



Science, governance and public engagement

TNS-BMRB Report

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Content

Executive summary 1
1. Introduction
1.1 The concept of public engagement in this study6
2. Our approach
2.1 Stage 1 - Literature review 7
2.2 Stage 2: Interviews with decision-makers in science organisations
2.3 Stage 3: The Royal Society Workshop 10
2.4 Stage 3: Analysis and reporting11
3. Findings from the interviews and 'in-depth review' process 12
3.1 Introduction 12
3.2 Governance structures
3.3 Strategic issues facing organisations 18
3.4 Organisational cultures and change management24
3.5 Openness and transparency 29
4. Responsiveness to public concerns about science governance
4.1 Purpose of S&T and motivations of those involved in its development 35
4.2 The relative lack of trust in Government to act in the public interest
4.3 People 'kept in the dark' around what S&T gets funded
4.4 Speed of innovation exceeds its scope for adequate regulatory oversight. 39
4.5 Whether the culture of science organisations discourage scientists to voice
concerns
5. Conclusions and recommendations 44
5.1 Moving from public engagement to governance in the public interest 45
5.2 Institutional conditions to help good governance flourish
5.3 Openness and the public interest 48
5.4 Innovation and the public interest
5.5 Collaboration and good governance51
5.6 Recommendations 52
5.7 Sciencewise-ERC 53
6. Appendix - Interview topic guide



Executive summary

The last ten years have seen a significant change in the way that relationships between science and the public are discussed. Policymaking bodies that support or use science are increasingly interested in new forms of dialogue with members of the public. But, attention needs to be given to the purpose of such activities.

Many people are ambivalent about a particular science or technology rather than clearly 'for' or 'against'. Rather public concerns relate directly to how science is governed in real world circumstances. In this study we explore the extent to which public engagement around science and technology has promoted better governance. In the context of this research, public engagement concerns the use of public dialogue to help shape decisions or policies around the development of emerging science and technology. Specifically, it explores whether cross cutting public concerns around issues such as stem cell science, nanotechnologies, biotechnology, synthetic biology, geo-engineering and so on, have influenced the governance of science organisations.

This report draws on a study of governance arrangements in 23 UK science organisations,¹ looking in particular at how public views and values were understood and incorporated into policymaking. The research was conducted on behalf of the Sciencewise Expert Resource Centre (ERC).² It comprised a review of 17 public dialogues on science and technology, 40 interviews with senior staff in science organisations and a workshop at the Royal Society.

The report's main conclusion is that relationships between science organisations and the public are changing, but that more work needs to be done to improve governance processes. Science organisations are becoming more open. They talk more readily about the need to hear the views of the public and communicate the uncertainties of science. But organisational pressures still prevent public values from being reflected in policies, procedures and practice. Public engagement activities, and large dialogue processes in particular, have had an impact. But they are still largely seen as a bolt-

² The Sciencewise Expert Resource Centre -(ERC) funded by the Department for Business, Innovation and Skills (BIS), helps policy-makers to understand and use public dialogue to inspire, inform and improve policy decisions around science and technology. www.sciencewise-erc.org.uk



¹ Defined as those that have a significant role in the policy, funding, leadership, regulation, research and development of UK science and technology

on to established structures rather than the start of a new sort of relationship with the public. There is therefore a need to move beyond thinking of 'public engagement' in isolation, to talk about *governance in the public interest*.

The report has a number of more specific findings:

- 1. There was a stated interest in involving the public to inform strategy and policy, but not involving the public in particular major decisions.
- Governance is expert-led. Power is concentrated at very senior levels. Leaders of organisations have a large influence on policy cultures. Efforts to engage and reflect public values remain largely marginal.
- 3. There are a number of important strategic issues facing organisations. Budget cuts and a change of Government priorities create pressure to close down the framing of problems, shutting out public voices. However, resource constraints have also increased the focus on and appetite for collaboration and there is scope to build on this for better governance.
- 4. Cultures of science-based organisations reflect tensions between being innovative and being evidence-based, and between being expert and open. Organisations in which public engagement has an impact on decision-making tend to be those willing to take risks, with supportive leadership and decentralised decision-making.
- Organisations saw their key accountabilities to scientists, government and business and routinely engaged these groups to inform their decisions. The public was seen as a lower level accountability and was not engaged through normal business practices.
- 6. There was greater support to engage the public to inform policies and priorities, than engage them in specific funding decisions.
- 7. Public dialogue exercises have had most impact where there is senior support. Clear goals, a specific decision context and a commitment to account for findings are also very important.
- 8. Openness and transparency are necessary but not sufficient conditions for good governance. There were organisations that were very transparent but did not effectively account for public views in decisionmaking.
- 9. Closed organisational cultures present a systemic risk of governance failure. They are more likely to regard publicly controversial activities as normal and ignore ethical dimensions.



10. The coupling of research with wealth creation ('the deal done with the Treasury') means that working with business is still seen as a priority. But some suggested that budget cuts had the potential to cut public engagement. The recent spending review and commercial drivers were also not seen to have helped scientists openly reflect on their work.

Recommendations:

- Public engagement for policymaking should be used by organisations not as a standalone exercise, but as part of good governance, strategy and decision-making. There should be strategic consideration of how it complements science governance processes such as openness and transparency, regulation and relationships to business.
- 2. Organisations need to consider whether policies impact on the public interest, how they should account for this and the consequences of not doing so. It is an important strategic issue for organisations to consider whether they want to lead or react to future public debates on science.
- Pressure to improve governance should be targeted at the most senior level in organisations. Leadership organisations – such as science academies and government – have an opportunity to help encourage, persuade and compel others to account for the public interest in terms of science governance.
- 4. Public engagement should enable organisations to 'reframe' policy issues beyond risks and benefits of technologies; to better consider social outcomes and the role of technologies in achieving these goals.
- Greater use should be made of engagement as part of the innovation pathway – both through open source development and co-creation of technology products; but also through enabling people to help redesign organisational governance processes.
- 6. In the light of these findings, Sciencewise-ERC should help organisations better account for public dialogue in terms of the processes of science governance. As part of this, we recommended that tailored findings are produced (in confidence) for each organisation that took part in this study to enable a new conversation around the future role of public engagement in governance.



1. Introduction

In the UK, the ability of institutions to anticipate and take account of the public reaction to technological risk has been a major challenge to science governance in recent decades. The controversy surrounding genetically modified (GM) foods and crops in the late 1990s, followed by mad cow disease and the uncertainties surrounding the link between bovine spongiform encephalopathy (BSE) and Creutzfeldt-Jacob disease (CJD), led to a number of influential policy reports written calling for more proactive public involvement and deliberation in debates about the social and ethical dimensions of science and technology.³

The Sciencewise-ERC has been at the forefront of this response, initiating innovative and comprehensive public dialogue over the past five years. It has constructed and guided a number of important projects, on issues from nanotechnology and stem cell research, to the forensic use of DNA and building low carbon communities. Sciencewise-ERC has also played a significant role in encouraging the appetite for public dialogue within government and its agencies. However, while there has been a range of innovation in participatory processes during this time, it remains unclear as to the extent and nature of the <u>impact</u> of these dialogue initiatives on commissioning and target institutions.

In this context, public attitude research has highlighted how people tend not to be clearly 'for' or 'against' a particular science or technology; rather they remain ambivalent, developing views that are contingent on how the science is being governed in real world circumstances: how adequate are current patterns of regulation; who will be responsible if things go wrong; can they be trusted; is the



³ Royal Commission on Environmental Pollution (1998). *21st Report of the Royal Commission on Environmental Pollution – Setting Environmental Standards*. London: The Stationery Office; Department of Trade and Industry (2000). *Excellence and opportunity – a science and innovation policy for the 21st century*. London: DTI; House of Lords (2000). *Third Report of the House of Lords Select Committee on Science and Technology*. London: The Stationery office; HM Treasury, Department of Trade and Industry, and Department of education and Skills (2004). *Science and innovation investment Framework 2004-2014*. London: HM Treasury; Wilsdon, J and Willis, R (2004). *See-through science: why public engagement needs to move upstream*. London: Demos

technology seen as imposed or open to change; who is this technology for; why this technology and not another; and so on.

A key and critical question is how institutions frame and have responded to governance issues that have been at the forefront of public concerns around science and technology.

This project, conducted on the behalf of the Sciencewise-ERC, aims to better understand how science organisations are governed, the responsiveness to public concerns in this context, and potential ways to improve this.

Key questions for the project include:

- 1. What are the current governance structures and strategic drivers facing science organisations?
- 2. To what extent have science organisations recognised and responded to the governance challenges posed by public concerns and values towards science and technology?
- 3. What are the cultural and systemic factors that act as barriers and enablers to these governance challenges?
- 4. In what way and to what extent have the direction, control and governance of science being shaped by and through public dialogue?
- 5. What conclusions can be drawn about future good governance in this context?

For the purposes of this study:

- Science organisations are defined as those that have a significant role in the policy, funding, leadership, regulation, research and development of UK science;
- Science governance is defined as the cultures, processes and structures though which science organisations are directed, administered and controlled. It also relates to how power is held accountable in these organisations;
- Scientist is used as shorthand for basic and applied researchers, engineers and those working on the translation of research into new technologies.

1.1 The concept of public engagement in this study

In this study we explore the extent to which public engagement around science and technology has promoted better governance. In the context of this research, public engagement concerns the use of public dialogue to help shape decisions or policies around the development of emerging science and technology. Specifically, it explores whether cross cutting public concerns around issues such as stem cell science, nanotechnologies, biotechnology, synthetic biology, geo-engineering and so on, have influenced the governance of science organisations.

This study is not explicitly concerned with the use of public engagement to raise the profile of science or for wider science communication activities - though its use in these contexts emerged in the interviews on occasion.⁴

In addition, the use of engagement to help co-create or develop user centred design of new products was not an explicit focus of the study - though was also noted by certain respondents.

Our methodology for the project is described next.

⁴ For a review of the different uses of public engagement in science see: Sciencewise-ERC (2010). *Public engagement for science and society – a conversational tool.* Available at: <u>http://interactive.bis.gov.uk/scienceandsociety/site/all/files/2010/10/PE-conversational-tool-Final-251010.pdf</u>

2. Our approach

Our approach involved four complementary stages.

- Stage 1 included a literature review of findings from previous dialogue processes and related evaluations.
- Stage 2 involved interviews with 40 respondents in science organisations. The interviews focused on strategic issues facing the organisation, current governance arrangements, and the extent to which the organisation had been responsive to public concerns about science, as identified through stage one of the research. This stage also included an 'in-depth review' process in two organisations (a regulator and a funder) to explore governance issues with a greater range of staff.
- Stage 3 involved a workshop at the Royal Society. Here, emerging findings were discussed with respondents who had been involved in the research to help validate findings and generate views on potential ways forward.
- Stage 4 involved **analysis and reporting**. Specifically, a framework approach was used for the analysis of transcripts from the interviews. The interview findings are the focus of this report. Findings from the literature review and the workshop are considered in relation to the interviews in the conclusions section of this report.

An Oversight Group helped to steer the project on the behalf of Sciencewise-ERC.

Each of these phases is now explored in more depth.

2.1 Stage 1 - Literature review

A literature review⁵ was conducted between October 2010 and January 2011. It was not a comprehensive academic literature review but rather an overview of emerging

⁵ The review is published separately to this report. See Chilvers, J. and Macnaghten, P. (2011). *The future of science governance: A review of public concerns, governance and institutional response*. Available at: <u>http://www.sciencewise-erc.org.uk/cms/science-trust-and-public-engagement-2/</u>



public concerns around science governance - and was specifically undertaken to inform stage 2 of the project.

The review focused on 3 areas

- 1. An account of science governance issues emerging from 17 public dialogues funded by Sciencewise-ERC.
- 2. A mapping of the diversity of governance responses emerging in complex areas of science, technology and innovation. Specifically, three domains were explored in depth: genomics, nanotechnology and climate science.
- 3. A synthesis of the review findings and conclusions. This explored the relationship between public concerns about the governance of science and actual governance responses. Specifically, this part of the review highlighted five cross cutting governance issues that would inform the interview topic coverage in stage 2 of the study. These governance issues were:
 - a. The *purpose of science and technology and the motivations of those involved in its development*. Specifically whose interests are innovations in science and technology serving? Are they necessary? Are there alternatives?
 - b. The relative *lack of trust in Government to act in the public interest*, particularly in relation to the perceived proximity between government and the interests of industry.
 - c. That people are *not* included in deciding what kinds of science and technology gets funded and feel 'kept in the dark'. They also express a desire to feed their values and aspirations into science and innovation.
 - d. That the *pace of scientific and technological development exceeds its scope for ethical and regulatory oversight* and may take us in directions that have not been adequately considered.
 - e. Whether the *culture of science* discourages scientists from voicing concerns over potential risks and uncertainties, or from reflecting on wider social and ethical considerations.

2.2 Stage 2: Interviews with decision-makers in science organisations

The centrepiece of the project involved 40 interviews with respondents in 23 science organisations in the UK - with typically two interviews per organisation. Specifically,

thirty-eight interviews were conducted with senior decision-makers - typically a Chair, CEO, Director of Strategy and/or Policy, or senior civil servant. The remaining two interviews were conducted with respondents who had an operational or delivery focus in the organisation, particularly those involved in the conduct of public engagement exercises. The achieved sample frame is provided in Table 1.

Table 1: Achieved sample	e frame for the study
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Organisation type	Number of	Completed	
	organisations	interviews	
Science funders	4	8	
Government departments	4	9 ⁶	
Regulators	4	8	
Learned Societies	2	4	
Businesses/ those involved in	4	5	
technology transfer			
Other government agencies,	4	5	
including local government			
Non-government organisations	1	1	
Total	23	40	

2.2.1 Interview process

Thirty-eight of the interviews were completed as telephone depths, with one interview conducted face-to-face and one via email correspondence (due to limited availability of the respondent). All research was conducted between January and March 2011.

All interviews were structured by use of a topic guide⁷ and were conducted in confidence. We explicitly did not seek to use verbatim quotes in order to encourage respondents to be candid in their responses. Interviews were audio recorded and transcribed for analytical purposes.

(i) In-depth review process

In addition to the main interviews, an 'in-depth review' process was conducted in two organisations - a funder and a regulator. Though originally conceived as

⁶ This included interviews with four Chief Scientists and one external advisor

⁷ See appendix 1.

'ethnographic' and observational in nature, these processes were ultimately undertaken as informal semi-structured interviews with a range of other staff (typically 4-5) within each organisation. The aim of this process was to:

- further explore organisational cultures and practices around science governance and public engagement with a cross section of relevant staff;
- validate emergent themes from the rest of the research.

All meetings were undertaken face-to-face at the organisations' premises.

Due to their informal nature, these discussions were not recorded, though field notes were written.

2.3 Stage 3: The Royal Society Workshop

A workshop was organised by and held at the Royal Society with 21 participants who had taken part in the interviews. The aim of the workshop was to gain views of respondents on emerging findings from the study and also to begin discussion around potential ways forward. The workshop agenda was as follows:

- Welcome and overview of the study.
- A presentation and discussion on emerging study findings.
- Discussion of the extent to which issues highlighted in the presentation were important for organisations.
- Discussion of what organisations could do individually and collectively to address public concerns.

Notes from the sessions were taken and have been taken into account in the conclusions section of this report. Currently, the Royal Society is considering the outputs from the workshop, with a view to potentially publishing a document on its findings.



2.4 Stage 3: Analysis and reporting

Analysis and reporting was in three stages.

- 1. A debrief session was held with the researchers on the project.
- 2. An analytical framework was then developed based on the topic guide and the debrief session. Each interview transcript was summarised in this framework.
- 3. A synthesis of the notes within this framework was then used to construct the structure of the report. As noted, due to the need to protect confidentiality, verbatim quotations were not used to illustrate findings from the study.

2.4.1 Limitations of the methodology

Findings are based on the views of governance as described by respondents. These views were validated only to the extent of:

- exploring internal consistency in the interviews (both during the interview and analytically);
- conducting a further interview with a respondent from the same organisation; and through the review of findings at the workshop.

Wider validation of views, for instance in relation to other published literature, was beyond the scope of this study.

As each organisation had different public engagement and governance practices, it was not possible to develop conclusions specifically in relation to different organisation types - e.g. a set of recommendations aimed at regulators, a set at funders and so on.

Whilst there are clear recommendations resulting from the research for individual organisations, it is not possible to publish these without compromising confidentiality.

Results and recommendations are hence presented at a generic level in this report.

It is recommended that a short confidential document could be produced, developing bespoke recommendations for each organisation that took part in the research.



3. Findings from the interviews and 'in-depth review' process

3.1 Introduction

This section and the following chapter of the report highlight the findings from the interviews as well as the 'in-depth review' process. All of the issues discussed in these chapters directly emerge from these interviews. This material has been interpreted only to the extent of trying to develop an analytical rather than descriptive account of findings. A summary series of findings and key implications emerging from the research are presented at the beginning of each section.

3.1.1 Structure of findings

The first section (3.2) explores governance structures. It includes an overview of decision-making in organisations and the extent to which public and stakeholder views are influential.

The second section (3.3) explores strategic issues facing organisations over the next few years - and includes a review of how financial constraints are shaping governance, the need to account for the impact of science, as well as increased drivers and opportunities for partnership working.

The third section (3.4) explores organisational culture and the extent to which organisations have changed in response to emerging governance issues.

The fourth section (3.5) explores how different organisations have viewed the role of openness and transparency in relation to governance.

The fifth section (3.6) explores the extent to which current government policy initiatives - in particular the 'big society' and open government - impact on the governance practices in different organisations.

Chapter 4 explores the extent to which organisations recognise and have responded to a series of public concerns around the governance of science.

Findings are described next.



3.2 Governance structures

Governance structures

Key findings in this section include:

- Governance structures and/or positions of power within organisations were dominated by experts
- Power within organisations rested almost exclusively in one of three sets of actors: CEO/Minister; Governing Board; senior Executives/civil servants
- Those leading organisations were most important in influencing decisionmaking culture – and the extent to which public views were accounted for
- The 'challenge' role of governing boards was very important in helping to prevent governance failures
- There was limited experience and appetite to get the public directly involved in contributing to major decisions in organisations
- There was greater willingness to involve the public to inform policies and priorities, than to directly engage them in specific funding decisions

Key implications include

- Organisations have a duty to manage governance so that it does not negatively impact on their reputation and/or the wider public interest
- Attempts to influence the governance of an organisation to be more responsive to the public interest should be targeted at CEO/Minister, the wider executive team/senior civil servants or the governing/advisory body
- The public interest should focus on cross cutting strategic issues for science policy, rather than be limited to the risks of individual technologies

3.2.1 Governance, power and knowledge

The governance structures and/or positions of power within organisations were dominated by experts and specialists. There were three broad models.

• Science expert-led model: this structure was typical of learned societies and funders. Here both executive and non-executive roles, in particular the chairman or the chief executive, were generally filled by senior academics with a technical scientific background. Certain organisations adopted a unitary board structure where the CEO and Chair roles were combined.

- Science executive model: this structure was more typical for regulators and certain Non Departmental Public Bodies (NDPBs). Here, though many senior staff had a technical/science background, non-executive membership on governing boards was broader: with representation from politics, finance, business, law and civil society groups/non-government organisations (NGOs).
- Science advice model: this structure was more typical of central government departments. These organisations were led by a Ministerial team. Technical knowledge for decision-making came from civil servants and independent science advisors, in particular the departmental chief scientists.

Either technical or policy expertise was at the forefront of decision-making in all organisations. As will be noted later, this impacted on the scope for the public to influence decision-making cultures.

3.2.2 Governance role of boards

Boards operate not only to develop strategy to progress the organisations goals, but also to protect corporate reputation and uphold standards. The 'challenge' role of boards, as well as science advisors and senior civil servants was noted as one of the key governance functions. Failures of governance were seen to arise when both internal and external institutional checks and balances (particularly regulatory functions) fail. Having a closed culture, where a lack of external scrutiny could distance the organisation from the outside world, was also noted to precipitate governance failures.

3.2.3 Wider governance and organisational power

As would be expected, power within organisations rested almost exclusively in one of three sets of actors:

- The CEO/ Minister
- The Governing Board
- Senior Staff in particular the Executive/senior civil servants

Within this context, the CEO/Minister was most important in shaping the decision-making culture in the organisation and the extent to which wider interests, including the public, could inform policies. From our analysis, it would appear to be vital for someone within one of these three roles to be a champion (or at

least sympathetic) about public engagement for it to be meaningfully considered within an organisation. This was exclusive of whether wider public engagement activities were being undertaken in the organisation.

Organisations devolved many aspects of decision-making down to subcommittees (or other similar structures), who would then develop recommendations for the governing body/Executive for approval. Within these structures there was more scope for a wider (including lay) representation of interests (this is explored in more depth below).

Relationships between senior staff/civil servants and governors/Ministers were particularly important in driving forward the business of an organisation, particularly when quick decisions were needed and there was no time to go through formal structures.

3.2.4 Decision-making and public values

There was limited experience and appetite to get the public directly involved in contributing to major decisions in organisations. A good example of this relates to science funding decisions - which was perceived as best done by scientists for scientists. In policy terms more generally, an expert led model dominated, where technically trained civil servants were best placed to make decisions.

There was a whole number of **barriers around involving public perspectives** in this process: including

- cultural not part of the traditional ways in which decisions are made
- **practical** how to design a process that can account for public views given the technical nature of discussion
- substantive better science or policy is better developed via expert review

However, there was stated to be greater appetite to feed in public views at a more strategic level: helping to inform policy, priorities and the direction of travel, rather than directly shape investments. There were three reasons for this.

 The most dominant reason was to 'sense check ideas', to ensure research was not significantly out of kilter with public values and promote public trust. This was tied to arguments around scientists needing a 'licence to



practise' - with public engagement helping to provide an early warning about areas of potential public controversy. Here the public would generally play a passive role, responding to the ideas of scientists. In this context, engagement was used for instrumental purposes and served institutional interests: how to help to best position a technology as socially legitimate; how overcome social barriers to its development; how to 'win public trust' around a specific application. This type of engagement was particularly highlighted by those involved with the commercialisation of research, to help manage business risks.

- 2. A less dominant reason was that strategy would be better if it was infused with public values. Here public engagement was used for substantive reasons - to help make better decisions by listening to different perspectives, scoping the issues more effectively and potentially stimulating novel policy solutions. In this context, the public play a more active role in shaping decisions and in turn help direct technologies towards social goals.
- 3. The least dominant reason was normative and relating to engagement as a democratic end in itself. This was not a key driver for most science organisations, though was a factor for certain actors in government particularly those with local accountability.

3.2.5 Accountability and stakeholders

There were four tiers of accountability highlighted by organisations.

- First level accountabilities were **administrative and legal**. They were through the governing body/Ministers and related to direct financial and/or fiduciary duties. Responsibilities were to:
 - Parliament for government departments
 - Government for funders or regulators
 - Shareholders for private sector organisations
 - Charity Commission for charities.
- Second level accountabilities were constituency based. These were very
 important and concerned accountability to those who have a direct and
 professional interest in the organisation's activities. Scientists were the key
 group in this regard most directly for science academies, but also for policy-



makers, funders and regulators whose activities directly impact on researchers.

- Third level accountabilities related to users or customers of particular products or services developed by organisations. Business in particular was cited as key in this regard. There was a strong sense that innovation - in research, policy or regulations - should meet the needs of customer groups.
- The final level of accountabilities was societal. This was expressed in terms of ensuring a licence to practise, ensuring the good use of public money and that the science developed is of relevance for society. Though not unimportant, this was generally seen as a lower level accountability and, unlike other areas, was generally not embedded in the routine structures and practices of an organisation. However, these types of accountabilities were also seen to carry risk. Specifically, not being attentive to these issues led to the potential for these to flare up as areas of controversy.

Overall, there was a strong link between lines of accountability and stakeholder engagement. Most organisations routinely engaged scientists, (other) government departments and business to help inform their decisions - to complement technical expertise held by their own staff. There was a focus on expert-led decisionmaking - with lay people or the public not automatically considered as contributing through normal business practices. When wider public engagement did occur, it was through specialised processes that were distinct from the routine ways in which organisations gained intelligence.

Finally, other stakeholders mentioned included the media and NGOs. These were not seen to reflect the public interest *per se*, but rather a narrower interest of a vocal minority. However it was also noted that such groups can also be key in forcing organisations to make sudden governance changes. In this regard, engaging both of these groups was also seen as important in terms of meeting lower level social accountabilities.



3.3 Strategic issues facing organisations

Strategic issues facing organisations

Key findings in this section include:

- Economic constraints, and the impact on public finances, was the dominant issue facing organisations
- This not only meant less money for research and administration, but also organisational retrenchment and loss of governance capacity
- As a consequence of the need to demonstrate the value of research, there was a greater focus on delivering social and in particular economic outcomes
- There was also a greater focus on partnership working. While to date this had mainly focused on identifying funding priorities within sectors, there was also an aspiration for this to happen in relation to governance. This was expressed in terms of government, industry and academia taking a long term look at issues in the national interest

Key implications include

- Retrenchment could potentially create a 'governance gap' on cross cutting areas of science policy, due to organisations focusing on core business
- However, greater collaboration also provides opportunities to govern science in the public interest and for organisations to collectively consider sector-wide responsibilities in this regard

The key issue shaping organisations was the economy. The global recession and budget deficit meant significant real terms reductions in incomes for all organisations. There were four related drivers on organisations:

- 1. Less money for research and administration
- 2. Retrenchment and a loss governance capacity through restructuring
- 3. The need to get greater impact from activities and investments
- 4. A focus on collaboration and opportunities for shared solutions/delivery.

3.3.1 Less money for research and administration

At best, public sector organisations that negotiated a flat cash settlement were looking at real term decreases of 15-20% in administrative as well as policy and programme budgets. Others, particularly government departments, were facing cuts of around 30%. For those organisations not reliant on the public purse, less demand for products or reduced income from investments also meant a period of belt tightening. This was likely to have a significant impact on R&D through cuts to research budgets and indirectly through a loss of administrative capacity.

In this regard, budget constraints were stated to undermine the ability of organisations to develop sufficient in-house expertise to help administrate funding or develop the evidence for policymaking. Specifically it reduced the capacity of:

- funders to spot strategic opportunities for investment and support scientists to deliver on this opportunity,
- policy-makers and regulators to commission research effectively and develop intelligent analysis.

Direct cuts to research budgets were also seen to have a detrimental impact on the UK's research capability and international competitiveness - particularly given the emergence of the new economies. Funding cuts also impacted on resources available for innovation and translation, and the ability to help stimulate technological growth in areas where there was market failure. The impact of the loss of the Regional Development Agencies was cited in this regard, particularly in terms of enabling growth in areas of economic decline.

3.3.2 Restructuring and retrenchment

Across all organisations, the lack of resources meant a stronger focus on core business. There were five issues emerging from this that have direct implications for governance.

 Certain government agencies had been restructured to focus on specific organisational (rather than cross cutting) priorities - for instance regulators focusing on the safety of technologies. Whilst these changes have helped provide a clearer remit for agencies, it also narrows how choices around science and technology are framed.



- 2. The review of arms length bodies has meant the restructuring of a host of science governance organisations such as the Human Genetics Commission (HGC), Human Fertilisation and Embryology Authority (HfEA) and Human Tissues Authority (HTA). While for certain respondents this was a useful opportunity to rationalise regulation and science advice, for others it meant the loss of independent voices able to ask questions of science in the public interest. ⁸
- 3. Within government departments there was seen to be the need to align evidence much more directly with what Ministers want to achieve. While government actors saw the public interest as being reflected through the democratic legitimacy of Ministers, the extent to which government acts in the public interest was one of the key themes raised through dialogue processes.⁹
- 4. A number of the organisations active around public engagement stated that they needed to be clearer about where their responsibilities are and 'only do the bits we need to do'. Specifically, there was stated potential for retrenchment in public engagement activity.
- 5. Funding constraints were used to legitimate particular ways of organisations making decisions. For instance, in relation to science funding it was explicitly stated that under limited resources, scientists are best placed to decide on priorities.

3.3.3 Wealth creation

A major driver shaping organisations was the coupling of research to wealth creation. For research organisations funded by the public purse, there was a view that they had escaped the brunt of the cuts by stressing this connection. This 'deal with the treasury' (in one participant's terms) had built a set of expectations around research - with government expecting a return on investment.

⁸ These issues are currently being explored in a project undertaken with Sciencewise-ERC co-funding for the Department of Health on the reconstitution of the HGC as a Departmental Expert Committee

⁹ Chilvers and Macnaghten (2011) pp.10-11

There were a host of activities put in place to assist this - particularly concerning knowledge transfer, translational research and greater entrepreneurial culture within the research community. Overall, it was believed to be impossible to interact meaningfully around research without engaging with business. Relationships with business were not seen as problematic, providing appropriate checks and balances were put in place to govern relationships and there were social benefits derived from publicly funded research. As such, in addition to economic growth, the use of science to promote quality of life was also cited. Funding programmes were also framed as responding to major challenges facing society - climate change, food security, cancer and so on.

As a consequence, policy-makers and funders were increasingly focused on the outcomes of research. This has meant moving from response mode grants, to playing a more active role in shaping research trajectories and gaining evidence on impact. Language was changing around this process - with funding organisations referring to their role as a 'sponsor of research' or a 'grant maker' rather than a grant giver. Whilst impact assessments (economic, social and cultural) have been an important part of the grant application process for some time, the increasing significance of this was stressed by respondents.

In this regard, a number of funders also highlighted they would be working in a different way with academics and higher education institutions (HEIs). For certain organisations, the majority of their funds went to only a dozen or so universities; in others there was to be a focus on greater rewards for fewer excellent individuals. In both cases it was felt that organisations could be more demanding of grant holders.

For funders, while it was acknowledged that greater responsiveness to business and government was important, independence was more so. There was a need to ensure that the Haldane principle¹⁰ still governed decisions about research funding, while mindful of the dynamic nature of modern research. Relationships with stakeholders were seen as interrelated in this regard - government and business priorities around science and technology are in turn informed by the advice they get from academia and from science organisations

¹⁰ The principle that decisions about the allocation of research funds should be made by researchers rather than politicians

3.3.4 Collaborative and partnership working

Related to the above, a critical factor for the future success of the UK research base was the capacity to collaborate effectively and provide new knowledge to address the needs of a changing society. This included developing better interdisciplinary approaches for research (particularly between sciences and social sciences), as well as collaborations with the public and private sectors. Activities such as sandpits were cited in this regard - helping to develop creative and interactive spaces to develop ideas and inform priorities.

Collaboration was also valued in terms of strategic partnership to deliver goals, particularly under financial constraints. This was expressed in many ways including the ability to gain better strategic join-up within sectors and the opportunity to pool talent and resources.

Collaboration was also related to better governance. There were a number of examples cited: from cross departmental working in government at an early stage in policy thinking; to a desire for government, industry and academia to sit down and take a broad, long term look at issues in the national interest (defined as pre-competitive collaborative activity) to ensure investment is targeted as tightly as possible. Science Cities were also cited as innovations in partnership working, creating spaces for HEIs, business and government to stimulate technology innovation - often explicitly linked to user needs and quality of life.

There was a greater focus on sharing and making better use of existing data and information - extracting the maximum amount of insight from existing research and programme activities, rather than commissioning new work.

Private sector organisations also noted the links between collaboration and innovation, moving from an approach driven by acquisition strategies and the stripping of intellectual property (IP) out of firms; to a focus on partnerships and distributed networks of research. This has implications for the relationship between spin out from HEIs and business - providing greater scope to maintain a relatively autonomous identity and research culture; which in turn impacts on governance.

In summary, there were a range of drivers discussed that have the potential to inhibit or support wider societal engagement. These may be summarised as follows:

Table 2:	Strategic	drivers ar	nd impact	on wider	societal	engagement
						55

Factors that potentially inhibit	Factors that potentially support
societal engagement	societal engagement
Reduced resources, competition for	Greater focus on demonstrating the
funds and lack of administrative	economic and social impacts of
capacity	research
Retrenchment and a focus on core	Collaborative working and the
business by organisations	opportunity to share resources and
	promote the strategic join up of
	governance
Loss of other governance capacity in	Opportunity to rationalise governance
the sector, through the review of arms	and have greater impact on decision-
length bodies	making, through the review of arms
	length bodies
Cultural impacts of reduced resource -	Cultural impacts of partnership working
scientists best placed to decide	- helping to norm principles of
priorities	engagement



3.4 Organisational cultures and change management

Organisational cultures and change management

Key findings in this section include:

- Science based organisations expressed conflicting cultures: being innovative, creative and open; as well as inward looking, elitist and over centralised. These both create and limit opportunities to engage the public
- Organisations where public engagement had more impact on decision-making generally had a supportive CEO; were willing to take risks; had a more decentralised (rather than strongly hierarchical) decision-making culture; and would focus engagement activity in policy rather than communications/science in society directorates
- While accounting for the public interest was not initially cited as a front-burner issue for commercial organisations, views changed as to its relevance and importance during the course of the interview particularly around managing commercial risks. However, the 'can do' culture of the private sector can limit the scope for reflection on public interests
- Beyond senior staff or governors, three other sets of actors were identified to promote more effective engagement with the public: internal managers with a passion for engagement; external advisors (particularly if they were eminent scientists); and science academies
- Leading by example, compelling others and changing the administrative environment were all cited as useful mechanisms to help embed change

Key implications include

- Framing public engagement as part of good governance may have more impact within organisations than framing engagement as an end in itself
- Where public engagement is used for policymaking, it may be more effective when directly embedded in policymaking directorates
- Leadership organisations such as science academies and government – have an opportunity to help encourage, persuade and compel others to account for the public interest in term of science governance.



3.4.1 Culture

There were a range of characteristics that were used to describe organisational cultures, and participants often expressed conflicting cultures within their organisation.

On the one hand, organisations were described as being innovative, creative, open, experimental, risk taking, rigorous and excellent. The culture of science itself was seen of one of open inquiry - challenging authority or the status quo.

On the other, it was also acknowledged that science organisations can become inward looking, elitist, over centralised, complacent, narrow minded, self reverential and conservative. They also had a tendency to over-analyse rather than act. There was a concern that the 'forces of conservatism' within organisations would use external financial pressures to argue for increasingly closed ways of working.

The relationship between organisational culture and the public interest was complex. Certain organisations had social aspirations built into their vision or mission statement. In these cases, organisational values became a driver of activity, embedded in the culture and the practices of the organisation to varying degrees of success.

Public engagement activities had more impact on organisations where:

- there was a supportive CEO,
- managers were willing to experiment and take risks,
- the organisation had a decentralised rather than hierarchical structure,
- engagement activities were led by policy rather than through communications directorates.

Organisations that focused more on the commercialisation of research had a different culture: described as 'business rather than academic'. The key attributes of this culture were being 'can do', direct and customer focused. Efficiently driving outcomes was also very important. As one participant noted: 'there is no value in us debating and talking; there is only value in us acting, and that sort of ethos runs through the company'.



Overall, respondents from commercial backgrounds considered that public debate should occur upstream - when basic research is being developed rather than at the translation stage. While accounting for the public interest was not initially cited as a front-burner issue for commercial organisations, views on its relevance and importance changed during the course of the interview - particularly around managing commercial risks. However, this type of engagement was not seen as their direct responsibility, but the role of an 'honest broker' (e.g. a science academy), with business acting as one stakeholder among many.

3.4.2 Organisational change

The most important enablers of change in organisations were those in leadership positions who had a vision and strategy to do things differently.

Certain CEOs were attempting to change their organisation by embedding various governance principles within their current strategies. For instance, one respondent highlighted how openness was being adopted as a 'brand value' and provided a hook for new activities and behaviours.

Key factors in helping to embed culture change included:

- Having a clear **vision** of why the change is needed.
- Having a clear and simple message that staff understand; and communicating it effectively.
- Rationalising activities and strategic plans, simplifying the number of work streams.
- Making explicit the relationship between the change and meeting business objectives.
- **Rewarding people** so that behaviours in line with the new culture were reinforced.
- Engaging with staff to embed the above.

Others important in enabling change

While CEOs, Ministers, board members, civil servants and other senior staff were lynchpins of change in organisations, there were other important groups identified. In the context of this research, these were advocates for engaging the public in science and would encourage the organisation to take better account of public views

and values in decision-making. They could either be within the organisation or an influencer/stakeholder from outside.

Those inside organisations were generally middle managers with a core focus of their remit around public engagement or science in society. Some of the most innovative governance experiments in organisations were happening through the activities of dedicated staff: from ideas around distributed dialogue, co-creation around R&D or setting up a 'people's research council'. Within this, organisational change, albeit modest, was noted to emerge from 'a greater sense of confidence in the judgement of staff' to do good things in this area. Such staff also used tactical opportunities to push for better governance, such as greater openness of the programmes they were responsible for, to enhance the public credibility of the organisation.

At issue was how effectively the ideas and practices of these staff impacted on the other parts of the organisation. This not only related to winning hearts and minds of senior people, but the overall profile of this work in the organisation. There were instances where senior people in strategy were unaware (or at least did not cite as important) specific public engagement activity their colleagues were most excited about.

The most influential people outside organisations were on advisory panels providing advice on science in society committees or policy working groups. Though not exclusively, such people were more effective when they were practising scientists, rather than those with a direct interest in public engagement. Having an eminent scientist (for instance a Fellow of a science academy) keen to see the organisation playing a more prominent and visible role in public life was very powerful.

External organisations that had money and/or influence were also important in driving change. This could be through:

1. Leading by example. This was particularly prestigious organisations helping to normalise engagement by conducting public dialogues or having an associated programme of work - a science and society programme for instance.



- Compelling organisations to adopt better practices. This concerned pressure groups or campaigning organisations. There had been some significant changes in this regard - for instance disclosure of clinical trial data in the private sector, due to pressure from patient advocacy groups.
- 3. Making a change in the policy framework to make organisations comply. This generally concerned government organisations or those with a formal transaction around funding (e.g. between a research funder and HEI). These types of controls ranged from legal mechanisms such as the Freedom of Information Act (FOI), to changes in administration - such as grants application forms.

It was often a combination of all these factors that was important for organisations to take action: what others in the sector were doing; the wider pressures for change; and the policy environment.



3.5 Openness and transparency

Openness and transparency

Key findings in this section include:

- Openness and transparency was most important for regulators. It was viewed as directly helping to build confidence and public trust
- Practices included publishing minutes on the web, web-casting of board meetings, dedicated websites for science advisory committees and an ability to independently publish advice to Ministers
- To a lesser degree, openness and transparency were also relatively important for government departments and funders. For the latter in particular, open data was particularly important in the context of Climategate
- It was of least importance to organisations that felt they had limited direct public accountability – such as science academies and businesses
- Openness and transparency were often highlighted as the key institutional responses to protecting the public interest. However, certain organisations were very transparent but still struggled to account for public views in decision-making
- FOI had acted as a key driver in promoting open government.
 Legislative force, clarity of the concept and resonance with wider governance practices were key in enabling its impact
- In this regard, the 'big society' had only minimal impact as a driver of wider public accountability.

Key implications include

- Openness and transparency are necessary but not sufficient conditions for good governance.
- Reframing public engagement as part of a wider set of governance processes can help strengthen the relationship with engagement and openness
- It may be difficult for certain organisations to lead on good governance, if their own institutional practices are viewed as opaque and lacking wider public accountability.



There were a variety of views and practices around openness and transparency, fundamentally tied to organisational goals and accountability.

Figure 1 illustrates the relative levels of openness amongst the main organisations interviewed.

Figure 1: Relative openness of organisations



Regulators in particular were very firmly tied to principles of openness - with these values firmly embedded in the organisation. They saw an explicit and direct relationship between openness and public confidence. There were a host of governance procedures associated around this, including publishing minutes on the web, web-casting of board meetings, dedicated websites for science advisory committees and an ability to independently publish advice to Ministers. With regard to transparency, documents detailing how decisions were reached were particularly important - for instance publishing decision criteria.

Government departments and research councils also adopted relatively high levels of openness and transparency, though not to the same extent as regulators.

Organisations that saw their accountability predominately to scientists (such as academies) generally were less open than those with a public remit. For such organisations, a distinction was made between the openness and transparency around the administration of an organisation (with often significant pressure not to do this) and openness around data or wider policy which aims to have an impact on the scientific community.



Climategate was highlighted by respondents in this regard. In general, the lessons from this were seen to be relatively simple and un-contentious - there was recognition that those involved should have been more open about the data and that while there was no deliberate attempt to misrepresent the science, scientists should be more attentive to how their actions in this area can be portrayed. Greater concern related to the governance implications of Climategate - in particular the impact on public perception of climate research. The role of the media in this process, on the one hand helping to increase transparency but on the other distorting the incident to fit with an editorial narrative; was viewed as a particularly problematic aspect which had wider implications for governance and science communication.

Private sector organisations were the least open and noted there were a number of barriers to greater openness and transparency. These mainly centred on commercial confidentiality and protecting IP; but also included not wanting to demonstrate failures or for consumers to associate products/brands with negative thoughts. However, it was also noted that this culture was changing. There were two main drivers for this. One was around reputation, for instance pressures on pharmaceutical businesses for greater transparency around trial protocols, which is now having some impact. The second concerned different approaches to innovation - such as open source, crowd sourcing and co-creation. In this regard there were some interesting initiatives for demonstrator projects, involving partnerships HEIs, local government and communities to stimulate ideas in relation to healthcare, digital technologies and low carbon living.

3.5.1 Open government and the big society

Open government was seen to be a key driver impacting on publicly funded organisations. It was framed in two ways - making research results and government information accessible; and having greater openness around decisions within institutions. Respondents in public sector organisations all had considered these issues at a strategic level - expressing an aspiration to put information in the public domain as soon as possible.

The **big society was not a significant driver** impacting on science organisations. This was mainly because the concept was viewed predominantly in terms of the engagement of communities in local service provision - and most of the organisations did not see this as part of their role. More broadly, the vagueness of the concept limited its strategic impact.

However, for those organisations with a clear customer focus and accountability at the local level, the big society had greater traction. This was generally seen through two lenses: the first was localism and the need to develop joint priorities work with local authorities/partners to maximise delivery and pool resources. The second related to how to enable society (i.e. local community groups) to help deliver social outcomes or services through voluntary work.

There were three reasons for the relative traction of open government relative to the big society: it had teeth though legislative changes for such as FOI; it was simple to understand as a concept; and it resonated with other organisation concerns around openness, trust and governance.



4. Responsiveness to public concerns about science governance

In this chapter, we explore the relevance to organisations of governance issues that have emerged from public dialogue processes. There were five in total:

- 1. The purpose of science and technology and motivations of those involved in its development
- 2. The relative lack of trust in Government to act in the public interest
- 3. The lack of public involvement around what science and technology gets funded
- 4. The speed of innovation exceeding its scope for adequate regulatory oversight
- 5. The culture of science discouraging scientists from voicing concerns

Each is now explored.



Response to public concerns about science governance

Key findings in this section include:

- Based on their personal experiences, respondents did not recognise how the motivations of scientists would precipitate significant governance issues. There was little recognition of how drivers on research – e.g. wealth creation – may act to influence *individuals* to focus on short term gain rather than long term public interest
- However, the relationship between publicly funded research and private business was recognised as impacting on *institutional* trust
- It was argued that trust should not be thought of instrumentally i.e. an
 organisation setting an objective to be trusted more. Rather it
 concerned the development of 'trustworthy behaviours' openness,
 ability to listen, keeping commitments and willingness to admit doubt
- A number of public dialogues were cited as having an impact on policy. These were characterised as having clear goals, a specific decision context and were complemented by formal decision processes
- Certain organisations cited other interactions with the public this ranged from open board meetings, open access events, online consultation, and the use of social media for engagement and so on. Experience on the effectiveness of these processes was mixed
- The conception of the public as customers/users of products in the private sector provides them with a role in the developing technologies
- Whilst acknowledging that regulation can lag behind innovation, it was questioned whether the pace of scientific development exceeds its scope for ethical and regulatory oversight. Rather, organisations may not pay sufficient attention to developments and create a space for discussion around implications as they are progressing
- Private sector organisation stated that they saw their accountability to the public not directly, but rather through regulatory bodies. The extent to which regulators therefore govern science in the public interest is important. New forms of anticipatory governance for business were cited – for instance voluntary reporting schemes and codes of practice
- Scientific cultures and practices had become more open viewed as productive in terms of developing public confidence in scientific research. Closed cultures can cause failures in institutional governance, creating an ethical distance for scientists and normalising controversial activities. It was also recognised that scientists are now more prepared to admit uncertainties when communicating with the public

Each is now explored in depth.

4.1 Purpose of S&T and motivations of those involved in its development

The purpose of science and the motivations of those involved in its development is a key concern of the public. Specific questions that have emerged from previous public dialogue processes included: whose interests are being served? Are particular innovations necessary? Are there alternatives?

Despite the complexity and importance of this issue, it was one of the least discussed in depth by respondents. Overall, whilst it was recognised as a concern of the public, the legitimacy of the concern was questioned.

Respondents generally saw the motivations of scientists being driven by societal goals - or found it difficult to relate *individual* research endeavours to outcomes that were of limited public value.

For instance, healthcare technologies were framed more as generally positive, even for trivial conditions, because the benefits were seen to reside with a patient and the wider societal impacts were perceived as limited. While this differed from agricultural or environmental technologies where impacts were seen to be borne by society, again these developments were generally seen as serving the public good, particularly in relation to future food security.

In this regard, the concern was dismissed by a minority of respondents as that of 'a small number of vocal people'. There was little reflection on how wealth creation may act to influence individuals to focus on short term gain rather than long term public interest.

Though a less significant issue, it was noted that science was sometimes used politically by policy-makers, as a means of circumventing political debate around the options available for society, by framing discussions through a narrow technocratic focus. In this regard, public engagement was seen as a means of helping to expose the purposes for which science was developed in the UK.

4.2 The relative lack of trust in Government to act in the public interest

The second issue related to the relative lack of trust in Government to act in the public interest. While this differed across science and technology areas, a key concern related to the perceived proximity between government and the interests of industry.

This issue was recognised by respondents particularly in terms of the relationship between publicly funded research and private business. Whilst there were a number of drivers promoting the translation of research into new technologies, there was concern about whether such relationships could compromise their reputation for being impartial or for acting in the public interest. The integrity of *science* was seen as important and as one respondent noted 'the extent to which it can maintain its integrity depends on temptation'.

Good governance was defined as being attentive to the impact of private sector funding, ensuring decisions are scrutinised, being open where possible, and in particular ensuring there is proper oversight of professional behaviour. The leveraging of funding between public and private sources was also noted as sometimes creating conflicting goals around whose interests are being served by research.

Certain respondents noted that **trust should not be thought of instrumentally** - in the sense of an organisation setting an objective to be trusted more. **Rather it concerned the development of 'trustworthy behaviours'** within institutions which included **openness**, an ability to listen, following through on commitments and a willingness to admit doubt. The publication of negative or inconclusive results was also cited in this regard.

To address the issue, **distinct governance structures and organisational practices had been developed to help maintain public confidence in areas such as regulation** - such as limits on the time that any individual can spend looking after a portfolio area. Wider control mechanisms - such as judicial review from pressure groups or industry - were also useful in providing incentives for employees to ensure



there are appropriate checks and balances in the work that they do, and that they are not open to charges of bias.

One organisation ran a programme called *building trust in local communities* - exploring public views on development of contentious environmental schemes - which directly fed into decision-making. Another, working on environmental management plans, had a specific focus on working with local agencies in the development of management strategies. Important within these processes were staff dedicated to the task, making engagement routine and normal in the organisation, and having transparency around the decision processes - detailing precisely the reasoning behind why a decision was reached.

More broadly, it was noted that the **public interest is sometimes only weakly reflected through the decisions of institutions** due to the indirect nature of democratic accountability - essentially there is a very limited relationship between a vote in an election and the technology choices developed in government. In short, it was thought that having a democratic mandate does not necessarily translate into political legitimacy around significant science and technology decisions.

Finally, certain respondents argued that it is not up to them to take an ethical **position around the use of research for particular developments** - such as technologies for the manufacture of arms. **Providing the uses were lawful**, they had an obligation to ensure investment. The public interest in this context was defined in legal terms.

4.3 People 'kept in the dark' around what S&T gets funded

This issue concerned the perceived distance between decisions on science and technology and the public, and a sense of powerlessness over its development. It specifically related to a desire to feed public values and aspirations into science and innovation.

There were a number of dialogues and other processes that were cited as having an impact on policy and funding:



- The synthetic biology dialogue provided a space through which initiatives such as responsible innovation, as well as ethical and societal awareness training for researchers could be brought into strategic focus.
- The Citizens Advisory Forum for *Living with Environmental Change* (LWEC) a ten-year programme aimed at providing decision-makers in government and the research councils with the best information to effectively manage and adapt to environmental change - was valued due to its breadth of partnership and because it offered an ongoing and iterative relationship with the public.
- The range of engagement activity that informed the Human Fertilisation and Embryology Act was seen as helping to develop a mature debate around a complex and emotive area of science and technology.
- The dialogues that have informed the *Grand Challenge* initiative a cross research council programme to tackle significant societal or economic issues
 was seen to enable the public to directly inform technology choices, particularly in the area of nanotechnology and healthcare.

Whilst a range of other public engagement activities were mentioned in relation to funding, the impact that these processes had had on sponsoring organisations was generally less clear. As one respondent noted, 'my feeling is that we have not done that well in incorporating the lessons into our own practices'. In this regard, a key issue related to how findings from dialogue processes were often externalised - aimed at other policy-makers or regulators.

In private sector organisations, the conception of the public as customers or users of products or services provided a role for them in the development and testing of technologies - for instance working with patients around research priorities and reported outcomes for novel treatments.

There were other examples - particularly in relation to the development of consumer products - where a company's relationship with the public was deeply understood in terms of consumer needs. Where their customers stood on various issues, together with their beliefs and aspirations, all became an integral part of the innovation process and related to brand identity. New product development became more than what is technically feasible or possible: it needed to account for these wider consumer views and did this in sophisticated ways.



Beyond consumer products, public views were viewed in defensive terms around social desirability and acceptability, and the ability to manage commercial risks. It was also cited that it was difficult for private sector organisations to lay out in detail how public values had been taken into account in the innovation process due to commercial confidentiality issues.

Beyond formal spaces for engagement, certain organisations cited less formalised interactions with the public - this ranged from open board meetings, open access events, online consultation, and the use of social media for engagement and so on.

Experience was mixed. At their best, these informal spaces were seen as a means to enter into a qualitatively different and sometimes more creative dialogue with the public, bringing new issues into the mix and allowing scope for different policy framings. At worst, these exchanges were described as 'parochial' (driven by very specific or politically motivated concerns), 'asynchronous' (not related to the subject matter) and 'not particularly useful interactions' (in that the quality of the discussion was poor). It was felt likely that a mixture of formal and informal processes will be needed going forward.

Finally, there was also seen to be a key role of accounting for the public interest in decisions not directly but by drawing on the experiences of social scientists who could analyse public opinion and broader engagement research and 'turn it into something that might influence policy development'. This was also noted in relation to helping create scenarios around future societal issues, again to enable better decision-making by policy-makers. The impact of this type of knowledge through things like the chief scientist network was felt to be lacking.

4.4 Speed of innovation exceeds its scope for adequate regulatory oversight

This issue related to the speed of research and innovation. Specifically, it concerned whether the pace of scientific and technological development may exceed its scope for ethical and regulatory oversight, or may take us in directions that have not been adequately considered.

When responding to this, respondents felt that good regulation should stay abreast of technical developments, consider its safety, as well as social and ethical significance, and develop appropriate responses that don't hinder innovation. Public concerns in this area were viewed through this lens. There were a number of issues.

- 1. Whilst acknowledging that regulation generally does slightly lag behind innovation, certain respondents questioned the premise of this concern specifically whether technologies do move on at such a pace that it prevents oversight. Rather, it was noted that organisations sometimes do not pay sufficient attention to developments as they are progressing and create a space for adequate discussion around implications. One important issue raised by regulators was that their attention is predominantly focused on the here and now rather than the future. While they did undertake horizon scanning and other futures orientated strategic activity, the principle drivers on the organisation were to focus on current rather than possible risks and hazards. As one respondent noted 'we can only regulate what's out there'.
- 2. Certain private sector organisations stated they saw their accountability to the public not directly, but rather through regulatory bodies which were viewed as governance organisations. The extent to which regulators therefore govern science in the public interest is important. In this regard, certain businesses also noted the need to support regulators given the uncertainties around new technologies. New forms of anticipatory governance were cited for instance business showing leadership through voluntary reporting schemes, earned recognition or codes of practice in areas such as nanotechnology.¹¹
- 3. There was a perception that, relative to other countries, the UK generally did reasonably well in terms of regulatory practice. Respondents from commercial organisations also noted that the regulation in UK 'is pretty much on speed with what is happening in the world of science'.
- 4. The point was made that good regulation was vital to help stimulate innovation and new commercial ventures. It should be noted that regulators were very conscious of this and were keen to develop better and

¹¹ See also Chilvers and Macnaghten (2011). p.18.

proportional regulations that nurtured rather than stifled innovation. Nonetheless, there were a number of examples cited - particularly in relation to new medical technologies and pharmaceutical products - where the regulations were perceived to be impacting on commercial development of technologies which in turn impacted on the public good. There was a sense in which the system had 'lost sight of the risk benefit ratio' and was too skewed towards prevention of risk, potentially denying people new medicines by 'throwing stuff out' where there are significant potential benefits but modest risks. As one person noted, 'a patient with cancer has got a pretty high tolerance for a bit of risk'.

Overall, there was a complicated interplay between regulation, investment in innovation around science and technology and the public good. As one participant noted 'I don't think we have a mature debate around that at the moment'.

4.5 Whether the culture of science organisations discourages scientists from voicing concerns

The final issue concerned whether the culture of different science organisations discourages scientists from voicing concerns over potential risks and uncertainties, or from reflecting on wider social and ethical considerations.

It was noted that the language through which scientists engaged in public discussion has changed over the past decade - with scientists more prepared to admit uncertainties and emphasise probabilities rather than state categorical facts. It was noted that traditionally experts have - in the words of one respondent - 'oversold the rigour with which they can say things will or will not happen'.

Overall, organisations were now generally more comfortable in stating: this is what we know, this is what we don't know, and this is what we are doing as a consequence. There was seen to be greater willingness to change courses of action as new evidence comes to light, particularly for policy-makers and regulators. The 'risk appetite' of the organisation, and how well this reflects the public interest, was critical in this regard.

It should be noted that the recent Spending Review and wider commercial drivers were not seen to have helped scientists to reflect openly on their work. Rather,



they encouraged institutions to demonstrate the economic value of research, through a language of success and growth: making it difficult for researchers to be seen to detract from these purposes.

More broadly, amongst organisations that provide leadership to the scientific community, there was an effort to help create a 'climate of recognition' for scientists who engage: through awards and structures. A number of training courses were highlighted to enable researchers to begin to think about these issues as part of their continuous professional development (CPD). This included 'narrative skills' programmes that highlighted how scientists should discuss and consider the weaknesses and difficulties of their work and to approach this openly and honestly. It also related to how to enable scientists to engage with public concerns around what they are doing - particularly in controversial areas.

Certain funders also discussed this in terms of their relationship with individual scientists through grant programmes and an 'expectation' that they will engage with the public around their work. There were a number of issues in the delivery of this however.

- 1. There was ambiguity in what public engagement actually meant a term that has become so broad in its use that it lacks any critical meaning.
- 2. By reducing complex governance issues to a transaction around a grant there was the potential for engagement to become box-ticking. While there was an explicit acknowledgement that funding organisations are, in one participant's terms, 'upping the significance of the box' and that researchers understood that engagement was viewed as important: spread across so many grants, it was difficult to make any real assessment of the impact it was having.
- 3. Whether increasing the sense of compulsion to engage with the public could be counterproductive.

In this context, creating a climate for scientists to engage or act ethically through statements of principles such as the Research Councils UK (RCUK) concordat¹² and

¹² http://www.rcuk.ac.uk/documents/scisoc/ConcordatforEngagingthePublicwithResearch.pdf

Royal Academy of Engineering (RAEng) statement of ethical principles¹³ was mentioned positively - albeit only by a few respondents.¹⁴

It should be noted that engaging with the public was 'looked down on' by certain science colleagues and that engagement was generally not taken into account to gain the top rewards in science (indeed, from the perspective of some respondents, doing anything other than the core science was viewed as counterproductive).

However, there was also a recognition that this was against the direction of travel. Certain organisations stated that an inward focus was untenable in terms of developing public confidence in scientific research. As one scientist noted: 'we need to get out there and start talking to society. We can't just hide in our institutes; it's not going to work'.

There was a wider issue highlighted of how closed cultures can cause failures in institutional governance, creating an ethical distance for scientists and normalising practices which were significantly out of step with public values. Again, having an open culture around science where controversial activities were discussed and reflected upon was thought to be useful.

 ¹³ http://www.raeng.org.uk/societygov/engineeringethics/principles.htm
 ¹⁴ Other resources to support this include Science for All Expert Group
 <u>http://interactive.bis.gov.uk/scienceandsociety/site/all/</u> and guidance from the Research
 Integrity Office http://www.ukrio.org/home/



5. Conclusions and recommendations

Key recommendations are:

- 1. Public engagement for policymaking should be used by organisations not as a standalone exercise, but as part of good governance, strategy and decision-making. There should be strategic consideration of how it complements science governance processes such as openness and transparency, regulation and relationships to business.
- 2. Organisations need to consider whether policies impact on the public interest, how they should account for this and the consequences of not doing so. It is an important strategic issue for organisations to consider whether they want to lead or react to future public debates on science.
- Pressure to improve governance should be targeted at the most senior level in organisations. Leadership organisations – such as science academies and government – have an opportunity to help encourage, persuade and compel others to account for the public interest in terms of science governance.
- 4. Public engagement should enable organisations to 'reframe' policy issues beyond risks and benefits of technologies; to better consider social outcomes and the role of technologies in achieving these goals.
- Greater use should be made of engagement as part of the innovation pathway – both through open-source development and co-creation of technology products; but also through enabling people to help redesign organisational governance processes.
- 6. In the light of these findings, Sciencewise-ERC should help organisations better account for public dialogue in terms of the processes of science governance. As part of this, we recommended that tailored findings are produced (in confidence) for each organisation that took part in this study to enable a new conversation around the future role of public engagement in governance.

One of the key issues highlighted in the literature review is that emerging science and technology will inevitably create new dilemmas for governance. Advances in biotechnology, nanotechnologies, synthetic biology and stem cells have all underscored the conditional relationship between the processes through which science and technology is developed and public views on its acceptability. Focusing questions of governance is therefore an important issue for science organisations. There are five issues that will be explored in the conclusions:

- 1. Moving from public engagement to governance in the public interest
- 2. Institutional conditions to help good governance to flourish
- 3. Openness and the public interest
- 4. Innovation and the public interest
- 5. Collaboration and governance

A final section briefly focuses on the implications of the research for Sciencewise-ERC.

5.1 Moving from public engagement to governance in the public interest

Overall, a significant issue emerging from the project has been the focus of organisations on the process of 'public engagement' almost as an end in itself, rather than a means to an end. This focus on engagement can leave activities siloed in communications directorates, being framed around public outreach and only having limited influence on policy. While Sciencewise-ERC has stressed the linkage with policy as very important, without senior support or policy ownership impact is at best partial. Actions also get focused more on communication activities - feeding back to participants, disseminating a report, having more engagement and so on.

It may be helpful for organisations to think more about governance in the public interest¹⁵ or public good rather than public engagement *per se*. Public engagement is a process (and an important one) for beginning to understand and reflect on the public interest in relation to policymaking. But it is a process amongst other things such as the use of social scientists or ethicists on panels, or wider policy analysis of future issues impacting on society.

¹⁵ Acting in the public interest is an ambivalent concept. It relates to actions that promote the wellbeing or welfare of the general population, rather than just promote private gain. Whether specialists or lay people are best placed to consider the public interest was discussed at the workshop and is a real issue for decision-making cultures in organisations. However, as governance is more than just a technical issue and reflects social values, considering public views in relation to specialist knowledge is likely to be most effective.



With a focus on the public interest, it also becomes easier to think about the relationship between a host of activities that support good governance, strategy and decision-making. This could include engagement, but may also mean considering the values that underpin how decisions are made, the openness and transparency of an organisation, its relationship to business, the implications of technical developments for the regulatory framework and so on. Bringing all this into one strategic remit may also enable institutions to reflect more fully on their own cultures and assumptions around science.

Specifically, organisations need to get better at considering when policies may impact on the public interest, and how they should account for this or consider the consequences of not doing so. Within this changing context, and a shift in emphasis from dialogue to governance, it will be important to understand the adequacy of current governance mechanisms and innovate new ones.

Some steps in this direction are explored next.

5.2 Institutional conditions to help good governance flourish

There are a number of cultural and structural factors that contribute to taking better account of the public interest within organisations.

As highlighted earlier, key amongst this was the support of those in charge - the CEO or Ministers in particular, but also the wider governing body and senior executives or civil servants. Any efforts to change governance processes need to be directed at this senior level. In this regard, arguments to account for the public interest may have most traction when couched in terms of the strategic opportunities in doing so and the organisational risks of not.

Moreover, there is a risk that the capacity to consider the wider public interest in science may be undermined due to lack of resources and retrenchment. The spaces created if institutions 'step back' in this regard are likely to be filled by other voices. It is an important strategic issue for organisations to consider whether they want to lead or react to future public debates on science.

Overall, there is a collective interest in better public governance and a legitimate strategic role for organisations in the sector to attempt to persuade those who

remain less convinced. A greater focus on collaboration may facilitate this, though good leadership more so.

If the arguments are accepted, developing changes to promote better governance becomes easier. There are a number of additional structural and cultural issues that were associated with enabling public views to impact on policy.

Structural factors

The first concerns restructuring public engagement activity¹⁶ to be led by policy rather than communications. As noted above, it makes it easier for substantive governance issues to be taken account of by the organisation. Rather than talk about engagement in terms of its communications purposes (to transmit, receive or collaborate), it provides more scope to talk about engagement for governance purposes and how to better understand the conditions under which technologies should be developed and controlled. Moreover, if public interest issues are framed in terms of good governance, rather than good engagement, there are more obvious reasons for it to be structured in policy rather than communications.

Housing dialogue in policy directorates alone will not be sufficient for good governance. Critical will be how policy comes to be defined and framed. It is the need to 'reframe', or at least to subject existing framings of policy to critical evaluation (not least through public deliberation) that constitutes one of the most important points for good governance.¹⁷

A second structural factor relates to the support for organisations from external experts - for instance by 'science in society' committees. To be effective, such committees need to be aligned with the interests of senior staff and be mainstreamed in activities of the organisation. At their best, committees provide useful advice and creative spaces for the organisation to help think about new governance activities. At their worst, they are marginalised with limited capacity to help drive change.

¹⁶ As noted earlier, in this context, public engagement refers to dialogue processes to inform policy or decision-making. It does not refer to wider science communication activities - which are more appropriately housed within communications directorates. ⁷ See Chilvers and Macnaghten (2011). pp 5-9.

Third, there was a set of expectations around particular organisational structures that are important to consider around governance changes. Call something a 'funding committee' and it comes with a firm set of beliefs around which actors should be present in the room, the types of discussions that take place and how people come to a decision. These beliefs were engrained in the cultures and practices of organisations, making it very challenging to change. Call something 'responsible innovation' and suddenly there is a whole new set of possibilities around who takes part and why.

Cultural factors

As noted earlier, organisations expressed the desire to be innovative, open, creative and experimental, though this was often tempered by more conservative instincts. A willingness to experiment and take risks was also cited by organisations that engaged more with the public.

Cultures in organisations are not immutable. They are based on what people say and do, and are amenable to change. Organisations can help facilitate that change by embedding various governance principles within their strategies. For instance, **openness, if adopted as a 'brand value', can provide an aspiration and a hook to hang new activities and behaviours around**. There are a host of ways in which these can then be made relevant for staff: personally (e.g. being built into performance reviews), collectively (e.g. awards for teams best demonstrating the behaviours) and environmentally (e.g. changing the physical layout of an office to promote new ways of working). There are a host of books and tools on organisational change that it is beyond the scope of this report to review. For change to happen, the key thing is that there is leadership, clarity of purpose and a focus on getting staff involved.

5.3 Openness and the public interest

There was a complicated relationship between openness, transparency and the public interest. On the one hand, openness and transparency were vital ingredients of good governance: shining a light on how power works in organisations, protecting against charges of undue influence and enabling scrutiny of how decisions were made. On the other, there were organisations that were transparent but still struggled to adequately account for public views and values in decision-making.



These organisations sometimes had a culture of paternalism. In these contexts, public interest was served by transparency around how evidence was used to inform decisions. It was understood through the eyes of experts. It was best protected through ensuring technologies were safe. Information was then provided to guide the actions of consumers, whose choices would reflect wider societal values in the marketplace.

'We look at other factors but focus on the science' was a key mantra for certain policy-makers and regulators. These other factors were not seen as easily addressed in institutional terms. This in part may be because certain innovations have complex relationships to the public interest: for instance how to balance food security arguments in relation to wider public concerns around the use of food technologies.

Progress around some of these issues can be achieved through different framings of the debate. Future debate around genetically modified organisms (GMOs) – for instance - does not make sense without exploring the purposes of these technologies and alternative or complementary ways to get there. The desire expressed by a number of institutions to use public values to help inform choices at this more strategic level may be an opportunity in this regard.

More broadly, there need to be more sophisticated ways of regulating social impacts of innovations than a label on a product. The literature review explored a number of novel governance responses in this regard. ¹⁸

A final issue concerning openness and transparency relates to leadership of scientists. Science academies were relatively less transparent than other organisations. If organisations are to show leadership around science governance for the community, their credibility may be undermined by the adequacy of their own institutional practices.

¹⁸ See Chilvers and Macnaghten (2011). pp. 14-21.

5.4 Innovation and the public interest

Three broad models of innovation were highlighted through the interviews.

- 1. The first model was traditional, top down and expert driven with ideas emerging from the minds of brilliant individuals.
- 2. The second and most dominant model related to more **distributed means of** innovation - though again expert driven, these were infused with ideas of networking and external collaboration across disciplinary boundaries.
- 3. The final and least mentioned model related to wider public engagement. This related to ideas around open innovation, the use of crowdsourcing, cocreation with customers, the rise of the 'user-maker' and user centred innovation in manufacturing.

Given the current focus on wealth creation and translational research, together with broader drivers around data sharing and openness, it would appear that there are greater opportunities to account for public views directly around technical innovations in the future. In doing this, it could move engagement activity from a defensive position to manage risk, to one where the creativity of people was harnessed in the public interest.

Though only cited sporadically in the interviews, there are numerous examples of this being undertaken in the private sector - most prominently in terms of open source development of software, but also in terms of the design of a range of manufacturing products including medical equipment, semi-conductors, green technologies, car design and information systems to name a few.

In addition to co-creating products, customers have also been brought directly into organisations to help redesign internal systems and administrative processes. How would governance look if the public were asked to help redesign practices of a science organisation?

A focus on process innovation could also link into the changing dynamic between funders and researchers by helping to rethink impact - involving a different set of conversations around the management of research and how research fits into a broader social context.



Finally, innovation can help to position public value at the interface of public and commercial science and technology - enabling organisations such as the Technology Strategy Board (TSB), science parks and high tech companies who deal with the commercialisation of public research consider public views more effectively in the innovation process. There is a tension here between the relatively short-term and financially-led dynamics shaping the activities of such organisations, and the need to govern in the 'long-term' public interest. The drivers for business to engage in such a conversation are specifically about the value that engagement could derive - either through embedded consumer insight into the processes through which a company innovates; or by enhancing corporate reputation, and helping to promote the longer term financial success and stewardship of the company.

5.5 Collaboration and good governance

Two of the most interesting findings to emerge from the study were a stated interest in involving the public to inform strategy and policy, together with a greater desire to collaborate. The current pressures on organisations, in terms of a lack of resources and restructuring, also create a space to do things differently.

Together these factors provide opportunities for a new type of governance - offering the public a genuine role in shaping the framing, direction and control of scientific and technological innovations. A new approach could have many benefits. Specifically it could:

- Focus discussion around science at a strategic level. As a consequence it could move discussions from the risks, benefits and safety of individual technologies, to a broader focus on what we need from different technological innovations - in relation to food, energy, transport, healthcare and so on. This could bring into focus why particular innovations are necessary, what alternatives there are, who benefits and so on.
- 2. Encourage institutional working within sectors and promote joined up governance. It could help organisations to explore the links between research, translation and regulation and to take a common view on ways forward. It could also promote a more strategic focus in terms of support between funders and HEIs if 60% of funds are going to a handful of universities, targeting governance support in these institutions will maximise

resources. Potentially targeting smaller, high quality research groups could also be effective - particularly as support for smaller groups in large institutions may be more fractured. It could also inform new approaches to regulation - for instance working with industry to build public values directly into voluntary codes of conduct and initiatives like responsible innovation.

- 3. Promote resource sharing. This could be in relation to sharing the costs of engagement activities. It could also make better use of existing knowledge and work on public values. It could also mean sharing expertise on science in society for instance rationalising the numerous committees that exist into ones which worked across different organisations sharing similar functions (e.g. research funders or regulators) or similar interests (e.g. health or energy).
- 4. Make better use of existing structures. This could be in relation to better use of planned meetings. At the workshop a multi agency initiative on global food security was highlighted as providing an ideal ground to experiment with new ways of governance.¹⁹ It could involve opportunities for less formal engagement: such as holding committee meetings in public; providing the public with opportunities for exchanges to help shape thinking around science advisory processes; placing the assumptions, values and visions that underpin research projects / programmes online and inviting people to comment; or highlighting decision criteria around policy options or funding. It could also mean taking better account of activism and protest around science and technology as a means of better of understanding 'uninvited spaces' of public debate.²⁰

5.6 Recommendations

In relation to these conclusions, a summary of recommendations is as follows:

 Public engagement for policymaking should be used by organisations not as a standalone exercise, but as part of good governance, strategy and decision-making. There should be strategic consideration of how it

¹⁹ See <u>http://www.foodsecurity.ac.uk/assets/pdfs/gfs-strategic-plan.pdf</u>

²⁰ See Chilvers and Macnaghten (2011). p.17

complements science governance processes such as openness and transparency, regulation and relationships to business.

- Organisations need to consider whether policies impact on the public interest, how they should account for this and the consequences of not doing so. It is an important strategic issue for organisations to consider whether they want to lead or react to future public debates on science.
- Pressure to improve governance should be targeted at the most senior level in organisations. Leadership organisations – such as science academies and government – have an opportunity to help encourage, persuade and compel others to account for the public interest in terms of science governance.
- 4. Public engagement should enable organisations to 'reframe' policy issues beyond risks and benefits of technologies; to better consider social outcomes and the role of technologies in achieving these goals.
- Greater use should be made of engagement as part of the innovation pathway – both through open source development and co-creation of technology products; but also through enabling people to help redesign organisational governance processes.

5.7 Sciencewise-ERC

One final issue concerns the future of the Sciencewise-ERC itself and where it may need to focus to have future impact. Whilst the support it has given to practitioners in the field was valued, its impact at a more strategic level was mixed. If future activity is to move from a focus on process to a focus on governance and strategy, so the type of work Sciencewise-ERC commissions, its internal capabilities and reporting lines, who it seeks to influence and be accountable to will also need to change.

Sciencewise-ERC should help organisations better account for public dialogue in terms of the processes of science governance. If the forty people we spoke to during the course of this project were to seriously consider its findings, the future of science governance could look quite different.

As such, one final recommendation is that tailored findings are produced (in confidence) for each organisation that took part in this study to enable a new conversation around the future role of public engagement in governance.

Overall, the Sciencewise-ERC has had a leading role in helping characterise the nature of the governance challenges through the numerous public dialogues it has sponsored. Building on this report, the next phase is to better articulate what this means in practice.



6. Appendix - Interview topic guide

- Overview of project:
 - the project explores science and technology governance from a variety of perspectives
 - we are interviewing 40 senior decision-makers in science and technology based organisations
 - we have also reviewed literature exploring public views in relation to the governance of science and technology
 - the project aims to explore the synergies and gaps between these perspectives; and draw conclusions and recommendations around the governance of science and technology in the future
- Interview will last approximately 1 hour
- The interviews will be completely confidential and no views expressed will be attributable. We will also only report findings at a generic level. However, we would like to record the interview to ensure an accurate record of the discussion. All digital files will be deleted and transcripts made anonymous. Are you ok that we record the interview? [Gain permission to record]
- Interviewee's role and role/purpose of organisation
- What is the current governance structure for the organisation [by this we mean how the organisation is directed, administered and controlled]
 - Probe role in relation to how organisation is directed/controlled
- How would you describe the culture of your organisation [by this we mean the values, norms and shared beliefs of an organisation]
 - \circ Probe in relation to:
 - Leadership style and decision-making (e.g. top down; delegated or team decision-making etc)
 - How interact with stakeholders/ how others see you
- What would you say are the key drivers impacting on your organisation over the next 5 years
 - Probe: policy initiatives within government
 - Economic issues
 - o Technical trends
 - o Social trends
- What would you say are the top 3 strategic issues facing the organisation in relation to these drivers



- And what do you think the governance implications are in relation to these strategic issues? [by this we mean <u>how</u> the organisation is directed, administered and controlled]
- How responsive do you think your organisation is to changes to the external environment (e.g. translating new ideas and opportunities into changes in how the organisation works?)
- Do you have an example of where your organisation has changed in response to a change in the external environment?
 - What was it
 - Who influenced the organisation [probe in relation to]
 - Government
 - Science community/ peers
 - Industry
 - Civil society groups/NGOs
 - Media
 - Public
- And have there been any significant pressures on the organisation to change that they have resisted
 - What were they
 - Who tried to influence the organisation [probe in relation to]
 - government
 - Science community/ peers
 - Industry
 - Civil society groups/NGOs
 - Media
 - Public
 - Why resisted/ key barriers
- To whom would you say your organisation is accountable
- And who should have a voice in decisions about science and technology
 - Probe those to which most/ least weight should be given?
 - To what extent would you say these groups reflect the public voice or interest [relate to influential groups highlighted above]
- And to what extent are openness and transparency issues for the organisation
 - o What processes or structures are in place to facilitate this

As mentioned earlier, we have been reviewing the literature on public engagement on science and technology over the recent years to explore generic themes emerging. Whilst the public have both aspirations and concerns for science, they have raised a number of specific concerns in relation to science and technology governance. We would like to explore five key areas with you.

- 1. The first relates to the **purpose** of science technology and the **motivations** of those involved in its development. Specifically issues such as: in whose interests is science developed? Are particular innovations necessary? Are there alternatives and so on?
 - Do you recognise these concerns? To what extent are they relevant for your organisation? How have they become evident to your organisation?
 - How has your organisation responded to these questions? Do they create any particular challenges for your organisation?
- A second issue relates to the relative lack of trust in the Government to act in the public interest. While this differs across science and technology areas - such as between health and food - a key issue relates to the perceived proximity between government and the interests of industry.
 - Do you recognise these concerns? Are they relevant for your organisation? How have they become evident to your organisation?
 - If so, how has your organisation responded to these questions? What challenges do they create for your organisation?
 - How do you govern relationships with business; how relate to the public interest
 - How does an organisation become more trustworthy in this regard
- 3. Third, **people** tend to feel that they are **not included in deciding what kinds of science and technology get funded** and feel 'kept in the dark'. They also express a **desire to feed their values and aspirations into science and innovation**.
 - Do you recognise these concerns? Are they relevant for your organisation?
 - Have there been instances where you have tried to feed public values into science and innovation?
 - What happened/what did the public say?
 - How did you respond?
 - Did it have any impact on the organisation?
 - In the future, how, if at all, could the public be given more 'voice' and influence in key decisions or debates around science and technology?

- 4. The next one relates to the speed of research and innovation. Specifically, that the pace of science and technology development exceeds its scope for ethical and regulatory oversight and that it may take us in directions that have not been adequately considered.
 - Do you recognise these concerns? Are they relevant for your organisation? How did they become evident to your organisation?
 - How well equipped are current processes and frameworks of regulation and oversight?
 - How could/ should regulatory and governance procedures be more flexible and adaptive?
 - How could/ should we consider the direction science is taking us?
- 5. Finally, people were concerned with whether the **culture of science** discourages scientists to voice concerns over potential risks and uncertainties, or to reflect on wider social and ethical considerations.
 - Do you recognise this concern? How did it become evident to your organisation? How are you responding?
 - How does this issue relate to your own institutional culture you mentioned earlier?
 - i. Probe whether organisational culture encourages discussion around uncertainties or implications of emerging science and technology?
 - How do you create cultural change in your organisation?

The last question I want to ask relates to the funders of this project, the Sciencewise Expert Resource Centre - who are funded by BIS. Sciencewise-ERC aims to create excellence in public dialogue to inspire and inform better policy in science and technology in the UK. Their work is predicated around a couple of ideas. The first is that science and technology is throwing up major ethical, social and regulatory challenges. The second is that opening up these challenges through deliberation between lay publics and 'experts' can inform policy formation and thus help ensure social robustness

- To what extent do you agree with these ideas?
- To what extent are they relevant for your organisation?
- Are there any occasions where you feel some or more effective engagement with the public could have helped decision-making/governance in your organisation
- Finally, are there any other issues want to raise

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Note there is a meeting at the Royal Society on the 9th of February where we will be discussing some of the findings and thinking through the implications. I wanted to check whether you had received an invitation?

• Would they be interested in attending? [Mark response and inform team].

Thank and close

