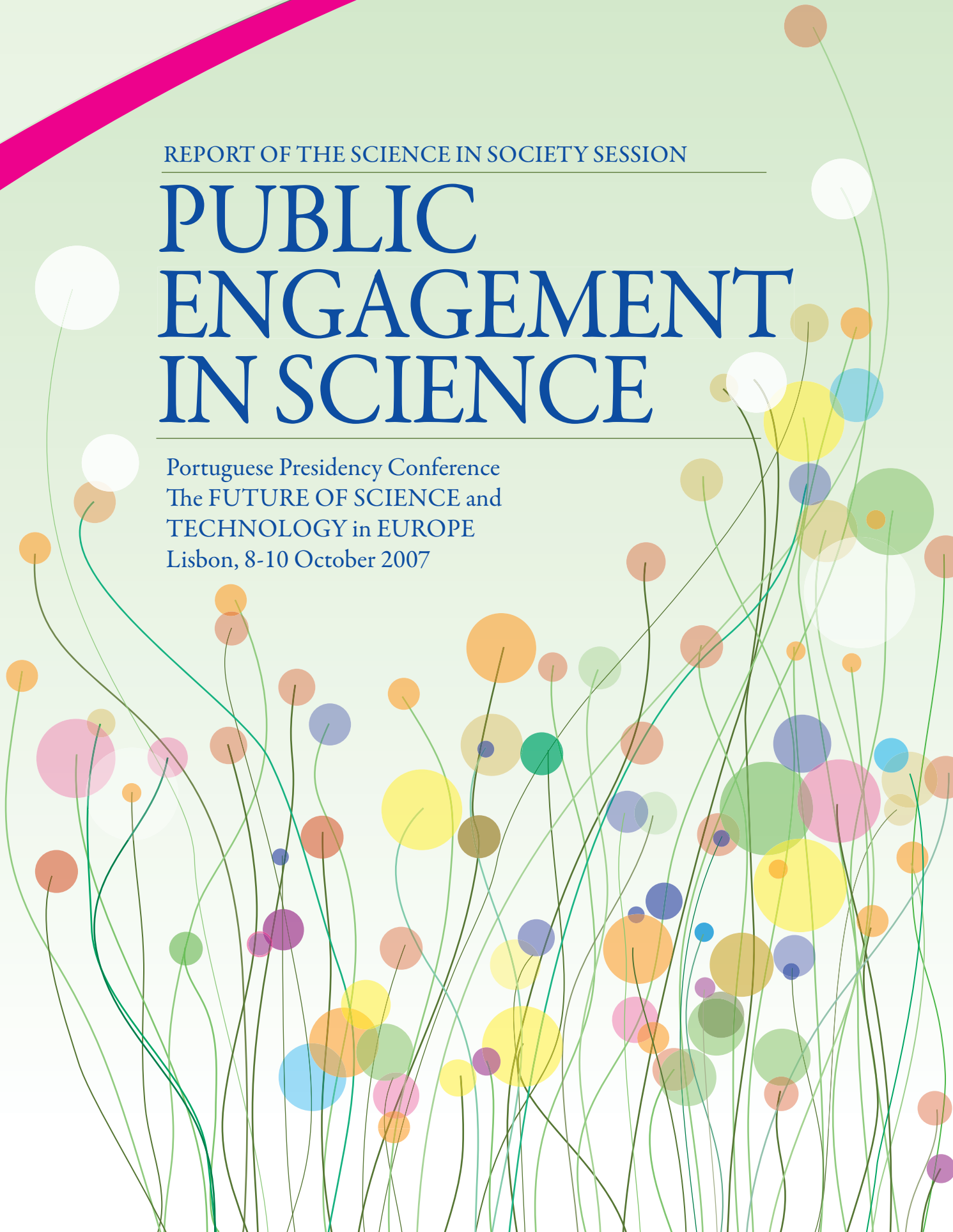
EUROPEAN COMMISSION

European Research Area

REPORT OF THE SCIENCE IN SOCIETY SESSION

PUBLIC ENGAGEMENT IN SCIENCE

Portuguese Presidency Conference
The FUTURE OF SCIENCE and TECHNOLOGY in EUROPE
Lisbon, 8-10 October 2007



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- **The public consultation 'The European Research Area: New Perspectives'**
  http://ec.europa.eu/research/era/consultation-era_en.html
- **The EU Science in Society portal:**
  http://ec.europa.eu/research/science-society/overview_activities/
  http://ec.europa.eu/research/science-society/civil_society_participation/

Foreword

Issues such as the preservation of our planet, cleaner energy, improved health and food production are closer than ever to people's concerns and interests. However no single country, industrial sector or scientific discipline can tackle these challenges efficiently on its own. It is not only a matter of what science can do but also a matter of choosing in which directions science and technologies should be developed and how they will shape the world.

There is not one single answer to respond to people's growing queries. Investing in teaching and communicating science is important but it needs to be complemented. I believe that we have to go deeper by revisiting the relationship between the public and science.

The debate I launched some months ago on the new perspectives of the European Research Area has addressed these issues and I welcome the valuable suggestions which were made during the consultations. They are now grouped in this publication and will enrich the Science in Society dimension of the seventh European Research Framework Programme.

The current limitations in the dialogue between science and civil society have to be overcome. And it is our task to set up new ways which both empower the public and reward those scientists who engage constructively with civil society. By multiplying opportunities for people to get familiar with the many facets of science and encouraging partnerships between scientists and non-scientists, we will open up new directions towards innovation that both inspire researchers and meet people's expectations.

I encourage readers to take up this challenge and contribute to the multiple ways in which science can benefit from society and society from science.

Janez Potočnik

I – The ERA Context

I – The ERA Context

In March 2000, the European Union adopted the Lisbon Strategy for Growth and Jobs, with the goal of becoming the world's leading knowledge-based economy by 2010. As part of this Lisbon Agenda, the objective of a European Research Area (ERA) was endorsed. Many initiatives have been launched since then, but with new major global competitors emerging in science, technology and innovation (STI), the European Commission has responded with a renewed commitment to these goals and a European-wide consultation in the form of a Green Paper, 'Inventing Our Future Together, The European Research Area: New Perspectives'([1]).

This Green Paper sets out the urgent need to revisit the European Research Area (ERA). It acknowledges that progress has been made since 2000 and puts forward for debate a vision for ERA in which there should be more specialisation, concentration and competition at the European level, balanced with better coordination, cooperation and access to knowledge throughout the EU. More specifically, the Green Paper prioritises six dimensions:

- realising a single labour market for researchers;
- developing world-class research infrastructures;
- strengthening research institutions;
- sharing knowledge;
- optimising research programmes and priorities;
- opening to the world: international cooperation in Science and Technology.

The fourth dimension, Sharing knowledge, gave a particular attention to the development of new channels and innovative approaches for communicating and discussing science, research and technology.

As part of the process launched by the Green Paper, an on-line consultation was set up to gauge public opinion regarding the present successes and remaining challenges confronting the ERA vision. 686 responses from a wide variety of countries, disciplines and organisations were registered and in addition 130 more detailed free-format responses were sent to the Commission.

This survey encompassed several questions on the different modes of public involvement in science. Their analysis constitutes the fourth section of this brochure.

The ERA consultation culminated with the Portuguese Presidency Conference on the future of ERA in Lisbon, 8-10 October 2007, which brought together 350 participants from across Europe.

A session of this conference was dedicated to the discussion of public engagement in science/research with participants from research communities and civil society organisations and the final report is presented in the second section of this brochure.

(1) COM (2007) 161. http://ec.europa.eu/research/era/consultation-era_en.html#greenpaper

II – Summary of the Science in Society session on Public engagement in Science

II – Summary of the Science in Society session on Public engagement in Science

> *'In the perceived pressing need to encourage innovation, democratic governance has become dislocated in ways that cannot be remedied by technical methods and tools alone. Policy making should not stop at simple or mechanical solutions; it should address the complex issue of science and governance honestly, thoroughly, patiently and with humility.' 'Taking European Knowledge Society Seriously', January 2007 ([1]).*

The session started by acknowledging that there has been **a perceptible shift in the past five years from public understanding of science (PUS) to public engagement in science (PES)**. And there has also been lots of practical experimentation with public dialogue and social reflection by scientists. But there is still a long way to go. And the Green Paper is a case in point – the relationship between science and society merits only 10 words – this urgently needs to be reinforced in the future European Research Area and European Framework Programmes for Research.

Our second point is that ***we need to renew the social contract for science***. There is an increasing body of evidence showing that interactions between science, civil society and the wider public can generate new forms of social intelligence and create mutual benefits by stimulating new directions for innovation. Some striking examples were presented in the session concerning the involvement of patient organisations in research around rare diseases; and the elderly in developing technologies to improve their quality of life.

So it is important to strengthen and multiply those efforts. The new funding mechanisms in 7th Research Framework Programme (FP7) to facilitate the involvement of civil society organisations are a step in the right direction. But in order to explore the full potential of civil society organisation (CSO) involvement, new partnerships will be required. This requires support to the specific capacity of CSOs to engage, measures to ensure easier matching between possible partners, and incentives to research institutes to take on the additional complexity of cooperation with diverse partners.

At the same time, there is a need to accompany 'hardware' of engagement – the focus groups, the citizens' juries – that can give the public a voice in science policy and research, with a greater appreciation of the 'software' – the codes, values and norms that govern scientific practice, but which are harder to access and change.

We have to acknowledge that there are serious obstacles to overcome here. Systems of funding, processes of research assessment, and the softer structures of career advancement, do not provide many incentives for scientists to spend time engaging with the social and ethical dimensions of their work. These issues should also be included in the way we train scientists. To what extent are the history of science, the philosophy of science, the social impacts and dilemmas of technology part of the curriculum in our universities? What signals are we sending to younger scientists about the relative priority of these issues in their research careers?

(1) European Commission (2007) Taking European Knowledge Society Seriously – Report of the Expert Group on Science and Governance (the 'Wynne Report'), January 2007 – http://ec.europa.eu/research/science-society/wynne_report.htm

Finally, we need a **more sophisticated account of the relationship between governance, ethics and competitiveness** in global innovation networks.

The way we think and talk about science and innovation is still dominated by questions of scale – 'how much?' and 'how fast?' – but we're not so good at talking about directions – the outcomes to which all of this investment and activity is being directed. The metaphor of the race exerts a powerful stranglehold on these debates. And the choice we are often presented with in that race is faster or slower, forward or back, but with no option to change course. We do not devote enough attention to considering the plurality and diversity of possible directions.

There are questions about the science we need and the science we want; questions about ownership, access and control. We need to learn how to open up and debate these questions with civil society and the wider public. And the assumption in too many of our policy discussions is that devoting attention to the governance and ethics of innovation will 'hold back' Europe, while the emerging economies of China and India forge ahead, unencumbered by such considerations.

But we should resist such myths of the 'wild east' in the way we think about global innovation. Our first defence has to be that this is a counsel of despair, the logical end point of which is a set of lowest-common-denominator standards not just for science, but also for labour rights, civil liberties and environmental standards.

It is also misleading, not to mention patronising, to pretend that people in India and China do not share many of these same concerns – albeit expressed in a variety of ways. Even in China, where there is less freedom to debate such issues in formal terms, the environmental and social consequences of rapid technological development are now becoming the focus of intense debate.

So the way our politics describes the relationships between science, globalisation and competitiveness must start to reflect these subtleties. Instead of seeing Europe's progress towards the more democratic governance of science as a barrier to our success in the global knowledge economy, can it not become a different form of advantage? Might it not lead us down new – and potentially preferable – innovation paths?

Europe leads the world in the governance of science and innovation. We should celebrate this fact and keep striving to develop a distinctive European recipe for innovation – that combines scientific excellence with good governance and public engagement – both at Member State and EU level. So this is another area of opportunity which we want to see carried forward in the next stage of the Green Paper.

III – Public Engagement in Science across the European Research Area

III – Public Engagement in Science across the European Research Area

Edited by **James Wilsdon, Head of Science and Innovation, Demos**
With the contributions of:
- **Jean-Pierre Alix**, *Secretary General, Universal Movement for Scientific Responsibility – Strategy and Foresight, National Centre for Scientific Research, CNRS, France*
- **Susana Borràs**, *Associate Professor – Copenhagen Business School, International Centre for Business and Politics, Denmark*
- **Terkel Andersen**, *President of the European Organisation for Rare Diseases and Chair of the Danish Council for Social Volunteering, Denmark*
- **Anne-Sophie Parent**, *Director of AGE – European Older People's Platform, Former Chair of the European Platform of Social NGOs, Belgium*

THE SCIENTIFIC STATE WE'RE IN

In recent years, the volume and intensity of discussions about science and society has risen, and we have seen a flowering of experiments with new forms of public dialogue. Yet more needs to be done to make the social, ethical and governance dimensions of science central to European science and innovation policy.

The Green Paper on the ERA is a case in point, making only the briefest of references to the need for 'new channels and innovative approaches for communicating and discussing science [2]'.

For 30 years, Ted Freer was an engineering lecturer at Leicester University. But these days, he is engaged in a different sort of science. When Ted's wife was diagnosed with Alzheimer's disease, he started getting involved with the Alzheimer's Society, a charity that puts over a million pounds into dementia research every year.

Alzheimer's disease is relentless. As with many diseases, most scientific attention is focussed on its cause and the possibility of a cure. There is little research designed to help people manage the disease once it has hit.

Ted decided to contribute his experience of caring for his wife to the Alzheimer's Society network for Quality Research into Dementia (QRD). The Network members are woven into all stages of the research process. They decide priorities, review proposals, interview scientists and monitor research. As a former scientist, Ted realises that the network contributes knowledge and opinions that might otherwise be ignored. 'It provides a totally different viewpoint for researchers... if it wasn't for us, they'd only be able to discuss it with their peers.' Initially, the process struck him as unusual. 'But watching it work in practice, I've been reassured. It's very effective.'

As the example above reminds us, public engagement is not simply about better communication. Institutions need to provide meaningful opportunities for public voices to influence decision-making. They need to ask how effectively the changing values, hopes and aspirations of society are being incorporated into the products and trajectories of science and technology.


James Wilsdon

BUILDING ON STRONG FOUNDATIONS

The *Science in Society* session at the Lisbon conference built on a number of earlier initiatives and reports. Notably, in 2007, DG Research published two helpful reviews of these debates:

- **'Taking EU knowledge society seriously'** [1], a report of the Expert Group on Science and Governance. This unpacks the widely held assumption that European publics mistrust or are fearful of advances in science and technology. Rather, it argues that there is 'selective disaffection in particular fields of science, amidst wider areas of acceptance – even enthusiasm.' Public concerns are often mischaracterized, or assumed to be directed towards 'risk' issues, rather than towards deeper questions about the direction and outcomes of particular trajectories of innovation. Such misleading views of the public should be replaced with a richer account of public values and concerns. At the same time, narrow conceptions of innovation need to be replaced with a broader understanding of it as a socially distributed and diverse process. The report argues that it is in the realisation of this diversity 'and in the robust and distributed character of publics, their capacities and imaginations, that we may justly conceive robust and sustainable pathways of technoscientific development.'
- **'Science, Society and Politics Knowledge Societies from an Historical Persective'** [3], a report by Dominique Pestre based on a two-day workshop in June 2006. This makes similar arguments about the need to revisit the relationship between science and other forms of knowledge. Drawing on a wealth of historical examples, it critiques the way that most policies for innovation are still framed according to a linear understanding of pure science flowing into new technologies and applications. This is 'a narrow vision of knowledge that neglects what could be gained, in social terms, by mobilizing what ordinary people know through active learning, exchanges and experience.' The report says that policy needs to take better account of knowledge that is produced outside academia and industry, including the 'huge world of amateur knowledge.'

CONSULTATION ON THE ERA GREEN PAPER

Public consultation has been another important source of inputs to the ERA Green Paper. An online consultation which ran for several months in 2007 included seven questions which related to public engagement in science, and all 686 respondents answered these questions. The responses to the online consultation on the future of the ERA reflect a general level of support for more and better

forms of engagement between scientists and wider society. But there is still considerable divergence on the best methods for doing this.

The widespread consensus on some issues (e.g. the use of television as a preferred method of disseminating science) is accompanied by a more varied set of views on how two-way forms of public engagement can be improved. The results suggest that public engagement 'is difficult but possible, but its very difficulty demands skillful and pragmatic handling, instead of the imposition of formal and standardised measures in all cases' [19]. (For more details, see Chapter V).

PADDLING UPSTREAM

After a decade punctuated by scientific and technological controversies – over BSE, genetically-modified crops, mobile phones, nuclear waste and the MMR vaccine – the vast majority of scientists and engineers recognise the need to become more open and accountable. There is particular interest in how public voices can be heard early, at a time when they can still influence research priorities. Indeed, we can perhaps identify three phases in recent debates over science and society [4].

Phase 1: Public understanding of science (PUS)

The initial response of scientists to growing levels of public detachment and mistrust was to embark on a mission to inform. Attempts to gauge levels of public understanding date back to the early 1970s, and have regularly uncovered gaps in people's knowledge of scientific facts. In the UK, Sir Walter Bodmer's influential 1985 report for the Royal Society argued that 'It is clearly a part of each scientist's professional responsibility to promote the public understanding of science [5].'

Phase 2: From deficit to dialogue

However, implicit in the language and methods of PUS was a flawed understanding of science, a flawed understanding of the public, and a flawed understanding of understanding. It relied on a 'deficit' model of the public, which assumed that if only people were told more about science, they would fall in line behind it.

In 2000, an influential UK House of Lords report detected 'a new mood for dialogue' [6]. In 2002, at EU level, the first Science and Society programme was incorporated in the sixth Research Framework Programme with new initiatives around public participation. The language of 'science and society' became prominent, and there was a fresh impetus towards accountability and engagement.

In the five years since, there has been a perceptible change. The science community has adopted a more conversational tone in its dealings with the public, if not always with enthusiasm, then at least out of a recognition that new forms of engagement are now a non-negotiable clause of their licence to operate.

Phase 3: Upstream engagement

Yet despite this progress, the links from public engagement back to the choices, priorities and everyday practices of science remain fuzzy and unclear. Dialogue tends to be restricted to particular questions, posed at particular stages in the cycle of research, development and exploitation. Possible risks are endlessly debated, while deeper questions about the values, visions, and vested interests that motivate scientific endeavour often remain unasked or unanswered. And as the GM case vividly demonstrates, when these larger issues force themselves onto the table, the public may discover that it is too late to alter the trajectories of a technology.

Political, economic and organisational commitments may already be in place, narrowing the space for meaningful debate.

More recently, there has been a wave of interest in moving public engagement 'upstream' – to an earlier stage in the processes of research and development. There is a sense that earlier controversies have created a window of opportunity, through which we can see more clearly how to reform and improve the governance of science and technology. Most immediately, policymakers and the science community are desperate to avoid developments in fields like nanotechnology, neuroscience and synthetic biology becoming 'the next GM'. The wounds of that battle are still raw, and there is little appetite for a rerun.

Yet it is important to emphasise that each of these three phases do not replace each other, but rather add to and influence each other. We have behind us and in front of us years of science communication and education which, together with more deliberative forms of public engagement, will be essential to building up the knowledge-based society promoted by the Lisbon strategy.

Science and society: some practical examples

There are a growing number of efforts underway across Europe to engage stakeholders and wider publics in scientific decision-making. Recent examples include:

***The Gover'science report** [7]: analysed the strengths and weaknesses of participatory projects funded at European level. It discussed how to design public engagement in research and proposed a framing for cooperative research processes which place researchers and non-researchers on an equal footing.*

***The Meeting of Minds** [8]: was a series of Citizens' Deliberations on brain science organised in 2005 and 2006 in nine EU countries. Citizens debated the ethical, social and legal implications of brain research with international experts. They suggested what should be done with our new-found knowledge and their conclusions have since been presented to policy-makers at national and European level.*

***Responsible Research in Nanosciences and Nanotechnologies** [9]: following a public consultation, the Commission adopted a Recommendation to the Member States on a Code of Conduct for Responsible Nanosciences and Nanotechnologies Research. It covers issues such as sustainability, precaution, inclusiveness and accountability, and invites Member States to take concrete action, involving universities, research institutes, companies and civil society for the safe development and use of nanotechnologies.*

***Funding partnerships between researchers and Civil Society Organisations in Research** [10]: this new scheme of the 7th EU Research Framework Programme (FP7) provides a funding structure of joint projects which encompass both research and dialogue on questions of societal relevance and impact.*

***Healthy Ageing** [11]: brings together partners from 15 national public health organisations across Europe to collect knowledge and exchange best practice on healthy ageing. The project has a strong emphasis on involving users throughout the research process to ensure that it is relevant to their needs and priorities.*

STUCK IN THE SHALLOWS?

Although the concept of upstream engagement has found favour in some parts of the scientific community, the reality does not always live up to the rhetoric. Engagement is still often portrayed as a way of addressing the impacts of technology – be they health, social, environmental or ethical – rather than helping to shape the trajectory of technological development. The hope is that engagement can be used to head off controversy; a prophylactic that we swallow early on and then forget about. There is no recognition that the social intelligence generated by engagement might become outdated or irrelevant as technologies twist their way through the choices and commitments that make up the innovation process.

Too often, even within processes designed to engage the public, the choice we are presented with is advancement or not, faster or slower, but with no real option to change course. This effectively rules out a role for public engagement of a more complex kind, in which scientists, engineers and policymakers, sensitised through engagement to wider social imaginations, might for themselves decide to approach science and innovation differently.

CITIZEN SCIENTISTS

For understandable reasons, many have concentrated on the 'hardware' of engagement – the focus groups, the citizens' juries, that can give the public a voice in science policy and decision-making. But this now needs to be accompanied by a greater appreciation of the 'software' – the codes, values and norms that govern scientific practice, but which are far harder to access and change. These prevail not only within science, but also around it, in funding and policy worlds.

How do we reach a situation where scientific 'excellence' is automatically taken to include reflection and wider engagement on social and ethical dimensions? Such expectations cannot be externally imposed. If they are to take root, they must be nurtured by scientists and engineers themselves.

At the same time, we must acknowledge that there are serious obstacles to overcome. Systems of funding, processes of research assessment, and the softer structures of career advancement, do not provide many incentives for scientists to spend time engaging with the social and ethical dimensions of their work.

We also need to rethink how we train scientists, and make sure that more opportunity to address these issues is included in degrees and postgraduate research. To what extent are the history of science, the philosophy of science, the social impacts and dilemmas of technology part of the curriculum in European universities? What signals are being sent to younger scientists about the relative priority of these issues in developing research careers?

THE RECEIVED WISDOM

Another part of the science and society landscape that is changing is the relationship between scientific expertise and public knowledge in policymaking. In recent years, governments have placed greater emphasis on both 'evidence-based policy' and 'openness and transparency.' The former pushes for decisions based upon the best available (i.e. expert) knowledge. The latter requires a degree of participation from stakeholders and members of the public. Policymakers then try to iron out the apparent contradictions in this by suggesting that public and stakeholder

engagement provides another addition to the body of evidence. This is a welcome move, but it misunderstands the value of public engagement.

Public knowledge can be split into two types. The first we might refer to as knowledge about the public. This is the sort of thing that emerges from traditional social research – quantitative surveys of public opinion about food demand or qualitative work with families to consider their difficulties in eating healthily.

But the second sort of public knowledge – *what the public know* – is just as important. It is this that tests the credibility of scientific advice. Social scientists who concentrate on issues of science and society refer to this as local knowledge, lay knowledge or lay expertise [12]. It emerges from dialogue between experts and non-experts, and if it is listened to, it contributes to socially-robust science. As with science, public knowledge should not be seen just as a body of evidence.

The types of public knowledge that have been important in past debates, and will become more and more important, can perhaps be understood under three headings: *questions, connections and suggestions.*

Questions…

Public and stakeholder questions tend to focus on *what we don't know*. It should come as no surprise that scientists and non-scientists ask different questions. Public questions reflect public values, and should be welcomed as a form of public engagement.

Connections…

Unlike scientific evidence, which tries to distance itself from politics, public knowledge often draws explicit political connections. So in public meetings, when ordinary people present evidence, they are usually presenting evidence *for* something – linked to an argument or a political cause, asking new questions of science and casting science in a new light.

Suggestions…

A European Environment Agency report from 2002 tells a number of stories, from asbestos through radiation to BSE, in which early warnings of possible danger have been ignored because of where they have come from [13]. Members of the public, NGOs and others outside the citadels of expertise have often provided the first suggestions of danger in public health debates. Such knowledge is often rejected as merely 'anecdotal evidence.' In cases like this, people are not claiming to know everything. They are more likely claiming that their bit of evidence points to a need for further research.

From passive consumers to concerned citizens

Not only are the public more sceptical and less deferential, they are increasingly active and interested. With easy access to expert knowledge on the internet, it is easier than ever for unengaged members of the public to become interested stakeholders, and for passive consumers to become concerned citizens.

This changes how we need to view dialogue between experts and non-experts. The danger of speaking to just the 'usual suspects' – those who respond to consultations – is that we miss the diversity of what the public think. Consumer representatives can only reflect a fraction of the interests and understandings across society. Citizens, including scientists and regulators, have multiple identities. A consumer may also be a parent and a farmer. A stakeholder may also be a scientist and suffer from diabetes. Socially-robust policy-making increasingly needs to understand and tap into these complexities.

Evidence-based policy should be designed not only with the process of 'policy making' in mind, but also in ways that take account of citizens. The European Parliament, national parliaments and their various committees should seek out diverse forms of evidence informed by social research and deliberative processes. Within the EU's framework programme, new 'social platforms' should be encouraged along with innovative instruments for presenting and debating the results of research and deliberation.

FRESH CHALLENGES

The current reflection on the future of the European Research Area creates an opportunity to address a number of challenges that require fresh energy and momentum. Otherwise, the science and society agenda will end up as little more than a well-meaning, professionalized and busy field, which never quite impinges on fundamental practices, assumptions and routines.

1. Renewing the social contract for science

At the moment, public engagement is splashing about in science's shallow end. But the challenges run deeper. If public engagement is a means to an end, what is that end?

We believe that the goal should be a renewed social contract for science. In the years during and immediately after World War Two, science was high on the political agenda in Europe. Across the Atlantic, Vannevar Bush imagined science as an 'endless frontier' [14]. Following a period where science budgets have soared, research is once again moving up the political arena with the knowledge-based Lisbon strategy.

However the language and frames of reference within which science and innovation are debated are good at asking questions of scale – 'how much?' and 'how fast?' – but less sophisticated at talking about direction – the outcomes to which all of this investment and activity is being directed. In the global 'race' to compete in science and technology, we don't devote enough attention to considering the plurality and diversity of possible directions.

The politics of science are subtle. There are questions about the science we need and the science we want; questions about uncertainty, evidence and burdens of proof; questions about ownership, access and control. ***We need to learn how to open up and debate these questions in public.***

Scientists need more regular opportunities to talk about the choices they are making, the assumptions their work reproduces, and the purposes to which it might be directed. Whether it is the prospect of a new generation of nuclear power stations, the convergence between nano and biotechnologies, or novel forms of human enhancement, our capacity for innovation will continue to present us with dilemmas as well as opportunities.

It is our belief that the future of science and technology in Europe rests as much on giving scientists and engineers the freedom and incentive to renew the governance of their institutions and practices, as it does on policy frameworks and R&D targets. Developing a more substantial and authentic debate on these questions is in the best interests of science, and of a progressive Europe.

2. Science and progressive globalisation

A second challenge concerns the implications of globalisation for this agenda. The assumption in much EU policy discourse is that devoting too much attention to the governance and ethics of innovation will 'hold back' Europe, while the emerging knowledge economies of China and India forge ahead, unencumbered by such considerations. But we need to resist such myths of the 'wild east' in the way we think about global science. Our first defence has to be that this is a counsel of despair, the logical end point of which is a set of lowest-common-denominator standards not just for science, but also for labour rights, civil liberties and environmental standards. It is also misleading, not to mention patronising, to pretend that people in India and China don't share many of these same concerns – albeit expressed in a variety of ways. Even in China, where there is less freedom to debate such issues in formal terms, the environmental and social consequences of rapid technological development are now becoming the focus of intense debate, and at times public protest.

The way our politics describes the relationships between science, globalisation and competitiveness must start to reflect these subtleties. Instead of seeing Europe's progress towards the more democratic governance of science as a *barrier* to our success in the global knowledge economy, can it not become a different form of advantage? Might it not lead us down new – and potentially preferable – innovation paths?

The evidence we have from the environmental sphere suggests that countries can gain competitive advantage from the adoption of higher standards [15]. We need to explore whether similar patterns can emerge here. There may also be insights from scientific governance, ethics [18] and public deliberation that we can exchange and export. We need to develop networks which allow policymakers and scientists in Europe to forge common purpose and alliances on these issues with their counterparts in emerging economies.

3. Be open to 'uninvited' as well as invited engagement

In the search for the 'real,' consensual public, more vocal interest groups are sometimes sidelined [16]. But if public engagement is to help us understand systems of science and technology, then interest groups need to be invited back in. We need to tie engagement to politics, rather than strip the politics away. We are starting to see, especially in areas of medical science, the emergence of public groups who are neither disinterested nor uninterested in science.

As with debates over the MMR vaccine, animal rights and nuclear power, 'engagement' can be uninvited but impossible to ignore. Patient groups in particular have demanded a say in scientific research [17]. In the future, such groups are likely to become more vocal and powerful. The challenge for institutions is to acknowledge the diverse interests that make up 'the public'; to learn from uninvited engagement, while making the most of organised engagement.

HOW SHOULD WE PROCEED?

Speakers and participants made several concrete suggestions for ways in which the science in society agenda could be strengthened across the ERA:

1. Strengthen ERA leadership of this agenda

In many respects, Europe is at the forefront of efforts to improve the governance of science and innovation. We should celebrate this fact and continue striving to develop a distinctive European recipe for innovation – that combines scientific excellence with good governance and public engagement – both at Member State and EU level. This idea should be carried forward and expanded in the next stage of the ERA Green Paper. This theme should also be pursued by the new Expert Group on science, global governance and ethics which the European Commission is planning to establish in 2008.

2. Acknowledge and support the contribution of public knowledge to research

There is an increasing body of evidence showing that interactions between science and civil society generate collective intelligence and mutual benefits. Incorporating public perspectives into research can also help to bridge gaps between research, policy and the ultimate users and beneficiaries of particular innovations. Several examples were presented during the session concerning the involvement of patient organisations and the elderly in the development of new technologies for health and social care (see Appendix presentations by Terkel Anderson and Anne-Sophie Parent).

Across the ERA and its institutions, there needs to be a greater acknowledgment of the contribution that public knowledge can make to the way research and innovation policies are developed. As Terkel Anderson argues, 'Civil society organisations are indeed capable of providing capacity, knowledge and idea generation in innovation... They can be active in both the push and the pull of science.' The strengthened mechanisms for CSO participation in FP7 projects are a positive step forward, but project consortia still have a tendency to think of CSO involvement as a last-minute add-on, rather than something which can add value from the start of the process of project development.

3. Build the capacity of scientists and engineers to engage with the public

Exhortations to engage are not enough; more must be done to develop appropriate skills for researchers to dialogue and interact with civil society actors. As Susana Borras points out: 'Researchers are extremely good at communicating with their counterparts, with other scientists. They have been trained to talk to each other... [But] to talk to the general public is a huge challenge and we need to give them the tools to do that.'

We also need to recognise the pressures that many scientists face and the lack of clear incentives to engage. Adding extra burdens to the workload of scientists, without appropriate structures for recognition and reward is unlikely to be successful, and may even discourage some from pursuing a scientific career. Jean-Pierre Alix, reflecting on the findings of a survey he conducted of 800 researchers at France's National Centre for Scientific Research (CNRS) observes that 'Lack of time is the main reason declared by scientists for failing to invest in science-society communication, and it is a consequence of the competition for publications, for innovation... We can have recommendations at European or even state level, but the question is whether scientific institutions are giving signals or not.'

4. Develop more systematic approaches to upstream engagement

Alongside the growing enthusiasm for early dialogue about science and technology, there is a need for honest evaluation of its value and impact. It is clear that, for the people directly involved in dialogue processes, it can make a difference to how they think – whether they are scientists, policymakers or members of the public. But if the aim is to affect just those people in the room, such initiatives seem awfully expensive. It is important that the ripples spread further, to the decision makers, institutions and systems where the power lies.

With the move towards deliberation, across all policy areas, different visions of the 'public' became apparent, such as abstract publics constructed via opinion polls, the 'pure' publics of citizen panels, selected at random and informed during the process about the issues they are invited to discuss, expert publics with recognised knowledge, concerned publics and engaged ones [20]. We have also seen the emergence of consultants eager to assemble these publics and deliver democracy. The sociologist Nikolas Rose calls this group 'experts of community', who come armed with 'devices and techniques to make communities real' [21]. But these 'technologies of elicitation', such as focus groups, surveys, citizens' juries and new online devices can create a new form of technocracy by disguising the politics of both science and participation.

The discussion on how to engage frequently obscures the more fundamental discussion of why. One of the most important aims of upstream engagement is to encourage institutional reflection, to get decision makers to question their own assumptions and consider a wider range of alternatives. If done disingenuously, engagement runs the risk of manipulating the public, which is worse than ignoring them. Anne-Sophie Parent describes some of the experiences of the European Older People's Platform (AGE) in this regard:

'Whenever there is a call for a proposal... AGE is often called at the very last minute by the applicants... The short paragraph we have on the description of the planned project looks very interesting and promising indeed. However we want to know more about the project and what added value we could bring to the project. Then it becomes very difficult to get more information about the project... First of all, there is often a lack of time... It is a kind of rubber-stamping and in our view, this is a form of tokenism that should certainly not be the way forward in the future.'

So the challenge is to encourage a deeper more systematic engagement with civil society groups and the wider public. For public engagement to make a difference, it must become part of the routine practice of good science. This does not mean an endless stream of citizens' juries, but it requires us to think through the different forms that engagement will take at different points in the cycle of research, development and diffusion. The aim should be to create an ongoing process of what the Expert Group on Science and Governance calls 'collective experimentation' [1].

In building the European knowledge society, we will continue to rely on constant questioning of the frameworks and assumptions that shape the politics of knowledge. We need to generate new approaches to governance, ethics and public participation that can learn from past mistakes, cope more readily with complexity and uncertainty, and harness the drivers of scientific and technological progress for the common good.

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[15] See e.g. M E Porter and C van der Linde, 'Toward a New Conception of the Environment-Competitiveness Relationship' *The Journal of Economic Perspectives 9*, no. 4, Fall 1995; P Hawken, A B Lovins and H L Lovins, *Natural Capitalism: the next industrial revolution* (London: Earthscan, 2000).
[16] Jack Stilgoe, 'Between People and Power: Nongovernmental organisations and public engagement,' in Engaging Science: Thoughts, deeds, analysis and action (London, Wellcome Trust, 2006).
[17] Examples of this include the argument between Alzheimer's sufferers and the National Institute for Health and Clinical Excellence about access to drugs and, further back, the involvement of AIDS patients in defining the early history of the disease.
[18] The European Group on Ethics in Science and new Technologies – EGE http://ec.europa.eu/european_group_ethics/index_en.htm
[19] David Tyfield, Report on the Results of the Public Consulation on 'The European Research Area: New Perspectives', Green Paper (April 2007). Analysis of the Issues Relating to Public Engagement in Science.
[20] PAGANINI – Participatory Governance and institutional Innovation – The new Politics of Life -FP6 research http://www.univie.ac.at/LSG/paganini/pdf_conf/booklet_final.pdf
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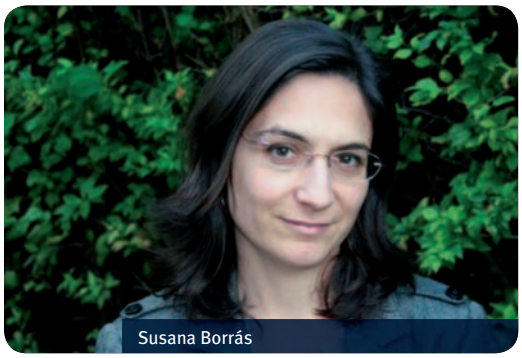
IV – Discussants' Papers


Susana Borrás

DISCUSSANTS' PAPERS

Susana Borrás
Associate Professor
Centre for Business and Politics
Copenhagen Business School

The co-evolution of science and of society

Looking back into human history, it is easy to see that social organisation evolves along with science and knowledge. Science, and more generally knowledge production, is highly contextualised in the large patterns of social organisation. In other words, science is a product of its time. The evolution of social organisation, for its part, is also highly related to science. More specifically, each society changes gradually when it interprets, accommodates and utilizes new knowledge. Science and society evolve hand in hand, they co-evolve in history. After all, human beings are 'homo sapiens'.

The paradox of modern times

The paradox is simple: With the path breaking advances of science during the past century, society has largely benefited from new knowledge. The society has accommodated, interpreted and utilised this new knowledge in ways that have led to the current forms of social organisation and economic production. However, and here comes the paradox, this has been at the expense of an increasing gap between society and science. Science has been perceived as an 'ivory tower' in an isolated world exclusive for scientists. The increasing rigour of the scientific method has been the success behind the expansion of knowledge-base, but at the expenses of becoming detached from the wider society.

Its all about legitimacy!

The science-society gap is more of a problem for scientists than for laypeople. Laypeople see science with very different eyes, some more positive and trustful than others. Or to put it in other words, there is a wide variation of societal perceptions of science. Nevertheless, what is different from earlier phases of modern and pre-modern history is that science has lost a great part of the aura and authority it used to have. Alternative sources of knowledge production outside the realm of official science have given powerful sources for laypeople's contestation of universal truth defined by established knowledge institutions. Science has to fight to re-gain this lost authority, and to regain lost popular confidence. Naturally, more ivory tower are not the solution. Scientists have to get engaged in society to a much further extent than today. This has to be done without losing the 'raison d'être' of science, namely, the production of highly reliable and universal knowledge.

Bridging the gap: Identifying problems and solutions

In a recent survey conducted by the European Commission, where more than 600 scientists and other stakeholders were involved, respondents pointed at three major problems in the question of 'what are the main factors hindering dissemination of knowledge and information to civil society that you have experienced'. These three problems were 'knowledge gap', 'technical language' and 'no incentive to disseminate'. More than 65 % of respondents considered these

problems as very important or important. When asked about possible solutions, respondents mentioned 'science education' as the first most important mechanism to promote and facilitate knowledge dissemination to civil society. 'Finance Research Institutions' was solution number two.

This survey is obviously focusing on dissemination of knowledge and science. However, a more reciprocal relationship between society and science could also be envisaged as the solution to this growing gap. Some authors have pointed out the need of creating knowledge that is scientifically sound AND socially robust. The latter presupposes a pro-active society engaged as much as scientists in the production of knowledge that is valid, accepted and legitimate to both parts. Science in society, and society in science. But this requires a partial re-thinking of the scope and scale of research and science policies, where non-experts are also welcomed as co-authors and co-participants in research projects and research endeavours, especially those with potentially wide societal implications.

Learning lessons

Biology is a scientific field that has been under pressure in the past decade. Two problems have afflicted researchers in this field. Firstly, the plummeting number of students choosing to study natural sciences at university and post-graduate level. Secondly, the possible applications and nature of research findings in the biotechnology field have been severely contested by civil society groups, sceptical about the automatic 'bonté' of these findings. Growing ethical, environmental, health and safety concerns by society took place at a time when there was a decreasing interest of young people to develop scientific careers in the field.

Therefore, in some countries biologists have been developing a series of strategies to reverse these two complex social situations. In particular, firms and researchers in public research institutions have made tremendous efforts in diverse forms of communication and dissemination of science, in programmes for science education, and in creating channels for a true open dialogue with the wider society. Their lessons can be learnt by other sectors facing similar or correlated problems.

Further policy action at EU and national level

Arguably, the EU and Member States have been creating a series of very interesting initiatives in the field of science in society in the past decade. However, problems seem to persist. For that reason, this contribution suggests the following three specific forms of further policy action at the EU and national level, namely:

1. Build communicative capacity in researchers: Create training courses for researchers to communicate with /to approach the media and the general public.
2. Better incentives for researchers to approach society: Member States' initiatives to introduce 'dissemination' as a third compulsory aspect of public researchers' career development. It is important that this aspect is taken into consideration in job promotions.
3. Tap into existing experience: The lessons learned over the past decade by biologists could be interesting to tap: they had to 'go to the real world' to get students (plummeting numbers of students in natural sciences was a real problem for them), and to redress the bad image of biotechnology (stem cell, GMO debate, etc.)... How did they cope with these mounting pressures, how did they bring science in society?


Terkel Andersen

DISCUSSANTS' PAPERS

Terkel Andersen
President of EURORDIS, the European Organisation for Rare Diseases

From EURORDIS' point of view, Civil Society Organisations such as patients' associations can certainly contribute in a number of different ways to stimulate and provide new inspiration to research and help build up a more 'society-oriented' type of research.

Some concrete and successful examples are the following ones.

EURORDIS' work on **orphan drugs** is an excellent example of how new drugs can be taken forward, and how research in rare diseases can be addressed, despite the lack of interest by the pharmaceutical companies.

The **networking capacity** of Eurordis has contributed to ensure rapid exchange of ideas, information and experience among experts and to define ways of linking clinical research and observations (in some cases collected by patients' groups themselves) with drug development.

In the field of rare diseases especially, patients themselves have been at the **origin of the research** on their own rare disease: they collect the money for research and make it available to attract researchers' attention to their pathology. Several projects have been initiated in this way and progress achieved.

Patients' work on **clinical trials** has added to the efficiency, as well as ethical awareness and pro-activity and reflection, in this field. As it is widely acknowledged, patients are experts from the experience of their disease and may provide invaluable information 'from real life' that is useful both in terms of clinical research, as well as in terms of pharmacovigilance.

On the clinical trials, EURORDIS has developed **a Charter** to guide a fruitful cooperation between patients and patients' representatives on the one hand, and sponsors of clinical trials (whether private or public) on the other hand. This cooperation can achieve the best results if implemented from the very beginning, from the protocol design, until the end, including the exploitation of results for the benefit of the whole scientific community and – ultimately – for the benefit of citizens affected by rare diseases.

EURORDIS has addressed issues related to **fundamental research** safeguarding basic principles of freedom of research.

Eurordis has helped define appropriate strategic objectives and **priorities** in EU research programmes in the field of rare diseases.

Our role in building a network of **Biobanks** has shown both the added value of European collaboration and how much more can be made out of the same effort IF the objective of making the optimal use of limited resources is put high on the agenda.

In the case of the specific EU funded project EuroBioBank, patients being fully aware of the difficulties encountered by the researchers in finding the necessary biological material, which is rare and scattered in different countries, have stimulated the creation of a **'visible' network of biobanks**. This new tool has allowed the very few researchers working on a rare disease to find biological samples more easily at an EU level. Furthermore, the contribution of patients themselves in sensitive areas such as the personal data and biological material management is fundamental: they are at the centre of these issues: they are not ONLY biological material providers.

Civil Society Organisations can thus provide **innovative methods and contribute new perspectives** to research programmes and add valuable information, knowledge and competence (capacity).

There is no future of science and technology in Europe WITHOUT the participation of civil society, through its representatives from various perspectives. The debate on ethically sensitive issues is a major illustration of the need to share knowledge and concerns and involve Civil Society representatives.


Anne-Sophie Parent

DISCUSSANTS' PAPERS

Anne-Sophie Parent
AGE – European Older People's Platform

AGE has been involved in research projects on ageing and older people for quite a few years now: Healthy Ageing project, ERA-NET AGE, EUROFAMCARE, UNIACCESS, BUILD for ALL, etc.

Although users' involvement has improved over the last years, there is still a lot to do to improve the way research projects involve civil society.

PROBLEMS

Risk of tokenism

Each time there is a call for proposals, AGE receives a large number of requests for partnerships from a wide variety of applicants: researchers, industry, public authorities.

Our experience has demonstrated that the added value of users' involvement is still widely misunderstood by scientists, both publicly funded and private researchers as James Wilsdon explains in his paper.

When it is a compulsory element of the call for proposals, most applicants only deal with that at the last minute and ask us to rubber stamp their application. There is still strong suspicion about the added value of users' involvement. Questions raised by researchers are: representativity of users' groups, lack of technical knowledge, lack of understanding of research objectives.

Perceived risk of disclosure of research material

Researchers also fear that users' involvement will lead to disclosure of their research project (some of them ask us to sign non-disclosure clauses; most of them just send us very minimal information about the proposal because they do not trust our ability to keep the information confidential). This is not only the case of research projects led by the industry but also projects led by publicly funded research teams. This results from the way research is organised: researchers have an obligation to have a certain number of publications in research journals to maintain their funding. This forces researchers to keep their research 'secret' until it is published.

For the industry, the issue is quite similar: they need to protect potential patents and keep their research 'niche' for themselves in order to protect their market share.

So the potential risk of disclosure by users' groups is perceived as a threat by researchers and is an additional reason why, while most are willing to involve users' groups in the dissemination phase, they are still reluctant to involve users in the whole research process. The potential financial impact of disclosure is an important but difficult issue to address.

POSSIBLE SOLUTIONS

Added value of users' involvement

They help bring research outcome to policy makers. The EUROFAMCARE project did a huge mapping of the situation of family carers in 23 countries and measures implemented to support them. AGE's role was crucial. We 'digested' the research outcome and presented it to the relevant policy makers, including the Commission, in a format and language that they could understand. Concrete outcome: the issue of informal care was added by the Commission in the questionnaire to Member States on health and long term care (new OMC on Health). This means that now Member States have to explain to the Commission how they provide support to informal carers (who are meeting the very majority of dependency needs in old age). Without our intervention, the research outcome would have been accessible to researchers only and the fundamental issue of informal care would have been left out of the new OMC process.

Users' groups can help bring new topics on the research agenda: with our limited 'empirical' knowledge of problems met by older people, we were able to convince the Commission that research is needed to inform policy development, e.g. on impact of pension reforms on risk of poverty among older women, elderly abuse, ethical aspects of use of ICT in support of independent living, intergenerational solidarity, age discrimination in access to insurance, etc. No researcher had picked the importance of these issues before and no policy maker was aware of their importance in relation to the policies they have to decide on.

Solution: *Genuine users' involvement should be an essential evaluation criteria of research projects funded by the EU.*

Perceived risk of disclosure of research material

In some of the research projects we are involved in, we feel treated on an equal footing with the other partners. Participation helps us understand better the roles and challenges of the other partners. It helps bring research closer to grass root citizens and to show them the relevance of research to their daily concerns. Civil society organisations (CSOs) understand the added value of being active partners in research projects but some have to build capacity to respect the need for confidentiality and non disclosure. They also need to build their capacity to contribute constructively to the research.

Solution*: involve CSOs more and more genuinely in research projects; those who have done so always found that it brought a real added value and helped ensure a long term impact to their project; it helps also build public acceptance because the outcome is more in line with citizens' expectations.*

The Science in Society programme is an excellent initiative to help achieve this objective and would deserve much more funding.

V – The ERA survey (May to August 2007)

Analysis of the Issues relating to Public Engagement in Science

David Tyfield
Institute for Advanced Studies – Lancaster University

ABBREVIATIONS

Categories of respondents

(Question I 7 of the survey) and corresponding abbreviations used in the report

• Higher Education Institution (university, university college, Polytechnic, etc.)	HE
• Public Sector Research Institution (performer other than Higher Education Institution)	PSRI
• Research Funding Organisation	RFO
• Governmental Bodies	
• Non-governmental, non-profit and not representing any commercial interest organisations	NGO
• Commercial organisations (including consultancy) with more than 250 employees	
• Commercial organisation (including consultancy with fewer than 250 employees for the purpose of this survey) – Small and Medium-sized Enterprise	SME
• Association representing commercial interests/Chamber of Commerce	
• Other	

Terminology used in the questions and their analysis

CSO	Civil Society Organisation
ERA	European Research Area
FI	Financial Incentive
KSH	Knowledge Sharing
PES	Public Engagement in Science
PLI	Public Lack of Interest (in science)
STI	Science, Technology and Innovation

INTRODUCTION

As part of the process launched by the Green Paper, an on-line consultation was set up to gauge public opinion regarding the present successes and remaining challenges confronting the ERA vision. This survey tackles six different issues concerning the ERA, namely:

1. a single labour market for researchers;
2. world-class research infrastructures;
3. excellent research institutions (universities and public research centres);
4. effective knowledge sharing;
5. optimised research programmes and priorities;
6. a wide opening to the world.

This report is concerned with the responses to Section IV of the survey, regarding Knowledge Sharing (KSH), and particularly those relating to the issues of Public Engagement in Science (PES). Knowledge Sharing is defined in the Green Paper as follows:

'Generation, diffusion and exploitation of knowledge are at the core of the research system. In particular, access to knowledge generated by the public research base and its use by business and policymakers lie at the heart of the European Research Area, where knowledge must circulate without barriers throughout the whole society.'

Regarding PES issues, the overall question posed in the Green Paper was (question 24): 'What conditions should be created to promote innovative approaches in the way that science and technology is communicated, taught, discussed and valued by Europeans, and taken up for evidence-based policy-making?' This was developed into a set of seven questions in the on-line survey, launched in May 2007.

The existing policy context for PES issues is a general call for the development of stronger relations between science and the broader society ([1]). Yet the interpretation of what this is to involve in practice, and its purpose, remains greatly contested. Furthermore, while the Lisbon Agenda itself arguably promotes a largely instrumental concept of scientific knowledge towards the production of economic value (in evidence, for instance, in the above definition of Knowledge Sharing), the explicit EU policy commitment to greater public engagement in the processes of STI may be itself seen to be contradictory and unclear ([2]). Nevertheless, given that the mandate for this report concerns PES issues, we concentrate here exclusively on these issues of public engagement and leave other issues regarding the sharing of knowledge with industry largely to one side. This broader context of the PES questions, however, should be borne in mind.

THE RESPONDENTS

All 686 respondents to the survey as a whole answered the PES questions. The survey was answered by 434 (63 %) men and 252 (37 %) women, domiciled in 53 countries, including all EU Member States except Lithuania. A total of 15 EU countries registered responses from more than 10 domiciles, while 4 had more than 50 (France, Germany, Italy, UK). Regarding fields of activity, 3 named areas

(1) E.g. Science in Society of the Seventh Framework Programme for Research and Technological Development as well as Science and Society Action Plan (2001) & Science and Social Action Portfolio (2005).
(2) E.g. DG Research Expert Group Working Paper (2007), Taking European Knowledge Society Seriously.

(Research Infrastructures, ICTs and Health) each account for more than 20 % of respondents (respondents not limited to just one field), and a further 5 areas each account for more than 10 % (Environment, Social sciences & Humanities, International co-operation, Biotechnology and Energy).

The majority of respondents (474, 69 %) replied in a personal capacity. Of those who responded on behalf of their organisations, all types of organisation are represented, but NGOs, Higher Education and other Public Sector Research Institutes are particularly prevalent, all with more than 15 % of relevant responses. The 'NGO' category, however, is dominated by scientific organisations, as is the 'Other' category, though various academic, policy and civil society interests are also represented in the latter. This relatively low response from civil society means that the answers from these organisations may be more credibly represented as the opinion of European scientists than of European society as a whole. The organisations are based in 21 Member States, concentrated in Western Europe, and work at all geographical levels, particularly the national (58 %), international (55 %) and European (52 %). The personal responsibilities of the respondents are concentrated in strategy/policy (53 % of relevant respondents) and in science & technology research itself (49 %).

OVERVIEW OF RESULTS

The 'Public Engagement in Science' (henceforth PES) issues in the on-line survey, analysed in this report, were covered by 7 questions in Section IV (Knowledge Sharing), namely KSH1, 4, 11, 12, 13, 14 and 15. Although interspersed with other questions on knowledge sharing, these questions may be roughly divided into those dealing primarily with issues of dissemination of scientific knowledge (i.e. 'science' to 'society': KSH1, 4 and 11) and those concerned with more interactive matters (i.e. 'science' and/in 'society': KSH13, 14 and 15), with KSH12 as something of a bridge (i.e. 'society' to 'science').

Two themes are particularly clear in the responses. First, the results of the survey reveal that, while there is striking consensus on some issues – such as the importance of TV as a means of dissemination or of the 'Knowledge Gap' between the public and scientists – this masks significant levels of dissensus regarding other more interactive factors. On the one hand, then, the consensus on issues of wide dissemination and improving levels of public scientific literacy reflects the overall high levels of public trust in science in the EU, as identified in previous EU reports ([3]). But this widespread agreement is matched by a significant body of opinion that is also concerned to improve and deepen the reciprocal engagement of 'science' with 'society', and for which dismissing public concerns over the governance of science and innovation is itself a major source of unease.

As such, the results display what may be called a 'both/and' logic, favouring a multi-dimensional and multi-pronged approach to PES issues. The current debate is thus shown to be between those for whom the issue of PES (regardless of statements of commitment to public engagement) remains largely that of public ignorance or poor public relations of science and those that accept these issues but also insist upon the importance of improving science's capabilities, resources and incentives

(3) E.g. DG Research Expert Group Working Paper (2007), Taking European Knowledge Society Seriously.

for engaging as a matter of course in in-depth public engagement with research agendas and findings.

Yet this is by no means the end of the matter, as is clear from the second theme that emerges from the results, and especially from breaking down the results amongst various sectors of society. For these show that even where there is agreement about the importance of intensifying dialogue between science and society, the thorny question of how to do this, which then arises as paramount, is not one that allows a straightforward answer. Even characterizing the debate with a single, fixed spectrum of opinion proves impossible. Indeed, the disagreement about the importance or unimportance of various problems (or mechanisms for addressing them) is most marked within sectors of society, thereby falsifying any attempt to draw the debate in simplistic terms of one sector of society (and its interests regarding science) against another.

The outcome of this intense intra-sectoral disagreement, however, is that it is effectively impossible for any analysis, such as this one, to define 'the' issues regarding the debate of how science and the public should best interact. Indeed, it is clear from the complexity of the responses to this survey that the issue of how best to engage the public is itself inextricable from issues of who that public is and what the purpose of such engagement is, and vice versa. Yet it follows that any debate or disagreement regarding these issues involves a whole set of intimately related issues being at play, and never simply one single, well-defined conceptual dimension. And this, in turn, entails that the debate is understandably complex, multi-dimensional and fractious because it is often characterised by relatively low levels of shared understanding, the precondition of productive debate.

Furthermore, complicating matters yet further, given the internal relations amongst the issues of how to engage the public and who to engage, any such debate in practice has itself already defined certain limits to the debate in ways that form and perform the relevant 'public(s)', and thereby include some interested parties while excluding others ([4]). Yet, given that such engagement is justified in terms of science engaging with society, such inclusion or exclusion simply takes the debate right back to the beginning again, invoking anew the issues of 'which public?', 'represented by whom?', 'how?' and 'to what end?'

These then are the two striking themes of the survey response. Confronted by such a Gordian Knot of actual engagement and simultaneously working out its terms and preconditions, we may be tempted simply to concede defeat and plump for the impossibility of a satisfactory policy of the successful engagement of science with society. Yet this would itself be a forlorn attempt given the widespread acknowledgement of the importance of such a development and, in any case, is to admit resignation too soon, as one final trend visible in the results demonstrates. For while particular sectors – especially small businesses, higher education and public sector research institutions – do indeed reveal high internal levels of controversy regarding profound public involvement in the scientific research process, it may also be argued that this very disagreement is evidence not only of the difficulties of such engagement, but equally of the possibilities of it being an important success.

(4) E.g. Jasanoff, S. (2005), Designs on Nature: Science and Democracy in Europe and the United States, Princeton (NJ): Princeton University Press.

Yet, crucially, the intense disagreement also shows, however, that PES issues must be approached in a more nuanced, detailed and less one-size-fits-all way, so that particular initiatives for engagement reflect the relevant matters at issue in that case. In other words, the results suggest that engagement is difficult but possible, but its very difficulty demands skilful and pragmatic handling, instead of the imposition of formal and standardised measures in all cases. In what follows, we first examine the responses to the individual questions in greater depth, before concluding with some further reflections and brief recommendations that follow from this analysis.

AD HOC RESPONSES

Alongside the responses to the on-line survey, 130 organisations sent ad hoc answers to the Commission. Among them 87 gave comments on chapter KSH in general and 19 on question 24 of the Green paper relating to Public Engagement in Science. These nineteen organisations comprised 8 higher education and research institutes, 3 administrative and governmental bodies, 3 business lobbies, and one Civil Society Organisation (CSO), namely AGE, the trans-European organisation representing the interests of older citizens. There are also responses from four other organisations that are associations of scientists.

These responses clearly are selective. Nevertheless, they provide some interesting insights. First, there is a broad consensus amongst these responses regarding both the importance of science communication and the need to change the personal communication skills and the institutional incentives and structures for such engagement with the public. Interestingly this is observable across the types of organisation. However, there are also informative differences in the responses. First, it seems that for many of these respondents 'science communication' remains dominated by a one-way model of telling the public about science. This is particularly visible in the responses from government and higher education. Conversely, business and the single CSO both strike a much more interactive stance on these issues, though here too there is a marked difference.

Taking each of these in turn, AGE argues that 'the best way for European citizens to understand research and use it to press for evidenced-based policy change is for them to take an active part in the research process, in particular in setting the research agenda.' Similarly, 'the question [for policy] should not be what researchers want from research, but what do citizens want from research and how can collaborative approaches be developed and sustained.' This openness to deep engagement of the public in the research process on the part of CSOs is also in evidence in the responses to the on-line survey. The responses from the business representatives (CEFIC, Business Europe and the UK's CBI) also stress the importance of public engagement and the need for new approaches and resources for these initiatives. Similarly, they also highlight the need to provide express encouragement for science communication: 'researchers should be trained and encouraged as a requirement of public funding to learn how to communicate in ways that are more meaningful to wider audiences.' However, it is clear that these responses understand such 'wider audiences' primarily as business. Indeed, while advocating a cultural change in science so that science communication would be

considered an esteemed part of the career structure, this is expressed explicitly in terms of making science more accessible to commercial enterprise: 'dissemination direct to business... has often been dismissed by academics as it is perceived to lack impact and/or credibility in terms of academic assessment and reward mechanisms. This culture must change.'

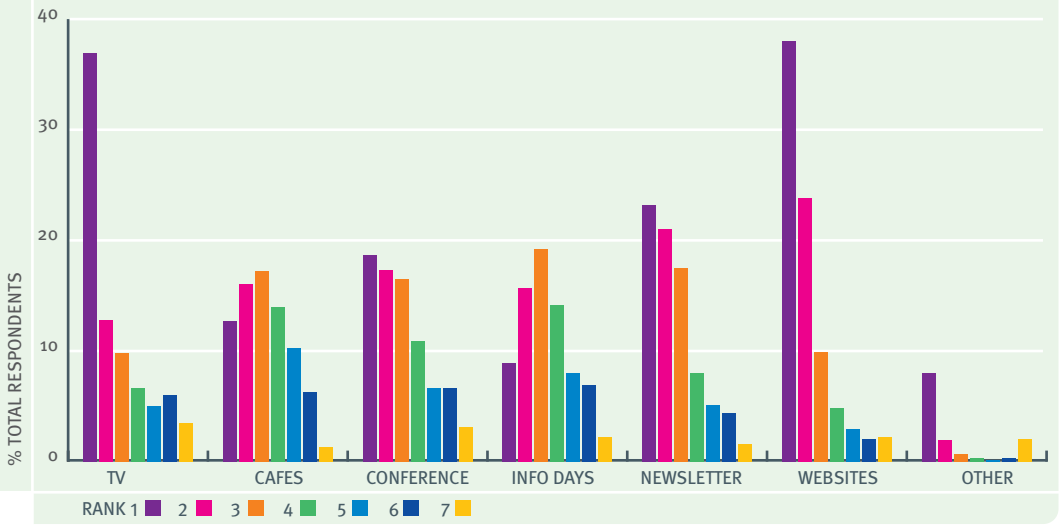
Furthermore, these arguments are made in the context of a broader argument from these organisations that there is insufficient attention paid to the needs of business in the Green Paper. Such sentiments should surely be set against the dominance of the KSH section by issues of intellectual property and dissemination to business; only one of the four KSH questions incorporates the broader issues of science and society analysed in this report. More importantly, however, this also highlights an issue of which PES policy will have to be aware in future, namely that, even where broader engagement of science is accepted, differing sectors of society will have differing and possibly conflicting aims for such PES initiatives. Thus, as discussed below, what these results reveal is that support for PES merely sets the stage for a further debate about what this means in practice and that facilitating this debate would be of major assistance to PES in the EU.

ANALYSIS OF THE INDIVIDUAL QUESTIONS

What is the most appropriate medium for distributing scientific knowledge (especially that resulting from publicly funded research) to a wide public? (Rank them in order of importance (1 to 7). You may give an equal ranking to a number of these areas)

Television programmes
Workshops/science cafés
Conferences
Regular information days
Newsletters/Publications
Websites
Other (please specify)

Figure 1: Responses to KSH1 – the most appropriate medium for distributing scientific knowledge



Overall Summary

As is clear from Figure 1, the most popular means for dissemination of scientific knowledge are Websites and Television (TV), with the former a slightly more common response. Conversely, the media with least support are Scientific Cafes and Information Days, both amassing considerably fewer higher rankings and more lower rankings. This would seem, on first glance, to present a straightforward consensus in favour of mass and largely passive forms of communication, while smaller, more interactive and more intellectually demanding forms are not supported to the same extent. This is not borne out, however, by a deeper analysis of the results.

Indeed, while TV is undoubtedly popular, websites are slightly more so, and it is arguable whether or not websites can also be viewed as interactive (especially through blogs and chatrooms). Furthermore, levels of support for the other forms are not insignificant. Yet, more importantly, the widespread support for both TV and Websites conceals the fact that they receive support both from those who are averse to interactive media (as would be expected) and also those in favour of them.

Not only is this analysis supported by the variety of comments, it can also be shown by analysing the correlations among the answers of those ranked '1', because respondents were invited to choose more than one answer at this level. This shows that TV was the answer most likely to be chosen as sole top rank, thus presenting the body of opinion in favour only of mass and passive distribution of science. Conversely, those who ranked other more interactive media top also tended to rank other media equal top, including TV and Websites. Thus, for instance, while only 10 % of those who ranked TV first also rated Information Days equally important, the converse relationship shows that 39 % of those who ranked the latter top also credited TV with equal first ranking. Similarly, those ranking Information Days top were nearly 3 times more likely to name at least one other answer as joint top as those answering TV. Websites were also twice as likely as TV to be ranked top along with another medium, reflecting their great interactive possibilities and so broader appeal. Indeed, those naming the smaller, interactive fora as the favourite choice were generally around twice as likely to co-nominate Websites than TV.

In short, then, while TV is undoubtedly a popular means of dissemination, focusing on this alone does not pay sufficient attention to the considerable interest in other, more interactive forms of communication and thus in multiple levels of dissemination. This is also clear in the comments, which include calls for a 'continuous dialogue between researchers and stakeholders of the problem involved" rather than one-off events, and various open access on-line initiatives regarding scientific publications. As we shall see in later responses too, therefore, the faultlines of opinion evidenced by the survey results are not 'tackle public ignorance vs. tackle science's failings', as some may still want to represent the debate, but rather 'tackle public ignorance vs. tackle science's failings *and* those of the public' or, rather, deepen *mutual* engagement.

Respondent analysis

When turning to an analysis of the correlations between particular responses and particular types of respondent, some interesting trends also emerge. First, there does not seem to be a significant difference in the overall responses of those answering in personal and in institutional or professional capacities. Yet the different types of organisation represented by the latter group do reveal differing levels of support for the various media. Before turning to this, however, it should be briefly noted that the different types of organisation also display widely differing levels of overall interest in the issue. In particular, in a trend that is displayed across all answers, Chambers of Commerce (and, to a lesser extent, Governmental Bodies) attach very low importance to the issues (and noticeably much less than business itself), while, at the other end of the spectrum, Research Funding Organisations (RFOs) attach uniformly high levels of importance to all answers and hardly register the unimportance of any suggestion at all. Both may be explained by the

particular mandates of these two types of institution, the former generally interested in lobbying for business but with no particular focus on science-and-society issues, while the latter having the institutional imperative to be seen to be taking such issues extremely seriously. Conversely, the responses of small businesses (SMEs), Higher Education (HE) and Public Sector Research Institutions (PSRIs) often display significant levels of interest, but *also* of disagreement regarding the various answers within that sector of society.

Turning to the answers for this question, the greatest support for TV, apart from RFOs (as discussed above), is surprisingly shown by PSRIs and, conversely, is least popular with businesses and NGOs ([5]). As regards the former, and discussed in further detail below, this may evidence a general lack of development in the interaction between these exclusively research-focused institutions and the public, especially in comparison to businesses and HE, where recent years have seen considerable pressure to engage with the public. This is also in evidence regarding the greater levels of support that SMEs and HE show for the interactive forms of communication, along with NGOs and 'Other'. Indeed, Information Days are most popular with SMEs, while the highest levels of support for Publications come from them and HE. This also highlights the interesting and important differences of opinion between big (greater than 250 employees) and small businesses that is a feature of all the responses.

Conclusions

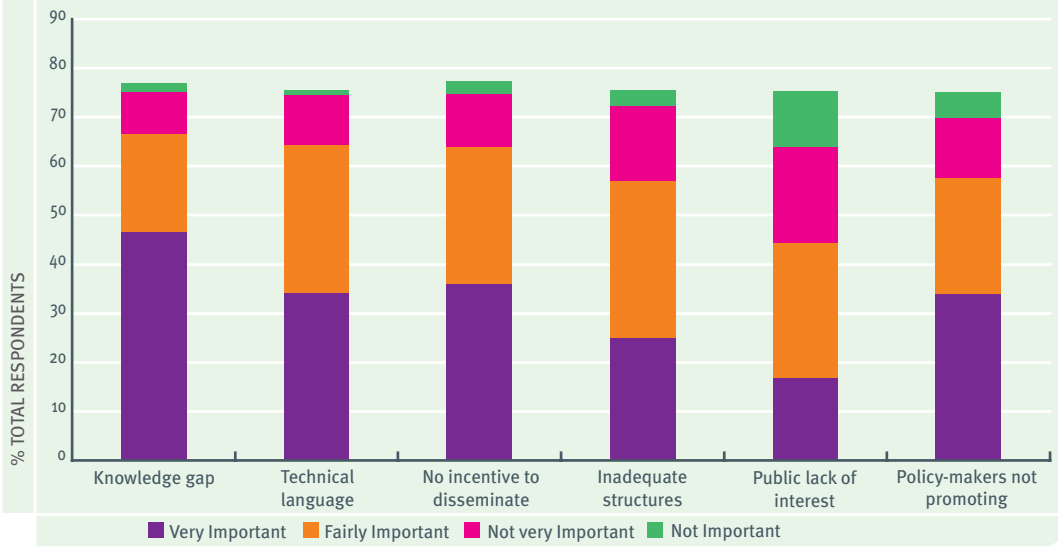
While there is widespread interest in TV and Websites, there is also significant interest in more interactive forms of communication. Furthermore, different sectors unsurprisingly attach different levels of importance to interactive forms of dissemination in ways that seem to reflect their level of experience of these different media. Yet the fact that those invoking interactive dissemination tend to do so along with, rather than instead of, conventional unidirectional mass media suggest that it is difficult to recommend particular forms over all others. Rather a range of media appears to be what is required, in ways that are relevant to the particular topic at issue.

(5) Similar to the 'Other' group, the 'NGOs' category also includes a mixture of predominately scientific representative organisations, along with organisations representing various business, academic, civil society and policy groups.

What are the main factors hindering dissemination of knowledge and information to civil society that you have experienced? (Rank them in order of importance. You may give an equal ranking to a number of these areas) (6)

Knowledge gap between science communities and civil society
Use of technical language
Lack of incentive for scientists to disseminate knowledge within civil society
Lack of adequate structures in scientific establishments
Lack of interest from civil society
Policy-makers do not promote dissemination of knowledge to civil society sufficiently
Other (specify)

Figure 2: Responses to KSH4 – main factors hindering dissemination to civil society



Overall Summary

As is shown in Figure 2, the most popular response to this question is the Knowledge Gap between science communities and civil society, at least as regards this being 'very important'. However, as for the related response of TV in KSH1, a more complex set of responses accompanies this straightforward default response. Thus, once overall answers of 'very important' and 'fairly important' are aggregated to show the overall importance attached to the various factors suggested, the strong lead of the Knowledge Gap is dramatically reduced and nearly all of the other responses, with one important exception, are shown to be accorded equal importance. As such, it is clear that there is widespread appreciation that the factors

(6) This question, and all remaining questions, employs the same schema of 'very important', 'fairly important', 'not very important', 'not at all important' and 'no opinion'.

negatively affecting successful science communication are two-way, and reside as much in the incentives, structures and resources for such communication as in the public's ability for its reception.

Indeed, the exceptional result here is not the Knowledge Gap, but rather the lack of public interest in science (henceforth 'PLI' for 'Public Lack of Interest'). Were the so-called 'deficit' model of public understanding of science to be the consensus, one would expect this answer to receive significant support (7). Yet this option receives strikingly little support as being important ('very important' plus 'fairly important') as opposed to the others. Equally significant is that the level of objection to PLI being a major factor is also considerably higher than for the others, with over 30 % of respondents expressly considering it unimportant (i.e. 'not important' plus 'not at all important'). As such, the importance (or otherwise) of PLI reveals itself to be a major faultline in public opinion: the extent to which difficulties in science's relationship with society are due to a largely ignorant and uninterested public is a source of considerable disagreement.

Yet, as for KSH1, this division in opinion is not a question of a polarised support for science on the one hand against support for society on the other. Rather, where importance is attributed to dealing with conditions affecting science's capacity and willingness to engage the public this is likely to be in conjunction with recognising the importance of improving public levels of scientific literacy. Thus, while only 31 % of those ranking the Knowledge Gap as 'very important' also rate Inadequate Structures thus, the converse correlation is 57 %. Furthermore, while those ranking PLI 'very important' are also likely to name other factors, these are predominately the Knowledge Gap (70 %) and the Failure of Policymakers' to promote dissemination (60 %). This cluster of responses suggests a greater propensity amongst pro-PLI respondents to see science as primarily being let down by the rest of society: the public (regarding PLI and Knowledge Gap) and policymakers alike.

Respondent analysis

Turning to analysis of the particular respondents, it may first be noted that those answering in a personal capacity are slightly more likely to opt for the Knowledge Gap as the most important factor. Similarly, comments from this group tend to offer more negative judgements regarding the public's, broadcast media's and policymakers' understanding of science. Conversely, those answering on behalf of their organisations are much more likely to judge the various options unimportant in all cases. This may seem somewhat surprising, especially regarding factors related to institutional incentives, structures and resources where experience of these issues may be expected to be greater. Yet the fact that these respondents are answering on behalf of their organisations may also suggest a defensiveness against admission of such impediments. This is borne out by the fact that the organisational responses are more heavily dominated by the relative importance attributed to issues of Knowledge Gap and Technical Language – where the responsibility for change lies elsewhere, namely with the public and individual scientists respectively – than are the responses of those answering in a personal capacity.

(7) For discussion of the 'deficit' model see, for instance, Wynne, B. (1991) 'Knowledge in Context' Science, Technology and Human Values 16(4): 1-19.

In the latter case, while many personal respondents are themselves scientists, they are not prevented by institutional ties from expressing their personal opinion and their answers attribute a much more even spread of importance amongst the options, including those relating to institutional problems.

Different organisations also attach importance to different factors. Thus there is significant disagreement regarding the importance of transformed structures, with SMEs, HE and RFOs in favour, while NGOs, PSRIs and Governmental Bodies generally against. Conversely, regarding the faultline of PLI, the latter three are strong defenders of this factor's importance, while HE and RFOs are strong detractors. SMEs also show themselves to be greatly undecided on the issue of PLI, with significant support both ways; a common theme for this sector in many of the questions. Yet this split in opinion is not indicative of the importance attached to the most obvious 'deficit' model factors of the Knowledge Gap and Technical Language. Indeed, the results for these factors are the opposite of what would be expected on this basis, with businesses (small and big), HEs, RFOs and NGOs all keen on these factors while Government, Chambers of Commerce and PSRIs are noticeably less so. Indeed, PSRIs register significant levels of unimportance regarding the Knowledge Gap.

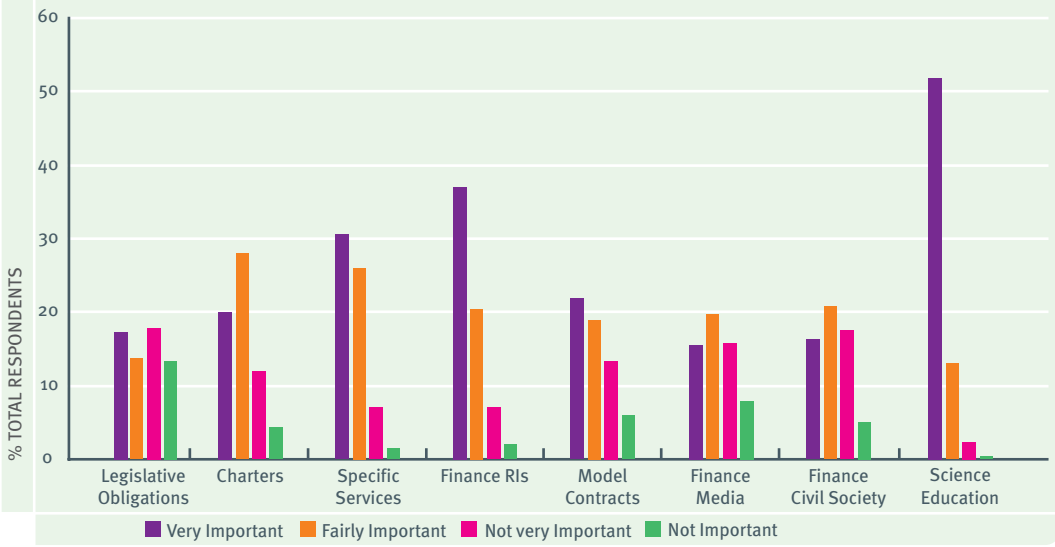
Conclusions

The results show that there remains a considerable body of opinion interested only in improving levels of scientific literacy and interest in the public. But support for some traditional 'deficit' model measures also comes from those in favour of more comprehensive public engagement, again displaying the 'both/and' logic of this position. Yet it is also the case that amongst those committed to deepening of public engagement there is a wide range of opinion, as is reflected in the complexity of the institutional responses. While the case against simple 'public understanding of science' programmes thus remains an important one to be made, these results suggest that the argument for such deeper engagement, and what this should involve, is not a single position, but the context of a varied and ongoing debate. Facilitating this debate, it seems, would be of major assistance to the PES agenda and thus the ERA vision.

Which public mechanisms should be reinforced to promote and facilitate knowledge dissemination to civil society? (Rank them in order of importance. You may give an equal ranking to a number of these areas)

Legislative obligations for research institutions
Charters/guidelines for research institutions
Specific services in research institutions
Financial incentives for research institutions
Model contracts for publicly funded research
Financial incentives to media organisations
Financial incentives to civil society organisations
Improve quality of science education in schools
Other (specify)

Figure 3: Responses to KSH11 – public mechanisms to be reinforced to promote dissemination to civil society



Overall Summary

With KSH11, the major obstacles identified in KSH4 are followed up to examine how best to tackle these issues. As will be discussed below, this allows for some triangulation of results. But we may note immediately that, just as the Knowledge Gap received widespread support in KSH4, so too improving the quality of Science Education is an overwhelmingly popular, and clear favourite, response (see Figure 3). Conversely, the least popular, and most controversial, response is Legislative Obligations for research institutions, with 31 % of respondents considering them important while 31.2 % consider them unimportant. Once again, however, this apparent focus on the public and not science is belied by a more complex set of responses regarding the other suggested options. Indeed, once again, while Science Education

is the most likely option to be chosen on its own, financial incentives (FIs) to media organisations and to civil society organisations (CSOs) are the most likely responses to be ranked 'very important' only when other responses are also rated top. Thus, the results again evidence a logic of 'both/and' rather than simply 'either/or'.

This can be seen also in correlations and conjunctions between the various options. Thus Specific Services and FIs for research institutions are generally deemed to be complementary, as are Legislative Obligations and Charters. Similarly where FIs are proposed for the media or for CSOs, these are likely to be suggested along with FIs to research institutions, though the converse does not hold. Indeed, apart from Science Education, FIs for research institutions are clearly the most popular and least controversial alternative measure.

Triangulation (i.e. comparison of evidence using two different perspectives to the same problem) with the responses to KSH4 also reveals some interesting conclusions. There is unsurprisingly a strong correlation (70 %) of those who consider both the Knowledge Gap and Science Education 'very important'. Yet a similarly strong correlation with Science Education is also in evidence for both Inadequate Incentives to disseminate and Inadequate Structures (65 % and 63 % respectively). As such, it is clear that approval of tackling educational standards is by no means exclusive of recognizing other significant problems. Another interesting result is the slightly less strong correlation between Inadequate Incentives and Financial Incentives for research institutions, which suggest that the absent incentives identified in the former are not necessarily considered to be financial in nature.

Respondent Analysis

As for KSH11, ties of institutional imperatives may be expected to encourage different types of response from those answering in a professional and a personal capacity and comparison of the results for these two groups does reveal some interesting trends. For Charters, Specific Services, FIs for research institutions and Science Education, organisational respondents registered significantly higher levels of importance than those responding personally. Conversely, those responding for their employers attached significantly higher levels of unimportance than personal respondents for the other four options (Legislative Obligations, Model Contracts, FIs for media and FIs for CSOs). From these results, it seems that institutions are more likely to see changes to the institutions of science and science education as important and more likely to object to measures that are either formal (and so potentially punitive) or deal with other, non-science institutions. In both cases, these trends are not unsurprising. However, it is interesting to note that while, in KSH4, institutions were reluctant to admit the existence of institutional problems, when the question is turned on its head in such a way that the potential admission of weakness is absented, they are in fact keener than individual respondents to deal with such institutional issues. The importance of these institutional problems thus receives considerable evidential support from these results.

Finally, regarding the different types of organisations, once again RFOs elicit the greatest enthusiasm for the issues, and Chambers of Commerce and Governmental Bodies the least. SMEs also reveal their characteristic level of commitment to the overall importance of the issues raised. Interestingly, SMEs also show the highest level of support

for Legislative Obligations, while least support comes from Big Business and Governmental Bodies, again showing the importance of distinguishing between big and small business sectors. Another interesting distinction between ostensibly similar organisations is revealed by analysis of Financial Incentives both for research institutions and CSOs. These receive their greatest support from HE but their lowest from PSRIs. This difference raises interesting questions about the extent to which HE, but not PSRIs, have been subject in recent decades to pressures of commercialisation (regarding FIs for research institutions) and public transparency (regarding FIs for civil society involvement). On this analysis, PSRIs continuing relative isolation may have allowed them to hold onto a more traditional 'public service' ethos, thereby eschewing financial incentives for themselves, but also the openness and interaction with civil society that was largely absent also in higher education in the days of more generous public funding and greater academic discretion over research agendas.

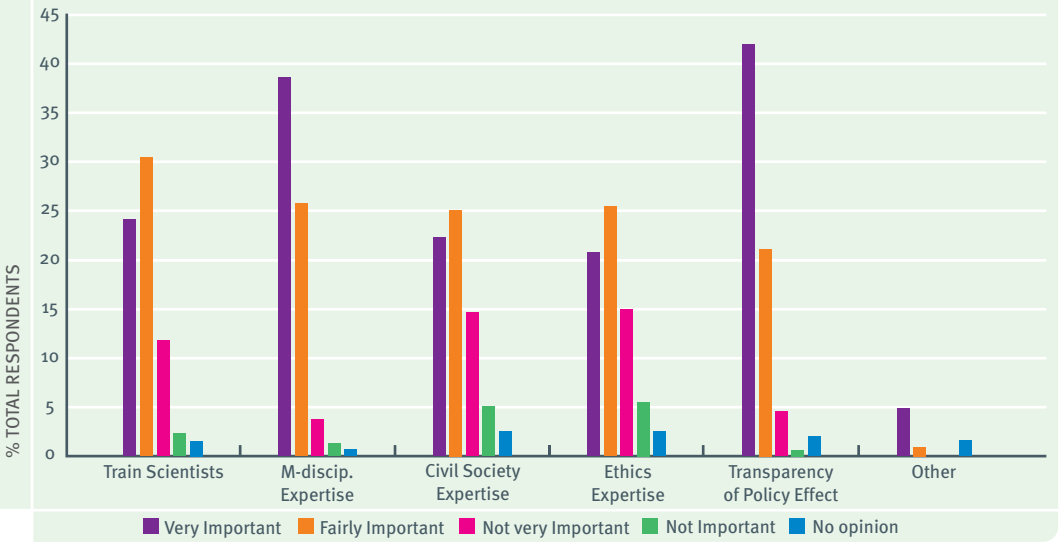
Conclusions

In conclusion, then, there is a broad consensus regarding the importance of improving Science Education, but (as is made particularly clear in the comments) this is seen to involve the need for a more hands-on, interactive introduction to scientific knowledge and research, including meeting with scientists. For such interactions to occur, however, there is also recognition of the need to deal with institutional structures that do not encourage scientists to engage in such practices; indeed, some structures may even actively discourage efforts to reach out to and engage the public. In short, while there is important disagreement on these issues, there is a groundswell of opinion in favour of a multi-dimensional response, with formal responses the least popular means of achieving these goals.

KSH12. Engaging the public and stakeholders in research decision-making processes. How can science decision-making better take into account societal concerns?

Train scientists on societal issues
Ensure multidisciplinary expertise in decision-making processes
Include expertise from civil society (e.g. civil society organisations) in decision-making processes
Include ethics expertise systematically in decision-making processes
Increase transparency on how scientific results feed back into policy making
Other (specify)

Figure 4: Responses to KSH12 – Ways to strengthen societal concerns in science decision-making



Overall Summary

As discussed above, question KSH12 acts as something of a bridge between the earlier questions, which focus on dissemination of science to the public, and the later ones, which focus on issues of dialogue and mutual interaction. The most popular responses (see Figure 4) are, unsurprisingly perhaps, those that demand the least transformation of the status quo in the process of science, namely increasing the transparency of how scientific results feed back into policy making ('Increased Transparency') and ensuring multidisciplinary expertise in decision-making processes ('MD Expertise'). The former, for instance, either assumes that science is already relevant to society, but is not sufficiently shown to be by politicians, or hopes that increasing the transparency of policy-making and its use and deployment of science will improve the decisions reached in a publicly demonstrable way. The latter must be contrasted with the involvement of straightforward 'outsiders' in the decision-making process, namely CSOs or experts ethicists. As such, choosing multi-disciplinary expertise may be seen as

plumping for the least intrusive of the suggested changes to a decision-making process involving only the scientific researchers (and their funders) themselves.

However, while these default responses are indeed the most popular, as above this is by no means the end of the story. For there is considerable debate over alternative possible mechanisms, such as the others listed: Training Scientists in social issues; CSO Expertise; and Ethics Expertise. All three of these receive significant support, but also strong levels (≈ 20 %) of objection. Such strong levels of disagreement suggest that there remains high levels of distrust in the scientific community (and possibly the public itself, though remembering that most respondents are themselves generally scientists) regarding the wider public engagement in the process of science itself. Yet, given the strong levels of support for such initiatives (e.g. at nearly 50 % 'very important' or 'fairly important' for both CSO and Ethics Expertise) this debate cannot simply be avoided. In short, these results reveal the importance for continuing public debate on these issues and commitment to a more nuanced and detailed approach, tailored to the particular subject at issue.

Respondent analysis

Analysis of different organisation types, in particular, reveals three types of response. On the one hand, Chambers of Commerce and Governments tend to attach low overall importance in the issues. Conversely, NGOs, RFOs and, in particular, the 'Others' category show high levels of trust in the importance of all suggested measures, including those involving non-scientists on a systematic basis. Finally, and perhaps most significantly, SMEs, Big Business, HE and PSRIs all reveal higher levels than average of both support for, and objection to, all measures. Indeed, the level of internal disagreement for all measures, and those involving external expertise, are striking in these cases. Yet these will be the institutions that have the most to gain and to lose from such interactions, as well as being those most likely to have had experience of these issues. As such, this result may be analysed in at least two ways. On the one hand, it may seem that greater experience of engagement initiatives polarizes opinion in a dangerously divisive way. On the other, however, in the absence of a positive experience of engagement these institutions are likely to start off as more averse because the costs of engagement (for instance, in terms of wasted time, money and other resources) may be deemed more obvious than the benefits. On this latter reading, then, the polarisation of opinion is the result of increasing numbers having positive experiences, and so shifting across the spectrum of opinion.

Conclusions

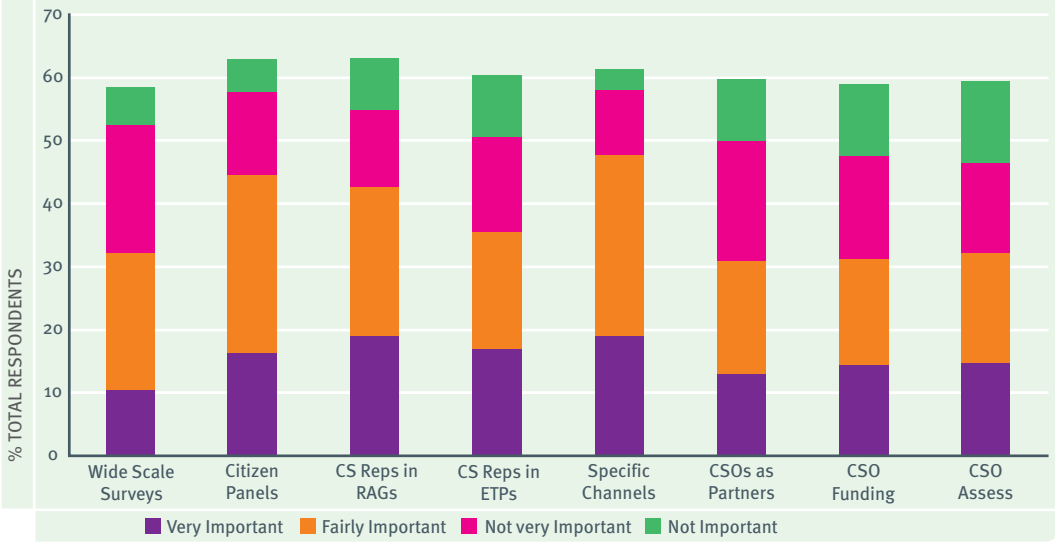
One need not be a Pollyanna about these matters, assuming that one needs only to try public engagement to be converted, to find some element of truth in this latter scenario. Rather, while engagement initiatives can no doubt fail in a way that puts participants off further efforts, the fact that the opposite can occur suggests that any given form of engagement will not necessarily be successful in all circumstances and regarding all issues. Instead, selecting and refining the form of engagement must itself be seen as an inseparable part (and an invaluable product) of the whole learning process of Public Engagement in Science. This in turn seems to refute the possibility of a one-size-fits-all solution to the question of how to engage the public that can be worked out in advance and then simply applied in all instances.

In particular, the results seem to demonstrate quite clearly that simply setting up expert panels, whether involving civil society representatives or ethicists, is unlikely on its own to quell disquiet about the direction of scientific research and may, in fact, have the very opposite to the desired effect, e.g. by negative experiences leading to lasting alienation of scientists from engagement processes. Yet this is not to counsel resignation, but rather a more experimental and inclusive approach to engagement, and to choosing the form of that engagement in the first place, so that all parties may consider it a success.

KSH13. How should dialogue and cooperation with civil society and its organisations be reinforced?

Through wide-scale surveys
Through citizen panels and focus groups
Civil society representatives should be involved in research advisory groups
Civil society representatives should be systematically involved in European Technology Platforms
Specific channels for consultations of civil society on research agendas / programmes
Civil society organisations should be involved as partners in undertaking research
Specific funding scheme/ provisions should allow civil society organisations to assign research
Civil society organisations should be involved in assessing research results
Other (specify)

Figure 5: Responses to KSH13: Reinforcing dialogue and cooperation with civil society



Overall Summary

In many ways, the division in public opinion regarding public engagement *in* science, and not merely *with* science, is clearest in this question's responses, and for the obvious reason that in presupposing that such dialogue with civil society should be reinforced, opinions to the contrary are made more stark. This is clear in the fact that none of the suggested options receives even 20 % as being 'very important', while the numbers of respondents saying that the options are important and unimportant are roughly equal in 4 of the 8 listed alternatives. Crucially, while these 4 unsurprisingly include those suggesting profound involvement of civil society in the research process (i.e CSO as Partners, CSO Funding and CSO Assessment) they also include the opposite end of the spectrum, namely the relatively remote form of engagement of Wide-scale Surveys. It follows that the respondents seem to

feel just as strongly against relative exclusion of civil society from science as its relative *inclusion*.

Yet this level of disagreement does not spell a straightforward polarization of opinion because the constant theme of the 'both/and' logic is also in evidence again in these results, and is especially marked for the most controversial mechanisms. For instance, those in favour of Wide-spread Surveys are more likely to consider Citizen Panels very important (61 %) than vice versa (39 %). Comments such as 'surveys are useful but only if followed up' echo this sentiment. As discussed above, by dealing directly with the issue of civil society engagement, this question also raises the important, and unavoidable, issues of: 'Who is the public and/or civil society?'; 'Who are its representatives?'; and 'How do they assume this role?' Given the importance of this issue, it is unsurprising to see comments raising it.

There is also no clear stand-alone favourite answer to this question, again suggesting its importance in identifying a crucial issue for further exploration. Indeed, the most popular response as sole answer accorded 'very important' status is Specific Channels, yet this may be compared with the relatively low support shown for Specific Services in research institutions in KSH11.

Respondent analysis

There are also interesting correlations amongst respondents and the division of opinion. First, women respondents show higher levels of trust in civil society with both higher importance and lower unimportance than men for all the suggested measures except, notably, CSO Assessment of results. Secondly, the overall importance and level of interest in this issue is stronger for those answering in a professional capacity than for those answering only for themselves. It is particularly significant, however, that the types of institution for which 'no opinion' or blank responses are lowest (thereby signalling higher levels of concern about the issue as a whole) also tend to be those for which opinion is most greatly divided regarding the importance or unimportance of particular mechanisms, with SMEs, HE and PSRIs as usual evincing this trend most strongly.

As regards perhaps the most controversial suggestion of CSO Assessment of research results, it is particularly interesting to note that SMEs elicit the greatest support for this, with 54.5 % of total respondents answering 'very important' or 'fairly important'. The 'Other' institutions are close behind at 48.8 %. Governmental Bodies and PSRIs also show higher than average levels of support for such deep levels of engagement, while HE and Big Business mark lower levels of support and much higher levels of objection to such a development. Again, therefore, it is clear that there is no simple correlation between types of institution and openness to public engagement, but rather a much more complex situation in which different parties within institutions perceive different forms of engagement to be important and worth exploring. No doubt, as discussed above, this reflects differing experiences and expectations of engagement, but also the relevance or otherwise of particular forms of interaction for different scientific issues. Hence it is arguably the groups with the most varied models of interaction with, or interests in, science that display most intense intra-sectoral disagreement on PES measures: SMEs cover multiple industries while not being subject to the more homogeneous demands of big business practice; HE and PSRIs are directly involved in multiple disciplines.

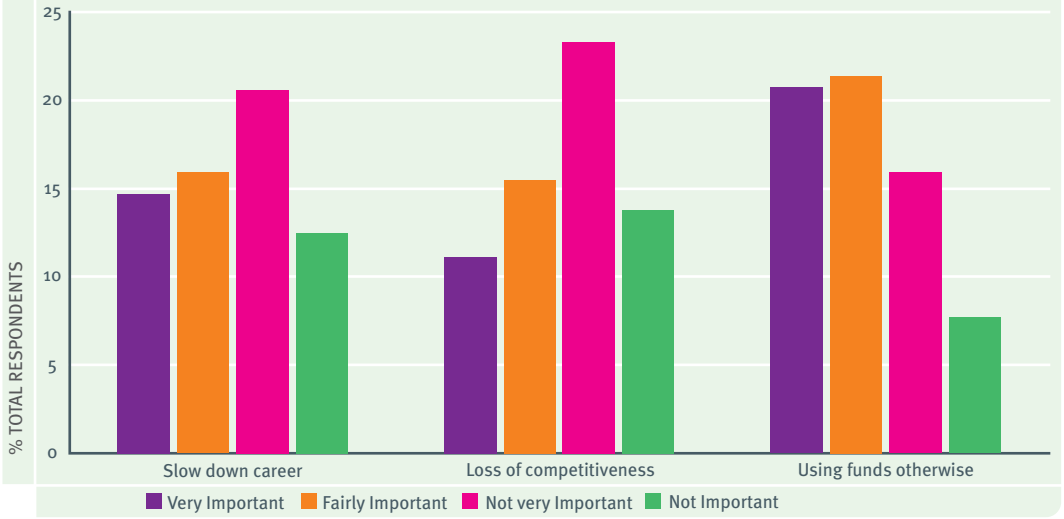
Conclusions

The marked level of intra-sectoral disagreement about these issues is itself, it may be argued, the most important result of this question, if not the questionnaire as a whole regarding PES issues. For once the importance of PES issues has been admitted, it is clear from these results that a much greater level of tailoring, regarding forms of public engagement, is needed if the potential impasse of polarized opinion is to be avoided. The need for openness to forms of engagement and collective experimentation thus appears to be a strong message from this survey.

KSH14. In what respect could the intensification of the dialogue between researchers and civil society be seen as a disadvantage?

Slowing down of researchers' careers
Research organisations would lose competitiveness
Using funds which could have been dedicated to research
Other (specify)

Figure 6: Responses to KSH14: Disadvantages of intensifying dialogue between researchers and civil society



Overall Summary

While this question still focuses on issues of two-way dialogue between 'science' and 'society', it is interesting to note the relatively slight level of controversy evidenced by these responses compared to those of questions 12 and 13. Indeed, while disagreement does remain, something of a consensus regarding the relative *unimportance* of these potential disadvantages of intensifying public dialogue emerges, especially regarding the slowing down of researchers' careers ('Career Slow-down') and the Loss of Competitiveness (see Figure 6). These are important results, especially given the nature of the respondents (who are mainly scientists) and the context of the survey in the Lisbon Agenda, for they seem to show something of a recognition of the room for flexibility in definitions of 'success'. Thus, first, a research career need not suffer from increased dialogue, especially if the definition of success in that career is altered to include such activities. And, secondly, a similar redefinition of competitiveness, for instance to include the need for dispersed public involvement in scientific and technological advance, also leaves room for such increased public engagement to be a positive gain and not at the expense of its research capabilities and success.

On the other hand, both in the quantitative results and the qualitative comments there

is a strong body of opinion that is concerned about the losses from using funds, and other resources including time, that could have been used for research ('Using Funds Otherwise'). Several of the comments also allude to the dangers of a short-termist research agenda, responding like a weather vane to the vagaries of the public mood and/or that of a media constantly on the hunt for the new. Yet the majority of the comments are in fact positive, suggesting that the disadvantages associated with greater public engagement are relatively insignificant compared to the gains.

Respondent analysis

Given the focus on career and competitiveness, it may be expected that different sectors of society respond differently. Indeed, women tend to attach a lower level of importance to all the suggested disadvantages than men. Different organisation types also show different tendencies, with NGOs, Others and (interestingly, given responses to KSH11 and 15) PSRIs tending to see the disadvantages as less important. Higher Education and SMEs again show higher levels of disagreement, with both the importance and unimportance of the various factors scoring more highly regarding Career Slowdown and, interestingly, Loss of Competitiveness. Yet SMEs register overwhelming support for the importance of Using Funds Otherwise (90.9 % 'very important' or 'fairly important'), while Big Business is not far behind (64.3 %).

Finally, given the different conditions of competitiveness and different working cultures across the EU, one may also expect different responses to this question for the different Member States. Amongst those with 10 or more responses (16 Member States), 4 clear groups are apparent. First, the Scandinavian countries (Sweden, Finland and Denmark) show a distinct lack of interest in the issue, perhaps reflecting a relative security regarding issues of competitiveness and career advancement. Secondly, the northern European countries of the Netherlands and the UK consider all three issues important, reflecting perhaps the strong Protestant work ethic traditions in both. Thirdly, central and south European countries (Austria, Belgium, France, Germany, Portugal and Spain) stress the effect on career advancement but are less concerned about issues of competitiveness, following the more corporatist traditions on the European mainland. Finally, the new Balkan Member States, Bulgaria and Romania, both emphasize the importance of Loss of Competitiveness and Using Funds Otherwise, reflecting the importance of these issues for the continuing growth and transition of their economies.

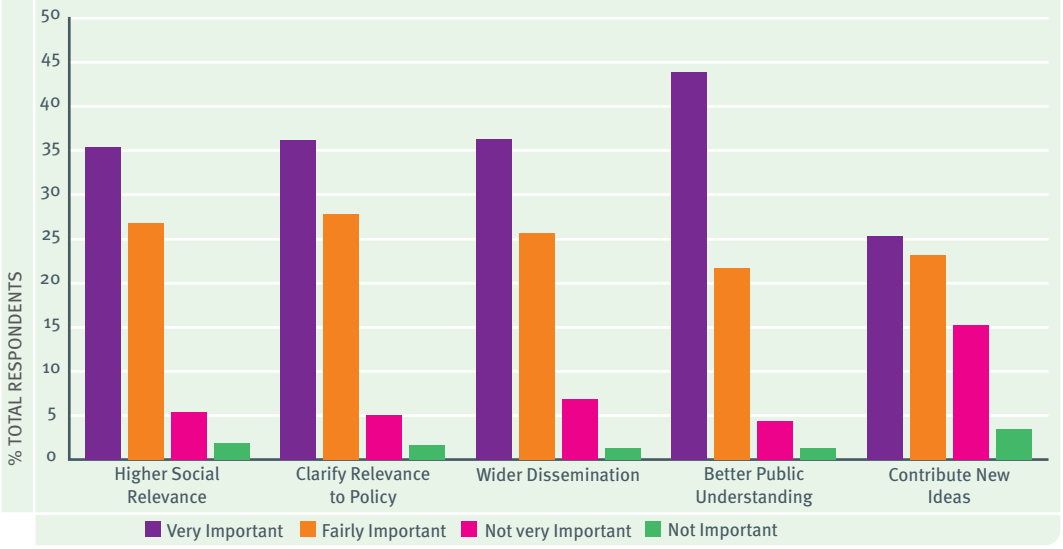
Conclusions

It is clear, therefore, that there is a broad spectrum of opinion across the EU regarding the possible disadvantages from more intensive engagement with civil society. Yet these differing opinions need not necessarily pose a threat to the successful cementing of the ERA. Rather, as above, it is clear that these different shades of European public opinion regarding science must find the means to be expressed and implemented in ways that respond to the differing conditions, where local or regional responses are more appropriate than a pan-European one. Again, therefore, this points to the need for experimentation regarding forms of engagement in order to develop a broad repertoire of mechanisms that respond to the particular needs of the issue itself.

KSH15. What do you think a dialogue between researchers and civil society and civil society organisations can bring to research?

Achieve higher societal relevance for research activities
Help to clarify relevance of research for policies
Promote wider dissemination of research results
Achieve better understanding of research by citizens
Contribute new ideas
Other (specify)

Figure 7: Responses to KSH15: Benefits from a dialogue between researchers and civil society



Overall Summary

The final question of the survey regarding PES issues asks explicitly what may gained from the greater interaction of researchers with the public(s) and/or civil society. Given the default position of the public needing to change to improve relations between science and society, one would expect the most popular responses to be the better Public Understanding of science and other suggestions that suggest improved social acceptance of science (as for TV and Science Education in earlier questions). And, indeed, this is precisely what the results of the survey show, with Public Understanding, Wider Dissemination and Clarifying Policy Relevance all scoring significant support (see Figure 7).

Yet other concerns are once again concealed by the analysis ending there. Thus, Increased Social Relevance also scores as well as these other measures, with 62.2 % considering this important as opposed to 65.6 % for Public Understanding. There is thus a clear and broad acceptance of the reciprocal advantages of greater public engagement. This acknowledgement of mutual advantage is

also evidenced in the 'both/and' logic again in play regarding this issue, with 70 % of those according Increase Social Relevance 'very important' also doing so for Public Understanding, while the figure is only 57 % vice versa.

The answer that is most informative, however, is that which is most controversial, namely that such dialogue could actually assist the productivity of research by Contributing New Ideas. We will examine below who is most in favour of this response, but first it may be noted that the 'both/and' logic is even more marked for this response than for Increased Social Relevance. While only 44 % of those considering Public Understanding very important attach equal significance to Contributing New Ideas, the converse figure is 75 %. The comments also show considerable support amongst those moved to add their own words as comments to the survey in favour of greater engagement improving social relevance and contributing new ideas, so that there is clearly a significant number of respondents actively in favour of such developments.

Respondent analysis

Keeping with the focus on Contributing New Ideas, there are interesting correlations between those in favour of this suggestion and the type of institution. In particular, there seems to be a clear three-way split in responses between those strongly in favour (NGOs and Other), those strongly in favour but also strongly against (HE and SMEs) and those largely against (PSRIs). As above regarding KSH12, this seems to reflect a conjunction between, on the one hand, the level of what is at stake for these institutions from devoting resources to greater engagement (the latter two groups having quite a lot to lose, while the former groups less so) and, on the other, levels of experience of such engagement (NGOs, HE and SMEs having more such experience in general that PSRIs).

Conclusions

In short, the responses reveal a broad consensus regarding the value of engaging the public in the production of scientific knowledge in order to ease tensions in the relationship between 'science' and 'society'. And while there is strong disagreement about the extent to which public engagement can actually *assist* science in its own endeavour, even here there is considerable optimism regarding these issues as well.

Conclusions and Recommendations

The survey results show that while there is broad agreement on the need for deepening public engagement in science, considerable differences remain regarding what this means in practice. Furthermore, they reveal that this diversity of opinion is most intense *within* those institutions most directly affected by engagement initiatives (especially small business, higher education and public sector research institutions). As such, it is clear that, while the argument against exclusion of the public from science remains an important one to be made, the success of PES goals, and thus of the ERA, depends on a more open and less standardized approach to the questions of how engagement should take place. The following recommendations are therefore offered:

- First, the EU should simply restate its explicit and emphatic commitment to deepening the engagement of science and society. Given the complexity of the issue itself, as just discussed, such a statement would act as the crucial spur and framing for all further efforts.

- Secondly, multi-dimensional public engagement should be invited, so that a one-size-fits-all 'best practice' approach is repudiated and there is explicit openness to refashioning the forms of public engagement as particular debates progress. The starting point of any particular engagement initiative thus should be that the form of engagement is an open question, as well as itself a substantive part of the issue to be debated, hence demanding a willingness to work this out in the process of debating the substantive issues.

- Thirdly, initiatives regarding public understanding of science should be continued and strengthened but, crucially, alongside other initiatives to amend the incentives, structures and resources for science communication where necessary, as well as initiatives to receive, process and show the effect of public responses. In short, the EU should encourage collective institutional innovation of the sort that has been discussed previously, for instance by the Expert Group on Science and Governance in their report to DG Research published earlier this year.

These suggestions are clearly neither detailed nor particularly new. Yet these or similar measures are required if the diversity of opinion reflected in this survey is to receive the audience it deserves and thus both the democratic and the competitiveness goals of the Lisbon Agenda are to be realised.

European Commission

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What does Public Engagement in Science mean? Science and its associated technologies pervade every sector of society but how do citizens relate to them? And how do scientists consider their relationship with civil society? In recent years, the volume and intensity of public debates about science and technology have risen, boosted by the emergence of controversies over issues such as BSE, genetically (no hyphen) modified organisms, mobile phones and nuclear waste. Should the public be involved only when a problem arises or is there room, reason and interest for a more systematic participation of civil society in scientific research?

These questions have been raised during a Europe-wide consultation on the future of the European Research Area (ERA) and the ensuing Portuguese Presidency conference in Lisbon in October 2007.

This publication presents the results of the consultation concerning public engagement in science and research. It also reports on the discussion which took place during the Lisbon conference on the purposes of public engagement and the forms it can take during the process of production and regulation of science and technology.

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