 'discover' the public's voice (and who the public is), but also how to link that voice with the policy-making process with sufficient legitimacy. This question is beyond the scope of this paper, but we can again mention Dryzek and Tucker, who have discussed the potentials for linking specific 'mini publics' (ie those groups of citizens that make up consensus conference lay panels, public forums, citizen juries etc) to established electoral processes by more actively disseminating their judgements and recommendations to the broader public, especially through the media.[85] Furthermore, there are suggestions that we need more public debates which acknowledge the uncertainty inherent in novel S&T developments, and move away from traditional positional debate.

[84] Note, for example, the change in government in Denmark impacting on the position of the Board of Technology despite its pioneering role.
[85] Dryzek & Tucker, *supra* note 81.

Methodology and Key Actors

Several interviewees highlighted the importance of using the right method depending on the context in addition to being proactive and seeking to identify those affected by new developments in S&T at an early stage. However, some key questions surround this. For example, is it more useful to engage stakeholders initially? And when new technologies become widespread, is it best to actively involve the broader public? Tension exists between engaging the public on new, little-known issues and the difficulty this can cause versus the need to be open and have input as 'upstream' as possible in order to identify potential concerns and impacts. Tension also exists between the desire for openness and transparency and the need to provide a 'safe', confidential space for scientists, citizens and government actors to discuss contentious issues.

An interesting trend is the emergence of greater collaboration between actors from previously separate fields such as science and technology assessment, science communication, environmental advocacy and social research. This convergence and the relative strength of the various actors have had an impact on the methods and structures of public engagement internationally. For instance, the prominent role played by environmental organisations in the US, or by social science actors in the UK, has shaped the focus and approach of public dialogue activities. Several interviewees commented on how vital a multi-disciplinary approach to public dialogue is and how important it is to continue to strengthen the links between multiple actors.

There appears to be a trend of more unstructured dialogue and engagement outside of traditional engagement structures in some countries such as the UK or the Netherlands. In France this can also be perceived in the more active role given to/taken by NGOs in public engagement. Yet despite this diversification, the need remains for professional skills in organising and facilitating participation. Where there is no significant drive at government-level to increase public participation in S&T policy, it is often left to networks of interested actors, such as social scientists, engagement practitioners, research organisations, science museums, NGOs and others, to push the public dialogue agenda even in the absence of direct links to policy-making as in the case of the US.

While NGOs have been actively included as participants, civil society representatives or sometimes experts in dialogue activities in several countries, there are signs of a European

trend towards conducting more engagement and dialogue through civil society organisations who act as organisers and facilitators. Therefore, the scope for broader, bottom-up approaches is being recognised together with government-initiated dialogue. Although in several countries, such as the US and France, there are many prominent NGOs promoting public participation in policy-making and the opening up of governance structures generally, fewer groups are specifically focused on science and technology.

In countries with a central TA institution, systematic evaluation and assessment is often a crucial component of their activity, as it is seen as important in maintaining and improving the high quality of their work, which in turn is necessary for their political and societal influence. Yet a stated challenge lies in the lack of robust processes for evaluating and assessing public dialogue at national and international levels as well as a lack of information-sharing. Several interviewees mentioned that a significant amount of learning and experience has been accumulated over the years regarding the various approaches and methods of participation, in different areas and sectors and by different actors, but that it is not capitalised on sufficiently by current governments, researchers and practitioners. The lack of proper structures and planning for evaluating and reflecting on public participation in science and technology is often contrasted with rigorous and well-developed structures and practices for evaluating scientific research itself such as the peer review system. This is linked to a lack of appropriate training on the key principles, methods and perspectives on deliberative democracy for actors involved in public dialogue activities, which was identified specifically as a concern in France.

Perhaps something could be learned in this instance from the transnational level, where actors such as the OECD or the European Science Foundation actively encourage strong communication, including sharing practice and learning between national governments, the European Commission and science institutions. In the UK, academics and think-tanks such as Involve do carry out evaluation of engagement activities, and all Sciencewise-ERC projects are evaluated and their results shared on a national basis. Systematic dissemination of the results of any evaluations at a trans-national level is needed in order to share best practice.

The Media

In the UK the trend of opening up government and public sector data and increasing transparency can be seen as a reaction to what Andersen et al describe in the UK context as a

'crisis of trust' in science and science policy.[86] The significance of the media in reaching wide audiences and the need to have a proactive, long-term, strategic approach to working with the media was emphasised by most of our interviewees. Working closely with the media at the earliest possible juncture 'upstream' significantly reduces the risk of negative and heightened coverage of S&T issues while encouraging deeper public consideration. However, a number of our interviewees acknowledged the 'catch-22' of wanting to engage the media before the emergence of controversy, and the media's need for controversial and newsworthy content. As Petersen et al indicate, the media is situated 'at the interface between scientists and lay publics' and therefore has the potential to play a 'significant role' in public engagement.[87] However, there is a need to go beyond simplistic calls for 'greater' media involvement. Experience in the UK suggests that even with background media interest (e.g. in nano-science) such new and undefined S&T arenas can fail to capture widespread public interest. This raises two key questions when moving forward:

- Is controversy necessarily a bad thing?
- Do we need large numbers of the public involved?

In countries such as the Netherlands and the UK, the media does have a significant and active role as organisers or sponsors of participatory activities. Furthermore, in countries with established and prominent TA institutions, it was found that the media quite regularly covers participatory activities (especially the larger-scale processes) as well as reports and recommendations produced. Political support is inextricably linked to the strength of media involvement and interest. Put simply, if politicians are not interested then it is unlikely that the media will be and vice versa. This strengthens the argument for countries to have a prominent TA institution as the creation of such an agency supported and listened to by politicians would help foster media interest, furthering political interest, and therefore maintaining public interest.

Apprehensions remain concerning the role of the media in manipulating public views, and reducing complex issues into simple for/against questions without encouraging deeper consideration and deliberation. Such 'fear' of the media may run the risk of prompting scientists to remain quiet about their work and related impacts. 2009's so-called 'Climategate' scandal was, according to Jasanoff, widely regarded by scientists 'as a blow to years of

[86] Peterson A., et al. (2009). Opening the black box: scientists' views on the role of the news media in the nanotechnology debate. *Public Understanding of Science 18*, 512-530. Available at: http://pus.sagepub.com/content/early/2008/10/01/0963662507084202.full.pdf+html
[87] Ibid.

international consensus-building on climate science'.[88] In the face of such intense global, and often negative, coverage, perhaps scientists' reluctance to stand under the media spotlight can be understood. Yet the only way to combat public distrust of governments and scientists internationally is to have high-level, wide-reaching interactive upstream public dialogue processes that engage media interest.

Public dialogue on S&T needs allocated resources to create and maintain media contacts, as well as to ensure that results of public dialogue processes are disseminated as widely as possible. In an era of global cutbacks, online tools and their low cost compared to possible audience capture has piqued significant interest from public dialogue providers internationally.

Social Media and Online Tools

Rapid developments in information technology (itself often the focus on dialogue activities), has increased interest in utilising these methods for public dialogue, especially in light of decreasing resources available for engagement.

In addition to its potential to capture large audiences quickly, cheaply and easily, online tools and especially social media can provide opportunities for bottom-up, unstructured dialogue as well as more organised consultation. There nevertheless exist major questions as to the quality of 'engagement' delivered by the internet, particularly in terms of its ability to build relationships between diverse publics or create consensus, which is a major concern for many of the practitioners in North America, Scandinavia and the UK.

Traditional S&T engagement initiatives that have used online tools in their process include: the National Citizens' Technology Forum in the US; the Grenelle Environnement roundtable in France; and the international World Wide Views on Global Warming. Responses to the use of social media have varied. In the US it was found that although the quality of internet-mediated deliberation was very different from person-to-person dialogue, it could not be said to be inferior.[89] On the other hand, initiatives in Switzerland and Germany involving the use

[88] Jasanoff, S. (2010). A New Climate for Society. *Theory, Culture & Society 27*(2), 233-253. Available at: http://tcs.sagepub.com/content/27/2-3/233.full.pdf+html
[89] Interview with David Guston, July 2010.

of online tools for engagement resulted in low response rates in light of the expected numbers of participants.[90]

Some of our interviewees view social media and digital tools very clearly as the future of public dialogue, as more and more discussions and debates are taking place online. It was felt that online tools are useful for bottom-up activities and the creation of open forums for debate. Other interviewees are wary about the lack of transparency and in-depth deliberation involved in only using online methods. Concerns include the sense that online tools can produce self-selected participants (specifically certain interest groups), are not personal enough, and may produce different reactions from face-to-face dialogue. There are also important questions around professionalism, representativeness, quality control, and the general rigour of online methods.

Despite these concerns, the use of the internet and social media is growing, more debates are taking place online, and citizen activity is increasingly being organised through the internet. Our research found clear indications of enthusiasm for exploring and developing online tools further. However, supporters of online tools also recognise that face-to-face deliberation cannot be completely replaced. A central challenge identified is how to integrate face-to-face and online successfully.

[90] Interviews with Sergio Bellucci and Norbert Steinhaus, July/August, 2010.

6. Recommendations

The purpose of this section is to outline specific recommendations to Sciencewise-ERC. In particular, the following recommendations have been founded on placing the UK in a relative international context (as summarised in Table 1); understanding what is working, such as: government support, embeddedness of dialogue, investment, government commitment to transparency, and diversity of providers; and what is not working: negative news stories linked to large social research businesses, the high cost of some national dialogues, low scale of public involvement, and formal engagement with parliament. We also touch on the opportunities for the UK in going with the grain of political priorities by, for instance, developing approaches around data and transparency, or framing dialogue as a key pillar of this.

Throughout the research one recommendation was raised time and again and forms a central part of this section: to create a government-backed but independent **National S&T Engagement Institution**. The role of government-funded technology assessment institutions (such as the Danish Board of Technology and the Dutch Rathenau Institute), would appear to be crucial in terms of six central factors:

- Building on the work of Sciencewise-ERC in creating institutional memory to capture experience and best practice
- Developing resource-efficient solutions (what we call 'third generation engagement')
- Creating and professionalising S&T engagement
- Providing a national focus for S&T engagement (somewhere for the media, politicians and the public to go)
- Creating a parliamentary link between elected representatives and the public on S&T matters
- Focusing on and developing opportunities for using social media to harness open government and transparency.

1. Create a government-backed but independent national S&T engagement institution

Effective TA organisations such as the Danish Board of Technology and the Rathenau Institute actively organise and support a wide range of dialogue activities often in collaboration with other actors, while systematically monitoring and evaluating existing practices. In addition, they provide direct channels to decision-making through, for example, policy recommendations or public hearings, and are able to develop strong links with the media.

Where these institutions are well-resourced, have a clear mandate, a well-established process for policy advice, and high standards of methodological quality and transparency, they can help drive public participation on S&T, and can have a direct impact on policy. Therefore, there is value in having strong public institutions as the 'owners' (not merely sponsors) of public engagement projects in order to make sure these activities, their objectives and results remain open and transparent, combined with a clear commitment from relevant policy departments.

The UK is currently establishing a centralised focus where the knowledge, experience and learning developed over time through various public dialogue projects and activities is held. Although Sciencewise-ERC is well placed and has been very effective in developing a range of innovative methodologies and embedding these into specific national policy programmes, it lacks dedicated full-time staff or a figurehead.

Lars Klüver, the director of the Danish Board of Technology (DBT) believes it is the staff of that institution, and its role in creating 'professionals' in science and technology policy and engagement, that is critical. He believes it takes a minimum of five years to become a professional; "It's no good just knowing about policy or engagement, you must have experience in both and the ability to combine them"[91]. According to Klüver, before the DBT was created either civil servants or academics were carrying out this work in Denmark, neither of whom had the necessary practical skills.

The other reason why Klüver recommends an institutional solution is to provide a focus for national attention with an explicit networking function. Networking and creating a coherent sector is incredibly hard to do. For example, when Involve was set up four years ago, we wanted to network the participation sector but without centralised resources for the task it was

[91] Klüver, L., quoted in Wilson, R. (2009). *Let's follow the Danes*. People & Science, June 2009. Available at: http://www.britishscienceassociation.org/NR/rdonlyres/A3C3D4DA-F0EE-4AFE-B2FE-2D0723B23BE4/0/Twoviews.pdf; p. 14.

very hard to deliver. According to Klüver, this networking function underpinned by central government funds has been central to the Board of Technology's success, but he warns that "to network well you have to live and breathe this stuff, you have to care about the policy and the practice. Running an organisation like the DBT never works if it's just a job - it must be a mission as well"[92].

Such an organisation should also encourage collaboration and information sharing, providing training, resources and other support for those wishing to carry out engagement projects, and collating data on the results and evaluations of such projects.

We would recommend a mixed-funding base consisting of some central resources to cover difficult areas to fund, such as parliamentary links and core costs. This approach would help to support an autonomous organisation not beholden to one particular funder. In addition, a mixed funding base would ensure that the centre's existence did not depend on the vagaries of incumbent governments. It would clearly be critical to constitute the new entity in a way which prioritised its institutional integrity and credibility.

It is envisaged that the proposed entity would fill gaps we currently find in the UK, by:

1.1 Building on the work of Sciencewise-ERC in creating institutional memory to capture experience and best practice

This would happen through providing an administrative function for gathering and sharing experience. It would also focus on supporting collaboration between actors across the UK.[93] Existing links need to be strengthened and new links forged. In the UK's case, a centralised national institution would help to bring together different actors under one umbrella organisation.

From the experience in other countries, active collaboration with the media stands out as a key element to good public dialogue. In the UK, there are already some cases of media outlets actively participating in S&T dialogue activities, but there is something to be said about the more general role of the media and 'public journalism' in actively supporting and promoting

[92] Conversation with Lars Klüver, May 2009.

[93] This echoes the recommendations by other organisations, such as the NEG's practical lessons for public engagement in science and technology (see *supra* note 54), or the Rathenau Institute's 10 lessons for a nanodialogue for governments, see http://www.rathenau.nl/en/publications/ten-lessons-for-a-nanodialogue-1.html

informed, balanced and reflective public debate on important issues as a cornerstone of healthy democracy.[94] Especially in the light of the Climategate scandal, involving the media as partners early on could be seen as critical, although there is need for further consideration of how such relationships should best be built.

1.2 Innovation (such as developing resource efficient solutions)

The UK has been especially innovative in recent years in the field of S&T public dialogue; however, the contemporary 'cash-strapped' environment demands fresh thinking in order to consider how we can move to citizen-led initiatives that do not rely on expensive consultants. Some ideas around this are outlined in what we have called 'Third Generation Engagement'.[95]

1.3 Creating and professionalising S&T engagement

The lack of adequate training for the key actors involved in public dialogue was identified as a key challenge in some countries. While there is no doubt that outsourcing dialogue can produce excellent results and well-considered inputs into policy-making, it is important to ensure that those who organise and implement engagement have the necessary training. In terms of the UK, the creation of a national institution would mean less outsourcing to individuals who, while competent and professional, have perhaps not had enough time to develop an in-depth understanding of the complexities and nuances of S&T public dialogue processes. In particular, there is a need for developing individuals who have skills in both engagement and S&T policy, while at the same time allowing enough flexibility for different actors to support innovation.

1.4 Providing a national focus for S&T engagement (somewhere for the media, politicians and the public to go)

Having a central 'hub' for S&T engagement would not only help to develop relevant expertise and share best practice, it would also act as a broader source of information, support and advice for politicians, civil society organisations, the media and the public, helping to

[94] Peterson et al, *supra* note 88.
[95] See http://www.izweproject.com/2010/05/third-generation-engagement-3ge/

promote a culture of openness and dialogue in the field of S&T policy and in political processes more generally.

A national institution also provides a focus for the international community, helping to forge new international links while strengthening existing relationships. A national institution will allow for innovation and development on an international scale, ensuring best practice is shared and communication strengthened, resulting in greater cross-border collaboration and skill sharing.

1.5 Creating a parliamentary link between elected representatives and the public on S&T matters

Having a permanent channel of consultation and communication between parliamentarians and the public would significantly improve public trust in the governance of science and technology, support existing democratic channels and provide politicians with direct access to public opinion. A national institution could, in the right circumstances and with enough political support, guarantee that public dialogue has policy impact.

2. Other Opportunities

2.1 Supporting direct dialogue between government officials and the public

There is a need to maintain pressure on both government and the scientific community to genuinely engage the public beyond mere opinion research. Especially civil servants and policy-makers could seek to ‘do dialogue' themselves and experiment more, with the support of organisations such as Sciencewise-ERC, instead of relying too much on second-hand information. There is value in policy-makers listening and being involved directly so that the public can witness their views being taken seriously.

2.2 Openness and transparency

Developing approaches which support transparency/harness newly available data

New approaches which are explicitly concerned with making government easier to scrutinise and understand should be developed. In particular, working with social media to both make S&T information more easily accessible but also discussed in ways which improve the policy engagement processes would be worth exploring.

Frame current practice as transparency-making

There is an inherent danger in the current drive towards more direct forms of democracy, which is at the heart of some of the fashionable approaches to transparency such as 'Open Data'; namely that the more dialogic forms of engagement are left to one side. We would encourage Sciencewise-ERC to position engagement as an essential ingredient of the transparency-making process.

Make processes more transparent

While there has been a trend internationally towards greater openness, there is still scope to be more explicit and transparent. This is important in terms of individual dialogue exercises, as transparency regarding the aims, methods and expected uses of engagement will help to foster public trust and manage expectations. It is also important at a broader level, as openness can be seen as a key element of constructive public dialogue, and because it will contribute to effective learning and reflection. Both at the national and the international levels, a more systematic dissemination of the results of evaluations of dialogue activities is

needed in order to share and further develop best practice. Existing channels of communication and networks of dialogue commissioners and practitioners could be strengthened and built upon to strengthen transparency and learning internationally.

2.3 Make better use of social media

The cost pressures and increasing internet penetration and innovation will ensure that social media and other internet-based applications become an ever more important element of the science-engagement mix.

Our research suggests three central areas for exploration and focus:

- Data engagement
- Dialogue
- Online supporting offline

Data Engagement: the internet provides new ways of making difficult scientific material easier to engage with[96] without having to rely on media partners which has, in the past, been a challenge. As more and more data is made available online, the opportunities for this are likely to grow dramatically.

Dialogue: although the internet's ability to support high quality dialogue is far from clear, its ability to engage large numbers of people in their own homes combined with the convergence of third-generation mobile devices (i-Pads, smart phones etc) and higher broadband speeds will make dialogic activities ever easier and cheaper. The quality and potential impact of internet-based approaches should be explored further.

Social media provides especially good opportunities for harnessing and channelling civic energy already expressed in online communities and forums to much more focused dialogues with clear links to policy-making. At the same time, the unstructured nature of many online debates should be appreciated, and new ways of using them to support and complement structured engagement processes, both online and offline, should be explored. If social media tools are indeed increasingly adopted by the organisers of public dialogue, careful attention should be paid to the questions of representativeness, bias, self-selection, transparency, quality of deliberation and follow-up.

[96] See, for example, the online tools used by the European Environment Agency: http://www.eea.europa.eu/data-and-maps/explore-interactive-maps/eye-on-earth; http://www.eea.europa.eu/data-and-maps

Online Supporting Offline: this is an area of particular interest in the UK where there has been a suggestion of costs being reduced through a lower reliance on professional 'engagement' organisations, and higher use of organisations embedded in the community, such as the voluntary sector. The internet could provide a vehicle for supporting such engagement.

2.4 Strengthen international collaboration

The need for strengthening international structures of democratic governance of S&T, including structures for public dialogue and input, was identified as a key challenge in light of the rapid development and spread of new scientific and technological developments. When the regulation of these developments and related issues such as environmental protection and sustainability is increasingly carried out at the supra-national level, the need for developing international mechanisms and avenues for public deliberation and input is growing. In addition, the drive to reduce costs can also be seen at an international level, with increasing focus on exploring the use of cooperative models and new information technologies for public dialogue, including cross-border dialogue.

Sharing learnings and experiences across borders and developing effective channels for cooperation can help individual countries and committed actors in those countries struggling to create meaningful dialogue: "the more we exchange what is happening in different countries in Europe, the more we have opportunities to learn, to imagine, to elaborate new visions"[97]**.** The UK could therefore benefit from sharing its innovative practice more actively with others, and in turn learning from new approaches elsewhere.

2.5 Investment and innovation

The continuing rapid development of new scientific and technological discoveries and applications will undoubtedly create new challenges in the future, including the risk of new 'crises in public trust' in the governance of S&T. There is therefore a need for ongoing investment to use and strengthen existing models and channels of dialogue, as well as a long-term vision that takes into account unexpected developments and seeks to develop new

[97] Interview with Jean-Pierre Alix, June 2010.

approaches. This in turn will require ongoing, genuine and broad political commitment to using public dialogue as a standard element in new S&T development.

2.6 Statutory commitment

At present, it is not compulsory by law to carry out public dialogue on science and technology research. There is a need for an international convention similar to the Aarhus convention[98] but stronger. While the main focus of the Aarhus Convention is the environment, it can also be interpreted to apply to scientific and technological developments. However, this is not enough. There is need to have a binding, international agreement explicitly linked to S&T and applicable at both national and international levels.

2.7 Future research

Future research topics could include the relationship between the wider debates on the nature and state of democracy in the UK and public engagement on science and technology. A valuable line of enquiry could be investigating the potential for a more proactive role for civil society actors and/or the media in public dialogue; as well as the effects of specific methodologies, structures and locations on the outcomes of dialogue and engagement exercises.

It would also be useful to consider what the global recession means for public dialogue on S&T in the UK, specifically in relation to the trend of professionalisation and commercialisation. Finally, the use of social media is an important area to explore with a view to developing more representative, collaborative and flexible models of public dialogue.

[98] See http://www.unece.org/env/pp/

References

Andersen, I.E. & Jaeger, B. (1999). Danish participatory models. Scenario workshops and consensus conferences: towards more democratic decision-making. *Science and Public Policy 26*(5), 331-340. Available at: http://www.tekno.dk/pdf/SPPoct99Andersen.pdf

Anderson, C. (2009). *Free: The Future of a Radical Price: The Economics of Abundance and Why Zero Pricing is Changing the Face of Business.* London: Random House.

ARD-DeutschlandTrend (2010). *Mehrheit für mehr direkte Demokratie* ('Majority in favour of more direct democracy'; online news article). Available at: http://www.tagesschau.de/inland/dtrend482.html

Blok, A. (2007). Experts on public trial: on democratizing expertise through a Danish consensus conference. *Public Understanding of Science 16*(2), 163-182. Available at: http://pus.sagepub.com/content/16/2/163.full.pdf+html

Bowman, D. & Hodge, G. (2007). Nanotechnology and Public Interest Dialogue: Some International Observations**.** *Bulletin of Science, Technology & Society 27*(2), 118-132. Available at: http://bst.sagepub.com/content/27/2/118.full.pdf

Chen, D.S. & Deng, C.Y. (2007). Interaction between Citizens and Experts in Public Deliberation: A Case Study of Consensus Conferences in Taiwan. *East Asian Science, Technology and Society: an International Journal 1*(1), 77-97. Available at: http://www.springerlink.com/content/q3523j4575488621/fulltext.pdf

Chilvers, J. (2010). *Sustainable participation? Mapping out and reflecting on the field of public dialogue on science and technology.* Harwell: Sciencewise Expert Resource Centre. Available at: http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Strategic-Research-documents/Sustainable-Participation-report-03-10.pdf

Council for Science and Technology (2005). *Policy through dialogue: informing policies based on science and technology* (report). London: CST. Available at: http://www.bis.gov.uk/assets/bispartners/cst/docs/files/whats-new/05-2180-policy-through-dialogue-report.pdf

Crettaz von Roten, F. & Moeschler, O. (2008). *Les scientifiques dans le cite: Cultures disciplinaires et engagement public* (research report). Lausanne: Université de Lausanne. Available at: http://www.unil.ch/webdav/site/osps/users/oglasse1/public/Rapport_SDCfinal3.pdf

Dryzek, J. & Tucker, A. (2008). Deliberative Innovation to Different Effect: Consensus Conferences in Denmark, France, and the United States. *Public Administration Review 68*(5), 864–876. Available at: http://deliberativedemocracy.anu.edu.au/documents/DryzekandTucker2005.pdf

Gavelin, K., Wilson, R., & Doubleday, R. (2007). *Democratic technologies? The final report of the Nanotechnology Engagement Group (NEG).* London: Involve. Available at: http://www.involve.org.uk/assets/Publications/Democratic-Technologies.pdf

Guston D. & Sarewitz, D. (2002). Real-Time Technology Assessment. *Technology in Society 24*(1), 93-109. Available at: http://www.hsph.harvard.edu/disasters/articles/realtime_assessment.pdf

Hanssen, L., Walhout, B., & van Est, R. (2008). *Ten lessons for a nanodialogue: The Dutch debate about nanotechnology thus far* (TA-report 0802). The Hague: Rathenau Institute. Available at: http://www.rathenau.nl/uploads/tx_tferathenau/Ten_lessons_for_a_nanodialogue_2008_01.pdf

Hashimoto, H. (2007). *Efforts to Regulate Cultivation Regarding Genetically Modified Crops in Hokkaido* (speech by the Director of the Food Policy Division for the Government of Hokkaido, April 19, 2007). Available at: http://www.gmo-free-regions.org/fileadmin/files/gmo-free-regions/Hashimoto_speech.pdf

Heierbacher, S. (n.d.). *A study of official Danish technology assessment activities* (draft case study). Available at: http://www.co-intelligence.org/P-ConsensusConference2.html

HM Treasury (2004). *Science and Innovation Investment Framework 2004-2014.* London: HM Treasury. Available at: http://news.bbc.co.uk/nol/shared/bsp/hi/pdfs/science_innovation_120704.pdf

Horlick-Jones, T. et al (2004). *A Deliberative Future? An Independent Evaluation of the GM Nation? Public Debate about the Possible Commercialisation of Transgenic Crops in Britain, 2003.* Understanding Risk Working Paper 04-02.

Horst, M. & Irwin, A. (2009). Nations at Ease with Radical Knowledge: On Consensus, Consensusing and False Consensusness. *Social Studies of Science 40*(1), 105-126. Available at: http://sss.sagepub.com/content/early/2009/09/24/0306312709341500.full.pdf+html

Jackson, R., Barbagallo, F., & Haste, H. (2005). Strengths of Public Dialogue on Science-related Issues. *Critical Review of International Social and Political Philosophy 8*(3), 349-358. Available at: http://www.informaworld.com/smpp/content~db=all~content=a723615608~frm=titlelink

Jacobi, A., Klüver, L., & Rask, M. (2009). *Relevant Research in a Knowledge Democracy: Citizens Participation in Defining Research Agendas for Europe* (paper for the conference 'Towards Knowledge Democracy, Consequences for Science, Politics and Media', Leiden, August 25-27, 2009). Available at: www.civisti.org/.../n_a_Knowledge_Democracy_-_paper_for_KD_Conf_.doc

Jasanoff, S. (2010). A New Climate for Society. *Theory, Culture & Society 27*(2), 233-253. Available at: http://tcs.sagepub.com/content/27/2-3/233.full.pdf+html

Jensen, C.B. (2005). Citizen Projects and Consensus-Building at the Danish Board of Technology: On Experiments in Democracy. *Acta Sociologica 48*(3), 221-235. Available at: http://asj.sagepub.com/content/48/3/221.abstract

Kass, G. (2001). *Open Channels: Public dialogue in science and technology* (Parliamentary Office of Science and Technology Report No. 153). London: POST. Available at: http://www.parliament.uk/documents/post/pr153.pdf

Marris, C. (2010). Briefing paper on French and Dutch dialogue initiatives (not published).

Ministry of Ecology, Energy, Sustainable Development and Sea (2007). *Le Grenelle Environnement: Consultation figures*. Available at: http://www.legrenelle-environnement.fr/IMG/pdf/ChiffresConsultation_EN.pdf

Ministry of Food, Agriculture and Fisheries, Denmark (2009). *GMOs - what's in it for us?* (summary of a fact report). Copenhagen: Ministry of Food, Agriculture and Fisheries. Available at: http://www.fvm.dk/GMO.aspx?ID=42573

Nishizawa, M. & Renn, O. (2006). Responding Public Demand for Assurance of Genetically Modified Crops: Case from Japan. *Journal of Risk Research, 9*(1), 41-56. Available at: http://www.americanwildfoods.com/applications/DocumentLibraryManager/upload/pdf28.pdf

OECD Global Science Forum (2009). *Improving the Dialogue with Society on Scientific Issues* (final report). Paris: OECD. Available at: http://www.oecd.org/dataoecd/18/37/42887346.pdf

Parliamentary Office of Science and Technology (2006). *Debating science* (Postnote No. 260, March 2006). Available at: http://www.parliament.uk/documents/post/postpn260.pdf

Peterson A., et al. (2009). Opening the black box: scientists' views on the role of the news media in the nanotechnology debate. *Public Understanding of Science 18,* 512-530. Available at: http://pus.sagepub.com/content/early/2008/10/01/0963662507084202.full.pdf+html

Research Councils UK (2009). *US approaches to engaging the public in the outcomes of research* (briefing paper). Washington DC: RCUK US Office.

Seifert, F. (2003). Local steps in an international career: a Danish-style consensus conference in Austria. *Public Understanding of Science 15*(1), 73-88. Available at: http://pus.sagepub.com/content/15/1/73.full.pdf+html

Shiroyama, H. (2009). *Innovation and Institutionalization of Technology Assessment (TA) in Japan: Experimental Practices on Nanotechnologies* (presentation). Available at: i2ta.org/files/EPTA_DirectorsMeeting_20090425.ppt

Skidmore, P. & Bound, K. (2008). *The Everyday Democracy Index*. London: Demos. Available at: http://www.demos.co.uk/files/EDI_all%20chapters.pdf?1240939425

Smith, S. (2010). *Public engagement by researchers* (online article). Available at: http://vitae.ac.uk/272401/Public-engagement-by-researchers.html

Stilgoe, J. (ed) (2009). *The Road Ahead: Public Dialogue on Science and Technology*. Harwell: Sciencewise Expert Resource Centre. Available at: http://www.sciencewise-erc.org.uk/cms/the-road-ahead/

Suzuki T., Yoshizawa G., & Shiroyama H. (2009). *Technology Assessment (TA) in Japan: Experiences and Future Prospects for Institutionalization* (presentation). Available at: i2ta.org/files/4S_20091029.ppt

The Danish Board of Technology (2005). New GM plants – new debate: The final document of the citizens' jury (report). Copenhagen: Danish Board of Technology. Available at: http://www.tekno.dk/pdf/projekter/p05_gmp_citizens_document.pdf

The Swiss Centre for Technology Assessment (2006). *Citizens' Survey: Lay thinking about nanotechnologies and what follows from it* (media briefing). Available at: http://www.ta-swiss.ch/a/nano_pfna/061211_MI_pfNanotechnologien_e.pdf

The Swiss Centre for Technology Assessment (2006). *Public Reactions to Nanotechnology in Switzerland: Report on publifocus discussion forum 'Nanotechnology, Health and the Environment'* (TA-P 8/2006 e). Bern: TA-SWISS. Available at: http://www.ta-swiss.ch/a/nano_pfna/2006_TAP8_Nanotechnologien_e.pdf

The Swiss Centre for Technology Assessment (2010). *Jahresbericht 2009* (Annual report). Bern: TA-SWISS. Available at: http://www.ta-swiss.ch/a/doku_weit_jahr/2009_JB_df.pdf

Van Est, R., Walhout, B., & Hanssen, L. (2008). *10 lessons for a nanodialogue: How to be deadly serious and still have serious fun.* The Hague: Rathenau Institute. Available at: http://www.rathenau.nl/uploads/tx_tferathenau/Ten_lessons_for_a_nanodialogue_-_How_to_be_deadly_serious_and_still_have_serious_fun_-_Rathenau_Institute_2009_01.pdf

Whiteside, K. (2003). French Regulatory Republicanism and the Risks of Genetically Engineered Crops. *French Politics 1*(2), 153-174. Available at: http://www.palgrave-journals.com/fp/journal/v1/n2/pdf/8200032a.pdf

Wilsdon, J. & Willis, R. (2004). *See-through Science: Why public engagement needs to move upstream*. London: Demos. Available at: http://www.demos.co.uk/files/Seethroughsciencefinal.pdf?1240939425

Wilson, R. (2009). *Let's follow the Danes*. People & Science, June 2009. Available at: http://www.britishscienceassociation.org/NR/rdonlyres/A3C3D4DA-F0EE-4AFE-B2FE-2D0723B23BE4/0/Twoviews.pdf

Wooding, S., Scoggins, A., Lundin, P., & Ling, T. (2005). Talking Policy: An examination of public dialogue in science and technology policy (a report prepared for the Council for Science and Technology). Santa Monica: RAND Corporation. Available at: http://www.rand.org/pubs/technical_reports/2005/RAND_TR268.pdf

Wright, R. (2001). *Nonzero: The Logic of Human Destiny*. New York: Vintage.

Yamaguchi, T. & Suda, F. (2010). Changing Social Order and the Quest for Justification: GMO Controversies in Japan. *Science, Technology & Human Values 35*(3), 382-407. Available at: http://sth.sagepub.com/content/35/3/382.full.pdf+html

Yoshida, S. & Matsui, H. (2007). *Social Aspects of the Regulation of GM Crops in Hokkaido - Attempts to Redesign of the Risk Communication* (presentation for the 'Tailoring Biotechnologies' Conference, Kyoto, November 3, 2007). Available at: http://www.tailoringbiotechnologies.com/Kyoto2007/Seiko_Yoshida_Matsui_ppt.pdf

Yoshizawa, G. (2010). *Third Generation of TA: Concept and Practice* (presentation at Science and Technology Policy Research Unit, University of Sussex, January 15, 2010). Available at: http://i2ta.org/files/SPRUseminar_20100115.pdf

Appendix

Third Generation Engagement (3GE)

In this paper we explore the history of participation and engagement and propose that new Third Generation Engagement is emerging as the exemplar of good practice.

A New Decade

At the start of the new decade, just as it was at the start of the new millennium, our democracies are seen to be left wanting. Here in the UK the MPs expenses scandal has highlighted serious concerns over the legitimacy of our national parliament. Perhaps more gravely still, in Copenhagen our international democratic structures have again failed to deliver a deal to protect the global environment. In both cases it is the systems and processes of government that have been exposed as being unfit for purpose.

2000s

At the turn of the millennium the concern was of a rapid disintegration of the traditional forms of civil society which had until then held together our politics and society. Be it the globally plummeting membership of political parties and electoral turnout, or the collapse of traditional membership organisations such as sports clubs, scouts, guides or community charities. In this new environment the link between us and our leaders became very unclear, and fears mounted as to the legitimacy of any government operating against the rising tide of apathy and disinterest.

These concerns, many of them as old as democracy itself, did not go unheeded. The last decade or so has seen an extraordinary global movement experimenting and reflecting on how to rejuvenate our politics and reconfigure it to meet the challenges we now face. Bound by the internet, there is now a global community which develops, shares and adapts new processes. From e-petitions to participatory budgeting, citizen summits to hyper-local social networks, new technology, new social trends and new challenges are forging new relationships between citizens and state.

This is not a defined sector or movement as such, it is people rising to the challenge. The last decade has been especially rich in improving our understanding of the problem, if not the solution. We now better understand power and empowerment. We know that; build it, and not everyone will come. Global government is littered with examples of web 2.0 projects that

didn't capture peoples' imagination and community meetings where no one turned up. We now better understand the intense everyday time pressures that most people face, and how we as democratic pioneers must compete in the fierce market for time, making offers every bit as engaging as the latest movie, video game or magazine article. Many find politics boring and that is a challenge, but it is better to rise to that challenge than ignore it or worse, frame society as 'apathetic' – when was the last time you gave up a weekend for politics? We also now know that new infrastructure and approaches create new opportunity.

The Long View

Taking the long view, the trend towards increased participation and collaboration is as old as time itself. As societies have become bigger and more complex, they have generated new forms of information and communication technology which have revolutionised how people interact and work together. From script, to paper, to the printing press and finally the internet, all have facilitated great leaps in collaboration and participation. Critically, these methods have created new and often unforeseen opportunity.[99] The point being that we are undoubtedly in the midst of another great revolution in participation and we need to be flexible enough to respond to the unpredictable opportunities that will emerge.

1930s & the Opinion Poll

Many today are making comparisons between now and the 1930s, but the comparison goes beyond the economic hardship of that time. The 1930s was a period of great innovation, especially in statistics and participation. In 1936, George Gallup correctly predicted Roosevelt's landslide victory and the modern poll was born. And it was following the crash of the 1930s that GDP was first calculated to account for the information scarcity that existed at the time.

In sharp contrast to the 1930s when Gallup invented the modern opinion poll, we now experience information overload rather than scarcity. IBM predicts that by 2010, the amount of information available online will double every 11 hours.[100] The ICT revolution is not limited to the West but is having a profound effect across the world. As the price of computers and mobile devices[101] plummet and internet access accelerates, it is enabling many

[99] Wright, R. (2001). *Nonzero: The Logic of Human Destiny*. New York: Vintage.

[100] See: http://www.ibm.com/smarterplanet/uk/en/business_analytics/visions/?ca=content_rn&met=uk_ideas_smarterplanet

[101] We recently had the first $100 laptop which for many years has been seen as a key step in the democratisation of the web.

of the most isolated communities to become connected to each other and to global markets and media.

The Move to Free

Link to this the high and accelerating availability of software and other digital media (such as music and film) for free[102] with the global acceleration of computing access and the very different models of copyright law and regulation practiced around the world and you have a powerful force for change.

These are changes that have already sent many well established newspapers and record labels to the receivers. The statistics sector is of course at the sharp end of this change; being affected both by increasing opportunities to create data quickly and cheaply, but also by trends towards transparency, making once private data more widely available.

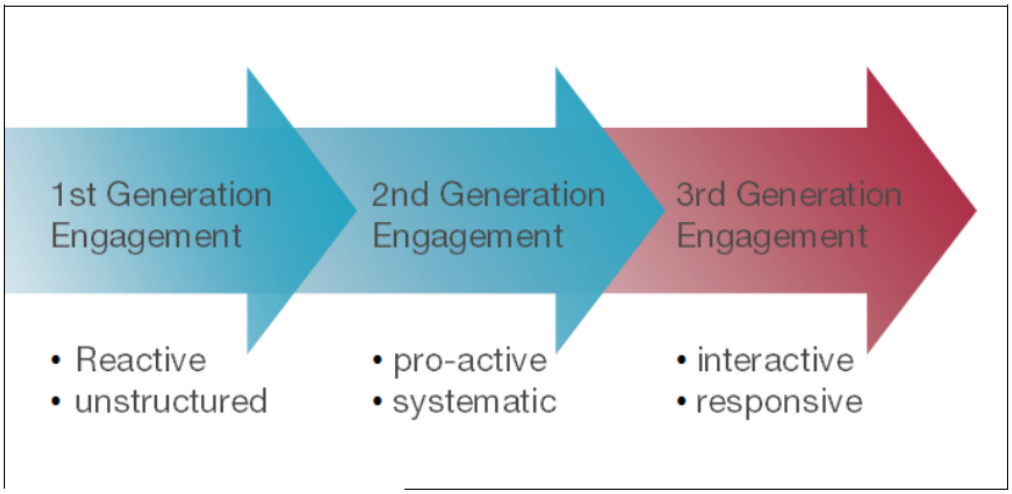
Third Generation Engagement

On that basis the next incarnation of democratic re-engineering must be characterised by interaction, innovation and responsiveness. We are now entering a phase we call Third Generation Engagement (3GE) (see Figure 2 below). Where historically, governments have sought to be reactive or pro-active in 'offering' engagement, democratic engagement is now being delivered on a more level playing field. Now citizens are able to e-petition when they want, and mobilise through their social networks for what they care about. The idea that engagement is choreographed through a government communications department no longer holds.

This should not be seen as a loss of control by government. The hoards are not about to storm the town hall; at least not often. Perhaps the greatest shift over the past decade has been government culture. Walk into almost any Town Hall or Primary Care Trust and the difference to 15 years ago is stark. What were once inhuman waiting rooms (these still exist), have been transformed into hives of community activity, bringing together community services, cafes and council business. Many town halls have reclaimed their place as community hubs. Some, like Barking and Dagenham, have won awards for such action. These places are being reclaimed by their communities and it is these organisations' staff who have galvanised this revolution.

Figure 2: Third Generation Engagement

[102] Anderson, C. (2009). *Free: The Future of a Radical Price: The Economics of Abundance and Why Zero Pricing Is Changing the Face of Business*. London: Random House.



That is not to say it is perfect, far from it. Too often the refurbished office lobbies are little more than a veneer of engagement over an old-style autocratic regime. Participation remains fragmented, infected by a focus group mind-set, designed to inform officials but not to empower individuals. At its worse this can channel valuable civic energy down consultation cul-de-sacs where it would be better spent through traditional campaigning.

But we are where we are, and democratic development is never a finished project. What is critical now is that we embrace the uncertainty of the communications revolution within which we now sit. We do not know which methods will emerge, or if our current tools will last. But we are able to identify the social and environmental challenges we face and set a course to solving them.