Overseas Development Institute

Lessons from deliberative public engagement work

A scoping study

Ajoy Datta

Working Paper 338

Results of ODI research presented in preliminary form for discussion and critical comment

Working Paper 338

Lessons from deliberative public engagement work

A scoping study

Ajoy Datta

November 2011

Overseas Development Institute
111 Westminster Bridge Road
London SE1 7JD
www.odi.org.uk

Acknowledgements

Many thanks to Involve, UK public participation specialists, who provided the author with an extensive resource database on public engagement with science in the UK, some of which this study draws on.

Many thanks also go to Chloe Sheppard, Senior Policy Manager at the Research Councils UK Strategy Unit, for the time and energy she spent reviewing an earlier draft of this working paper.

ISBN 978 1 907288 54 8
Working Paper (Print) ISSN 1759 2909
ODI Working Papers (Online) ISSN 1759 2917

Contents

Figures and boxes

Acronyms

AIDS	Acquired Immune Deficiency Syndrome
BBSRC	Biotechnology and Biological Sciences Research Council
BSE	Bovine Spongiform Encephalopathy
CHSRF	Canadian Health Services Research Foundation
DNA	Deoxyribonucleic Acid
DS	Development Studies
EPSRC	Engineering and the Physical Sciences Research Council
EU	European Union
FSA	Food Standards Agency
GE	Genetic Engineering
GIS-P	Geographical Information Systems for Participation
GM	Genetically Modified
HFEA	Human Fertilisation and Embryology Authority
HIV	Human Immunodeficiency Virus
LA	Local Agenda
MORI	Market and Opinion Research International Plc
MRC	Medical Research Council
NEG	Nanotechnology Engagement Group
NGO	Non-governmental Organisation
NIDG	Nanotechnology Issues Dialogue Group
ODI	Overseas Development Institute
PAR	Participatory Action Research
PCDB	Public Consultation on Developments in the Biosciences
PEALS	Policy, Ethics and Life Sciences
PRA	Participatory Rural Appraisal
RAPID	Research and Policy in Development
RCGM	Royal Commission on Genetic Modification
RCUK	Royal Councils UK
S&T	Science and Technology
STS	Science and Technology Studies
SuScit	Science for Sustainability
UK	United Kingdom
ULYSSES	Urban Lifestyles, Sustainability and Integrated Environment Assessment
UN	United Nations
US	United States

Executive summary

Using largely grey literature, this working paper draws practical lessons from processes in which members of the public have been involved in public engagement work. We define public engagement as those initiatives where members of the public have been recruited or invited to collaborate or engage in dialogue with scientists and other professional stakeholders through participatory or deliberative means. Given the strong linkages between the move to 'democratise' science and technology (S&T) (in the 1990s) in the industrialised North and the arguably long history of participation in expert-led development policies and programmes in the South, the review includes cases from both these areas. The study assesses the benefits of engagement with science for the public, for scientists, for institutions and for other actors, including industry. It then identifies and discusses 16 issues and concludes with some guiding principles to help public engagement practitioners (including scientists) plan ahead.

The benefits of public engagement

The literature surveyed suggests members of the public involved in public engagement work value engaging with experts and decision-makers through face-to-face dialogue. This helps to dispel stereotypes about scientists, helps the public to learn more about science and science policy and gives them a more critical understanding of science in their daily lives. Scientists involved in public engagement work are often impressed with the public's level of understanding of science. Engaging with the public helps them to overcome any fear they may have had of two-way communication and to counter negative coverage of science issues in the media. Scientists have often developed a better understanding of public engagement and been more able to reflect on the social impact of their work. Public engagement has helped shape the thinking of key policy actors, raised their awareness of potential conflicts between the public, scientists and other professional stakeholders and informed policy processes and decisions. Engagement processes have also contributed to the development of ideas with industry about where they may find public dialogue most useful.

Lessons from public engagement processes

Intentions: There are three motivations behind public engagement processes: normative, instrumental and substantive. From a normative point of view, participation is 'the right thing to do'. From an instrumental perspective, it is a better way to achieve particular ends. In substantive terms, it leads to better ends. These are not necessarily mutually exclusive: public engagement can have several and often unanticipated impacts.

Approach and methods in engaging the public: The methods used and approach taken vary according to the intentions, the issue at hand, local contextual factors and the stage of the research process at which the engagement takes place. One-off engagement exercises on specific issues are likely to be viewed by the public as extractive and may put them off. However if an exercise is part of a longer-term engagement strategy then it may be better received. Those being engaged have to feel comfortable with the methods employed. Imported strategies developed elsewhere have different and unintentional outcomes. Organisers need to make sure they ask the right questions. A mixed methodological approach helps to capture a range of perspectives from the public, in which participatory methods are combined with one-way communication and/or consultative or information-gathering processes.

Context: Engagement processes' ability to succeed is often affected by the political climate, the relevant history, the decision-makers and the infrastructure that connects them.

Representation: Some argue that, if public engagement is to have any legitimacy in national policy processes, it needs to go beyond convening small groups of citizens and engage with tens of thousands. However, what is gained from smaller, more interactive processes is a depth of discussion that is often lost in large-scale public engagement

Engaging with marginalised groups: Although not all public engagement work aims to reach the most vulnerable and marginalised groups in society, some that did, failed to achieve this aim. The vulnerable and marginalised face a number of barriers to their participation. They are often not involved in the mainstream societal networks through which participants are usually recruited. Writing, reading and speaking requirements of some participatory methods tend to exclude or intimidate second language speakers and people with low literacy skills. And engagement methods and tools to engage the marginalised are often inappropriate or do not exist. This could be addressed by explicitly recruiting those from marginalised backgrounds as well as providing support to people to engage effectively.

Supporting the public to engage: Power asymmetries are, on occasion, apparent among stakeholders, based on information and knowledge, economic strength and resources, political power, negotiation skills or simply motivation and the capacity to take the initiative. Hence the 'weakest' participants often require capacity development. This includes giving participants more control over the process, the provision of information and training, logistical support, financial incentives and/or effective marketing. Essential to building a good engagement process, regardless of asymmetries, is the development of trust. However, effective public engagement can be costly. Drawing on intentions above, if public engagement is seen as purely an instrumental process then it is unlikely to be undertaken as the costs will be too high. If it is seen as normatively a good thing to do then one may not be sufficiently critical about how it can be done as efficiently as possible. And if public engagement is done for substantive reasons one is more likely to be realistic about balancing the costs and benefits.

Supporting scientists to engage: Scientists have for some time now been expected, particularly by funders, to engage with the public. Engaging effectively requires a change in role from that of 'teacher' or 'observer' to that of 'facilitator' or 'participant'. Further, scientists need to find a balance between the various streams of work expected of them, including grant applications, publications, administration, teaching and public engagement. Public engagement tends to play a marginal role in scientists' work. Those scientists who have wished to engage in more deliberative and two-way forms of dialogue traditionally faced institutional constraints, such as lack of time, support, resources and incentives. However, this is changing as a) institutions increasingly recognise the reputational benefits of engagement (particularly that it makes them look good to funders) and b) there are more people specialising in research communications and public engagement of science.

Working with public institutions: Developing links between deliberative processes and more formal arenas, such as representative politics, bureaucratic processes of policy-making or the legal system, is crucial if engagement is to have any purpose. This raises the question of how scientists engage with public institutions as well as how public institutions engage in wider science engagement processes. Both of these depend largely on the culture and capacity of the public institutions in question. Nevertheless purposeful engagement with public institutions is useful if one is concerned with changing policies about science. Likewise, decision-makers could benefit from taking part in a similar capacity to that of scientists by listening to members of the public, engaging in dialogue and offering their own perspectives on issues discussed.

Combining expert and citizen knowledge: The literature presents both merits and drawbacks in drawing on community-inspired or indigenous knowledge (versus expert analysis). While some see the incorporation of citizen knowledge into analyses as diluting scientific knowledge and subsequently eroding its credibility and instrumental value, others place citizen involvement alongside expert assessments as different but important, and as capable of providing a more informed picture if incorporated in the right way.

Communicating with participants: The gap between explicitly stated objectives and the expectations of those involved highlights the need to make the intentions of dialogue clear to participants and to let them know who is listening to their discussion and where the results will go. Managing expectations involves acknowledging tensions, prioritising objectives and making clear that, in light of the often complex nature of policy-making, single dialogue events are unlikely to have a considerable influence on decision-making.

Promoting wider uptake: Some of the literature suggests that public engagement organisers should do more to distribute the learning from what are often small-scale deliberative processes. Doing so helps contribute to wider cultural change in how social dimensions of S&T are addressed among scientists, policy-makers and members of the public. This could be done through the direct involvement of more people in public engagement activities and/or communicating the outcomes and findings of public engagement processes to more people, using the media and online tools.

Human resources for engagement: Most, if not all, projects require facilitation and conflict management expertise and those with a background in the social sciences. Skilful, structured, sensitive and independent facilitation of dialogue events is required to create space for conversations among a wide range of participants on often controversial S&T issues. There is an increasing tendency to draw on social science expertise, although some advise against bringing in social scientists to do dialogue at the end of large-scale projects. Conversations about involving the public in project development should take place from the start, and need not be the field of social scientists alone, which in turn calls for better cross-disciplinary working.

Managing public engagement processes: Effective deliberation is time-, energy- and resource-intensive. Clear processes for planning, along with clearly outlined roles and responsibilities of different actors, facilitate an efficient management process. Advisory groups made up of different actors ensure that the process and content are informed by a wide range of perspectives. Thought needs to be invested in deciding how to collect and analyse what is often a huge amount of data from deliberations.

Monitoring, learning and evaluation: The complexity of the systems in which engagement takes place and the shifting relations between the context, participants and process means a high degree of flexibility informed by continuous monitoring and learning is required. This in turn necessitates the establishment of appropriate knowledge management systems to respond to needs internal to the project team and stakeholders as well as the outside world.

Implications for funding: Finally, the management of engagement processes is often incompatible with traditional systems of project management. Funders need to reconcile their desire for detailed project plans with clearly defined activities, outputs and outcomes with engagement processes' need for openness and creativity. Moreover, given the increasing expectation by funders for scientists to engage the public with research, dedicated funding streams would encourage better planning and implementation of public engagement activities as an integral element of the project from the outset.

1. Introduction

1.1 Background

In response to tensions and controversies surrounding issues such as genetically modified (GM) crops, so-called Mad Cow Disease (Bovine Spongiform Encephalopathy, or BSE) and Foot and Mouth Disease, there has been a significant increase in participatory, deliberative, inclusionary or what we call public engagement processes in issues involving science and technology (S&T), aimed, in part, at increasing public confidence in science decision-making. A variety of organisations have hosted events employing several different techniques – from citizens' juries to consensus conferences, deliberative panels and multi-criteria mapping. Their aims have ranged from responding to crises and concerns over risks from technology; including citizen input and expertise in particular plans and decisions; and putting in place broader mandates to explore wider technology futures and development options (Leach et al., 2005).

1.2 Objectives and definitions

This working paper identifies and discusses key lessons from relatively recent public engagement processes in both the North and the South. Although people engage in several ways with S&T, making claims using the law, the media, the internet, science festivals and organised activism and protest, among others, our review draws practical lessons from processes in which members of the public are invited to engage with scientists and other professional stakeholders through participatory and deliberative dialogue processes.

1.3 Methods

This scoping study's primary focus was on deliberative or participatory processes involving citizens or members of the general public or communities. It was compiled based on a review of mainly grey literature, much of which covered public engagement initiatives in S&T in largely industrialised societies. The review also included some studies assessing participatory action research (PAR) in agriculture and rural development in low-income countries (for reasons discussed in the next section). Articles were found through an internet search and from a resource database compiled by Involve, a UK non-governmental organisation (NGO). The scoping study was undertaken in 2009 and thus does not include more recent public engagement work.

1.4 Structure

The next section places the current trend towards public engagement in the context of the broader paradigm of the democratisation of science. It draws linkages between the literature on citizen involvement in S&T in developed societies and the body of work on citizen participation in expert-led development programmes and policies in developing societies. Section 3 describes some of the benefits of engagement processes in S&T, and Section 4 identifies and discusses several overlapping lessons from recent public engagement processes in a range of S&T fields. The final section concludes by drawing together some principles for those who are undertaking deliberative public engagement work.

2. Science, citizenship and development studies

2.1 The literature

Issues around public engagement in the sciences are rooted in discussions about the democratisation of science and how and why citizens engage in scientific debates and decisions that affect their futures. These range from specific policy issues relating to genetics, HIV and AIDS, occupational health, biotechnology and GM foods to broader processes of assessing the risks of new technologies. These are often analysed by those in the field of science and technology studies (STS), which has since the 1970s examined issues of scientific and technological practice and culture, as well as the specific technological products and risks of modern science in Northern, largely industrial, settings (Leach et al., 2005).

Leach et al. suggest a convergence between STS and development studies (DS), especially in terms of their anthropological contributions: DS has engaged with similar issues, but in a Southern setting. The emphasis has been on agricultural and rural development, the connections between technology and livelihoods and perspectives emerging from indigenous or community knowledge in relation to modern expert knowledge and citizen involvement in expert-led programmes and policies.

While DS draws on a longer tradition of work assessing local knowledge and practices and their conceptual and social underpinnings (from the 1970s and 1980s onwards), STS by contrast has only relatively recently (since the 1990s) come to focus on lay and experiential knowledge.[1] Leach et al. (2005) argue that globalisation has spurred on the convergence of these two bodies of work. They also claim that, 'many of the categories that might once have been used to think about engagements in different parts of the world – North and South, developed and developing countries, indigenous and modern – no longer seem salient' (ibid.) – thus justifying the inclusion of DS literature (albeit in a limited manner) in this study. Drawing heavily on Leach at al., we chart the trajectory of STS, pick out key strands and highlight linkages to DS to help explain the emergence of deliberative or participatory public engagement processes.

2.2 The deficit model

Collins and Evans (2002), in Leach et al. (2005), identified three phases in STS. The first aimed at understanding, explaining and reinforcing the success of science, without questioning its foundations. Science was held to be authoritative, objective and universal, and provided an unquestionable basis for expert-led decisions. Perceived crises of legitimacy in science were thus deemed to be the result of public misunderstanding. This 'deficit' in public knowledge, manifesting itself in scepticism, would be filled through science education, as the 1985 report of the Royal Society suggested. 'Science shops' throughout Europe, enabling the public to consult accredited experts on issues that concern them, reflected this view (Royal Society, 1985). The deficit model resonated with DS, where for a long time development was seen largely as a technocratic process in which 'experts' planned programmes that were implemented by policy-makers and agencies for the benefit of a passive public.

2.3 The politics of science

A second phase of science studies focused on challenging the assumptions and practices of science. Science was now seen as a social and political activity, and public understandings were seen as more sophisticated and nuanced, encompassing not only content and methods but also issues of power and control. In DS, Leach and Scoones (2005) argued that the focus on science for development fell too

[1] There is also a long history of participation at a local level in the UK for environmental issues such as planning.

much on its role in promoting economic growth at the expense of prioritising poor people's needs. Further, 'lay' people engaged with and contested science and its advice by conducting their own research. Groups united by common experiences of S&T and its risks, such as HIV and AIDS activists (e.g. the Treatment Action Campaign in South Africa), toxic waste campaigners or parents concerned about vaccine risks and side effects, made claims based on their experiential knowledge. This connects with DS literature on civil society and social movements, in particular the actions of movements in the Chiapas, Seattle, Genoa and the Narmada Valley, as well as the anti-war movement and the World Social Forum. Pro-poor development was seen as achievable through the empowerment of citizens to provide inputs to affect upstream choice of policies as well as downstream delivery. A notable example was the farmer-to-farmer science learning in the 'Campesino a Campesino' movement in Latin America, where poor peasant farmers throughout southern Mexico and Central America over the last three decades taught one another through experimentation, piloting and testing about how to protect their environment while still earning a living (Holt-Gimenez, 2006).

2.4 Local versus expert knowledge

A third phase in STS has focused on the nature of expertise in the decision-making process. Experts include both specialists and non-specialists, such as members of the public. In the UK, for example, lay people became members of Science Advisory Councils, the high-level bodies advising government departments on science issues (Government Office for Science, 2010). This reflects the move towards deliberative and inclusionary processes inviting the lay public to make claims in new fora, such as citizens' juries, consensus conferences and scenario panels. Ironically, though, just as new institutions adopted the language of inclusion, engagement and deliberation, globalisation seemed to render the governance of S&T more obscure, remote and inaccessible.

Meanwhile, the expertise associated with engagement has continued to be based on Western scientific rationality and the idea of statistically valid trials. Homeopathy and other similar sciences, as well as indigenous or folk knowledge, have been excluded, seen to represent ignorance, misunderstandings or unfounded fears that (in echoes of the deficit model) science communication, education or political processes have to counter.

In the DS literature, in contrast, indigenous and folk knowledge have been central in debates about rural people's knowledge for decades. Knowledge of technical issues in, for example, health, agriculture and ecology, have been inseparable from cosmology and local religion on the one hand and questions of social order and power relations on the other. Indigenous knowledge has often been depicted as a valuable and complementary resource, with natural sciences seen as having a predominantly Northern-driven knowledge base (Jones et al., 2008). For instance, rural people's indigenous knowledge and expertise have contributed to technology development in the agriculture and environmental sectors (Bentley, 2001). In addition, work on indigenous technical knowledge and 'ethno-science' argues that indigenous knowledge is a key input into community development processes.

2.5 Erosion of trust in expert institutions

Work in developing country settings shows that limited trust in expert institutions, particularly in the 1990s, was not necessarily a unique feature of the industrialised West (Latour, 1993). Long-term social science research in low-income countries of Africa, Asia and the Caribbean, concerning, for instance, pastoralism, forest management, soils or water, has often exposed a major disconnect between the knowledge and perspectives of land users and those of national and international science and policy institutions (e.g. Brockington, 2002; Fairhead and Leach, 1996). Moreover, public critiques of science and the way institutions frame risk to legitimise their power, date back to early colonial times and can be seen today in terms of concerns about forests in West Africa (Fairhead and Leach, 2000) or water and dam development in India (Mehta, 1998).

2.6 Risk and uncertainty

Perspectives from DS suggest that the STS literature overstates the novelty of the risks facing late industrial society. Risks, hazards and uncertainties have long been experienced in developing country settings, and have not been appreciated adequately in the management of public health, rangelands, watersheds, soils and vegetation, which were often thought to be premised on ideas of predictability and control. These strands of work in DS have developed out of a concern for rural people's basic needs in agriculture, natural resources and health – unlike the sort of high-tech issues that have dominated STS debates, which have been more cautious about the knowledge contributions of lay publics.[2] In fact, it is only since the 1990s that engagement in the sciences has moved upstream to enable publics to contribute to agenda-setting.

2.7 Participation

Engagement (including upstream engagement) in DS is a well-established phenomenon. In its better known form as participation, it gained prominence in response to the perceived failure of the top-down state-led development project, and has generally been constructed at the community level. A large repertoire of participatory techniques has evolved since the 1980s to help communities express their concerns and to elicit local knowledge. Participatory Rural Appraisal (PRA), for example, has become an essential tool in development practice throughout the world (see Chambers, 1997). There has also been considerable work on implementing development interventions to create spaces for invited participation. Only since the early 1990s, in the wake of Agenda 21 initiatives (in response to the UN Conference in Rio), have such approaches become popular in the North.

Meanwhile, it is only relatively recently that DS has reflected in any depth the politics of participation, whereas in decision-making in developed societies in S&T, participation has been bound up with extensive debate on political interests. In the participation literature in DS, Leach et al. (2005) point to four key reflections. First, participation is viewed as a social event in which particular types of power prevail, resulting in the exclusion of particular social groups and types of knowledge. Second, these events are often led or convened by institutions – local governments, aid agencies or activist NGOs. Citizens are enrolled into an institutionally pre-defined agenda which present 'science' or 'risk' issues in a particular way. They are seen as those who use or choose from an array of options rather than those who might make or shape development agendas derived from their own framing of issues. Third, and as a result, participatory processes are vulnerable to framing by the most powerful; as Chambers asks, 'Whose reality counts?' Fourth, questions arise about the relationship between invited spaces and wider political processes. This in turn raises questions about the objectives that participation is expected to achieve. Are spaces for participation isolated, serving to co-opt and manipulate to support the status quo, or are they linked to broader processes of social and political transformation?

We explore some of these issues in the section on lessons. First, however, we discuss the perceived benefits of deliberative public engagement processes.

[2] However, one could argue that hi-tech issues pose substantively different types of risk from (say) public health risks. For instance, nanotechnology is about 'unknown unknowns' (we aren't sure what happens to nanomaterials in waste streams), whereas much public health is about 'unknown knowns' (we know what the pathogens are, but we are unsure when, where or why they cause problems). Clearly this is not a strict delineation as the emergence of a new virus such as SARS puts us, for a while, into the 'unknown unknowns' space.

3. The benefits of public engagement with science

3.1 Introduction

The theoretical benefits of public engagement with science are well documented. For instance, Cohen, et al. (2008) point to the creation of an informed citizenry, the generation of new ideas from the public, increased chances of research being adopted, strengthened public trust and the answering of ethical research questions. They go on to say that decision-making can be improved if public views are combined with those of decision-makers and experts. Public engagement also fosters 'global communication', enables shared experiences and methodology, standardises strategy and generates global viewpoints. Beyond benefiting society at large, public engagement with science can complement market signals in setting the research agenda, resulting in research that is more likely to meet social needs. Stilgoe (2007) warns us that, 'If we take upstream engagement seriously, the difference made by deliberation [in research and policy] may be hard to detect for some time.' Nevertheless, this section focuses on the benefits as documented in some of the literature which documents lessons learnt from deliberative public engagement processes up to 2009. We describe these for the public, scientists, institutions and other actors (including industry and the private sector).

3.2 Benefits for the public

The Nanotechnology Engagement Group (NEG) report (Gavelin et al., 2007) suggests that, for many, the experience of taking part in public engagement transformed their attitudes to science and the governance of nanotechnologies. Members of the public attached great value to being able to engage in dialogue face to face with scientists and decision-makers and to discuss new perspectives, as opposed to being fed information (Sciencewise, 2008a; 2008e). Engagement helped break down stereotypes and dispel public concerns that scientists would be arrogant, pompous and distant (Winstanley et al., 2005). And, on occasion, groups normally excluded from policy-making processes were able to interact directly with scientists and decision-makers (Sciencewise, 2008a).

The public learnt more about science, technology and related policy (Sciencewise, 2008e). Participants at a Royal Councils UK (RCUK) dialogue on energy research suggested they learnt about energy research and levels of research funding (Warburton, 2008b). In addition, a deliberative citizens' jury in Zimbabwe on food and farming futures enabled an exchange of information that rural farmers would never have had before (with experts and policy-makers). Based on the presentations and information from specialist witnesses, farmers acquired information, for example about the policy-making process, which they felt they could act on (Rusike, 2005).

An evaluation of the Citizens' Inquiry into the Forensic Use of DNA in 2007 suggests the process brought out 'the challenges, opportunities and uncertainties of the use of DNA for forensic purposes', and achieved a 'mutual learning process' between experts (including researchers) and diverse publics (Farrar, 2008). Some members of the public subsequently developed a more critical understanding of the role of science in their daily lives, society, politics and the media. Feedback from some dialogue events highlighted demand for more such events (Sciencewise, 2008e). In fact, the success of 'Trustguide' led to 'Trustguide2', funded by industry and involving further public dialogue. In some cases, face-to-face interaction helped to foster a sense of solidarity between scientists and the wider public. For example, one process produced a shared sense between scientists and members of the public that they both had limited agency in influencing the direction of nanotechnologies.

Eames et al. (2008) argue that it is important that research and dialogue processes, which are unlikely to yield immediate outcomes, deliver practical benefits, such as education and skills development, for participants. The Science for Sustainability (SuScit) project, for instance, developed participants' ability

to make community films to articulate their perspectives on their local environment and urban sustainability.

Leach et al. (2005) argue that public engagements with science can have wider and unanticipated effects on other dimensions of empowerment and citizenship. Gavelin et al. (2007) similarly argue that that participation in public engagement can lead to involvement in social and political activities elsewhere, and thus foster a culture of active citizenship. These findings resonate with a US study of the University of Wisconsin's Citizens' Conference on Nanotechnology, which found that taking part in the conference had a positive effect on public participants' knowledge and sense of empowerment.

3.3 Benefits for scientists

Many scientists feel there is value in listening to different perspectives (Sciencewise, 2008f). They often find that members of the public are not 'anti-science', and they are often impressed by the level of understanding and knowledge the latter display (Gavelin et al., 2007), and the speed at which they are able to 'get to grips' with science issues (Sciencewise, 2008e). Scientists thus have overcome fears of two-way engagement with the public (Sciencewise, 2008a). Engagement has also helped counter the often negative coverage of science in the mainstream media (Sciencewise, 2008d; Winstanley et al., 2005).

The NEG report (Gavelin et al., 2007), suggests some scientists realise the need to communicate more clearly with non-scientists and see public engagement as beneficial to them and the wider science community. Expert speakers involved in dialogue on energy research indicated they had themselves learnt significant lessons about public engagement processes (Warburton, 2008b). Some scientists have been able to reflect on the role of regulation of new technologies, as well as their social responsibilities and the social impacts of their work (Sciencewise, 2008e). In addition, the SuScit process has provided opportunities for scientists to reflect and deliberate on the challenges, benefits and implications of working with local communities to address the challenges of sustainability for future research policy (Eames et al., 2008). Dialogue has sometimes led to the emergence of new research areas (Winstanley et al., 2005). Following a Nanodialogue experiment, for instance, scientists included social questions in their research proposals (Sciencewise, 2008e).

3.4 Benefits for policy

Public engagement has helped shape the thinking of key policy actors, raised awareness of potential conflicts between the public, scientists and other professional stakeholders and informed policy processes and decisions. In the UK, for instance,

- sciencehorizons informed the development of a cross-departmental mapping of where policy 'homes' lie (Sciencewise, 2008h).
- Nanodialogues informed Environment Agency, the Biotechnology and Biological Sciences Research Council (BBSRC) and the Engineering and the Physical Sciences Research Council (EPSCR) policy on nanotechnology (Sciencewise, 2008f).
- Nanodialogues also informed the work of the government's Nanotechnology Issues Dialogue Group (NIDG) – a cross-department working group that coordinates the delivery of the government's commitments on nanotechnology and the Sciencewise-funded NEG (Sciencewise, 2008g).
- Trustguide informed a House of Lords Select Committee on personal internet security and a House of Lords Constitution Committee on the impact of surveillance and data on citizens' privacy (Sciencewise, 2008j).
- Trustguide contributed to the development of a set of guidelines for educators, policy-makers and service providers which addressed a range of issues, including education, the value of experimentation and control and increased transparency in the storage of personal data.

- Human Fertilisation and Embryology Authority (HFEA) dialogue fed directly into a major policy decision (on the creation of human animal embryos for research purposes) and led to HFEA to look at dialogue in a wider context (Sciencewise, 2008d).
- Dialogue on energy research informed RCUK decision-making, reinforcing previous findings. Public engagement was seen to provide legitimacy and enabled decision-makers to take decisions more confidently (Warburton, 2008b).
- SuScit showed it was possible to produce a community-led agenda for urban sustainability research which responded to the needs of socially and economically excluded citizens (Eames et al., 2008).

Public engagement processes have also created interest in the field of public engagement and contributed to learning in the application of different engagement techniques (Sciencewise, 2008h).

3.5 Benefits for other actors

Some engagement processes have contributed to the development of the generation of ideas with industry about where public dialogue might be most useful (Sciencewise, 2008f). For example, Trustguide influenced the internal practices of industry giants such as Hewlett Packard and British Telecom to address public perceptions and needs (Sciencewise, 2008j). Undertaking engagement projects has also helped project organisers strengthen and extend existing relationships and networks and has brought together research teams with new skills (Winstanley et al., 2005).

As such, public engagement has had a number of benefits, for the public, scientists, public institutions and industry actors. But what do we know about public engagement processes? The next section identifies and discusses a number of overlapping lessons from public engagement exercises in the North and the South, starting with the question, 'Why engage?'

4. Learning from public engagement processes

This section discusses a number of key overlapping issues regarding participatory and deliberative public engagement processes: the intentions behind public engagement processes; context, approach and methods; representation; diversity and inclusivity; supporting the public to engage; supporting scientists to engage; working with public institutions; combining expert and citizen knowledge; communicating with the public; promoting wider uptake; human resources for public engagement; managing public engagement; monitoring, learning and evaluation; and implications for funding. The following section gives some overarching guiding principles for those interested in undertaking public engagement.

4.1 Intentions behind engagement

While many public engagement activities will have multiple motivations behind them, the NEG study suggests that, for some, public engagement is about 'putting science into context', that is, promoting decision-making that is more transparent and trustworthy, and that incorporates ethical and social considerations. It suggests this is done not only through written recommendations but also through real interactions between decision-makers, scientists and members of the public. However, discussions of 'how' too often obscure discussions of 'why' (Stilgoe, 2007). Stirling (2005) points to three motivations behind public engagement processes: normative, instrumental and substantive. From a normative point of view, participation is 'the right thing to do'. From an instrumental perspective, it is a better way to achieve particular ends. In substantive terms, it leads to better ends. These are not mutually exclusive: public engagement can have several and often unanticipated intentions. We discuss these three perspectives briefly, using examples to illustrate where possible.

4.1.1 Normative commitments

Normative commitments to participation rest on a commitment to empower citizens, especially those with marginal or excluded interests, rather than dominant institutions or elite social groups. They aim to ameliorate the undue exercise of power by institutions. Participation is seen as a good thing in its own right without need for further justification. These normative commitments could be seen as broader than just about science. They tend to reflect a political worldview that encourages participation more generally. Stilgoe (2007), in his analysis of upstream experimental dialogues, on nanoscience, disagrees, suggesting that, while doing public engagement might be fascinating, it is not an end in itself.

4.2.2 Instrumental engagement

Instrumental engagement can take the form of 'social intelligence', which may help gauge the likelihood of adverse public responses to specific actions taken. It can also help with the shaping, presenting and implementing of pre-designed policies. This resonates with Wakeford and Hale (2004)'s argument, according to which the most common charge is that the commissioning body has used the participation to provide legitimacy for a decision made before the consultation began. Participatory processes can also provide guidance on how best to prevent or mitigate negative social responses. Although unclear, this seems to be the approach of the UK Environment Agency, which suggests that early-stage, small-scale dialogue can yield valuable insights for regulators and decision–makers, which is useful when 'socially framed evidence is lacking', threatening its ability to undertake future work (Gavelin et al., 2007).

An instrumental perspective can explain objectives that aim to foster more public trust in the institutions and procedures responsible for governing S&T. Part of this lies in demonstrating commitment or a track record in public engagement. These issues are often prominent in the framing of funding bids for public engagement research. Reputation management is an important activity for scientific, public (and private) institutions. For instance, the objectives of the European Union- (EU-)

funded Urban Lifestyles, Sustainability and Integrated Environment Assessment (ULYSSES) project included trust building among communities in scientific and policy institutions.

However, if public engagement is seen as purely procedural in order to placate stakeholders, and if recommendations made through public engagement processes are consistently ignored, this can have a negative impact on trust and credibility. Some examples from the UK over the past decade highlight to varying extents a possible disconnect between public engagement processes and policy. While the UK National Consensus Conference on Plant Biotechnology in 1994 contributed to the wider debate on the public understanding of science, and attracted interest from policy-makers and the media, it had no visible direct impact on public policy and decision-making on plant biotechnology (Tomei et al., 2006). Moreover, the UK public has often been cynical towards desultory attempts at public involvement, such as the Labour Party's 'Big Conversation' in the run-up to the 2005 general election (Stilgoe, 2007).

An instrumental perspective then aims at achieving ends that are conditioned by existing power structures. As Stirling (2005) suggests, the design, implementation and interpretation of participatory processes is very sensitive to framing effects:

> 'Relationships with sponsors, the constitution of oversight, the design of the process, the choice of focus, the partitioning of perspectives, the engagement of stakeholders, the recruitment of participants, the phrasing of questions, the bounding of remits, the characterizing of alternatives, the provision of information, the medium of discourse, the conduct of facilitation, the demeanour of practitioners, the personalities of the protagonists, the dynamic of deliberation, the management of dissension, the documentation of findings, the articulation of policy – all provide ample scope for contingent variability, inadvertent bias or the exercise of deliberate and powerful conditioning influence.'

Similarly, Stilgoe (2007) argues that the emergence of consultants armed with devices and techniques such as focus groups, surveys, online platforms and citizens' juries has created new forms of technocracy by disguising the politics of both science and participation. Participatory processes then are no better (or no worse) than expert analysis. After analysis, Stirling (2005) argues that participatory processes share several characteristics with expert analysis. Both are sensitive to framing conditions, both can have the effect of reducing diversity of evaluative approaches, both are applied in institutional environments which are structured and pervaded by pre-existing power relationships and both are vulnerable to 'strategic' behaviour. Yet either approach may be undertaken and presented in ways which conceal such motives.

Co-option, (where what were intended to be genuine deliberative and participatory processes become processes to prevent major changes being made and to maintain the status quo), can occur powerfully, but subtly, through the careful wording of questions asked, thus setting the agenda for subsequent discussions. For instance, a citizens' jury in *GM Nation?* was asked, 'What conditions should be fulfilled before genetic testing for common diseases becomes available on the National Health Service?' This framing prevented discussion of the possibility that participants would oppose such testing whatever conditions had been fulfilled. Box 1 gives an example in New Zealand regarding genetic engineering, which illustrates how a public engagement process that initially appeared 'open' was actually, on close inspection, 'closed'. Examples of more genuine dialogue include Citizen Foresight – funded by a major UK supermarket, a genetics think-tank and the Consumers' Association – which adapted the citizens' jury method and drew on a variant of multi-criteria analysis. Although information provided to the jury was clearly framed by the organisers, the jury were allowed to formulate their own vision, based on their deliberations.

Box 1: The Royal Commission on Genetic Modification in New Zealand

The Royal Commission on Genetic Modification (RCGM) aimed to investigate possible options and relevant policy changes needed regarding genetic engineering (GE). Citizens were asked to make written submissions using a specially designed template; in processing these, the commission found it difficult to balance the many different viewpoints held and to define an agreed ethical framework within which to accommodate the submissions of various religious, ecological, Maori and Pakeha (white settler) groups. Despite 92% of the 10,861 submissions being against the promotion of GE, the RCGM gave GE the green light. This resulted in widespread protest – the destruction of a GE potato trail at Lincoln University Crop and Food Research Institute Laboratory; a pledge by 3,500 ordinary citizens to take direct action against GE; the occupation by anti-GE Maori of the offices of the Environmental Risk Management Authority; and a three-week hunger strike by a student in Christchurch. Not surprisingly, biotechnology firms, research institutes and insurers saw these events as illegitimate and referred to them as eco-terrorism, sabotage and the work of the far left.

Overall, what appeared to be an open forum had turned out to be closed, as a result of unquestioned assumptions shaping the whole process of inquiry, argument and deliberation. For instance, the submission template, whose appearance added to the apparent openness of the participatory exercise, on close inspection served to fragment the views of those with a more holistic position on the GE/environmental risk debate. The ambitious expectations invested in the RCGM were thwarted by a dominant institutional policy culture (viewing economic growth and nature as being enhanced by GE), which closed down the process.

4.1.3 Substantive participation

The third reason for participation – substantive – is linked to informing the substance of social choices themselves, rather than their presentation, implementation or management strategies. Here, citizens are engaged as subjects rather than objects of discourse. The aim is to pursue more socially robust S&T pathways. However, if poorly executed, such approaches can ignore the power dynamics that shape the process and can focus exclusively on improving outcomes (however, done well, such an approach recognises power dynamics as an integral component (see Jones, 2011)) This approach resonates with the final report of the NEG, which concludes that public engagement is really worth doing only if it makes a substantive difference.

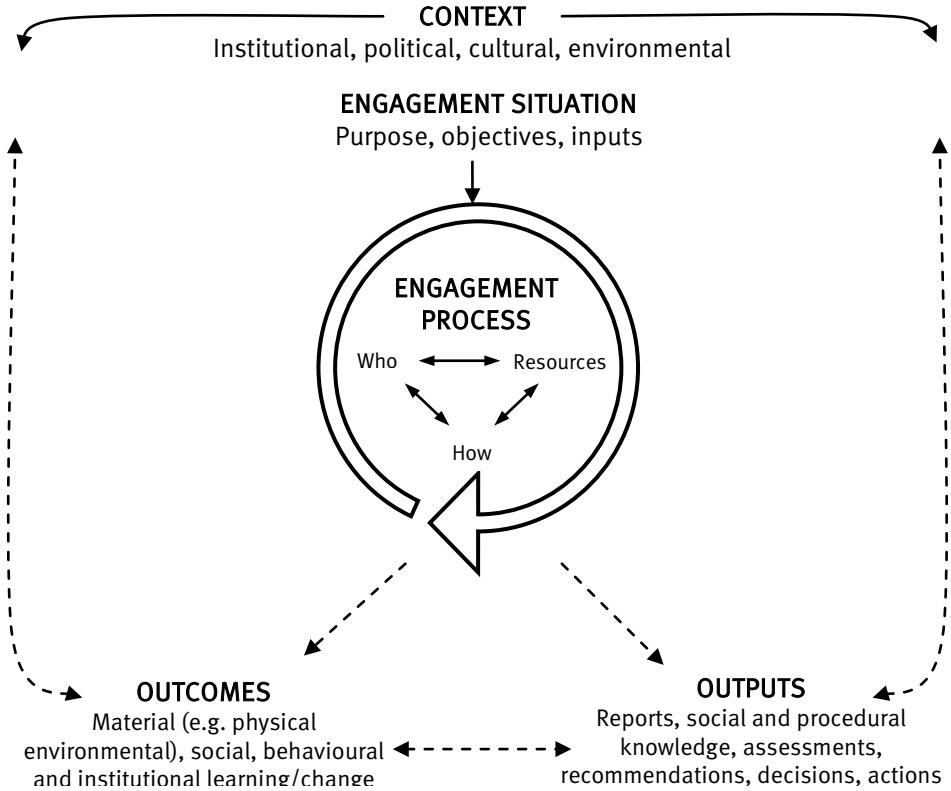
Further, Gavelin et al. (2007) argue that in-depth public dialogue on S&T can inform and improve science policy, research and development by bringing new perspectives into science and policy discourses and can allow diverse groups to raise concerns of relevance to them, which might otherwise be overlooked. Nevertheless, even if the intentions are to promote positive change, in many instances engagement is unlikely to influence technocracies to change their 'institutional deafness' to informed public opinion (Wakeford and Hale, 2004). Furthermore, trajectories of technological development are often driven by the goals of (private) industry and not (democratically governed) public institutions (ibid.). The next section assesses the role context plays in public engagement: having discussed the 'why', we discuss the 'how' by looking at the various approaches and methods used.

4.2 Approaches and methods to engaging the public

Several deliberative and inclusionary mechanisms have been trialled in the past decade to enable citizens to deliberate on contentious/scientific issues. The New Economics Foundation (1999) identified 21 methods for public engagement, whereas Rowe and Frewer (2005) list over 100 mechanisms. These include citizens' juries, scenario work-shopping, future search, consensus conferences, constructive technology assessments and participatory policy appraisals (Rusike, 2005).

But when, where and how is dialogue integrated into research programmes and strategies? The methods used and approach taken will vary according to the intentions, the issue, local contextual factors (see below) and the stage of the research process at which the engagement takes place (Figure 1). Those being engaged should also feel comfortable with the methods employed. Imported strategies developed elsewhere could have different and unintentional outcomes (Winstanley et al., 2005).

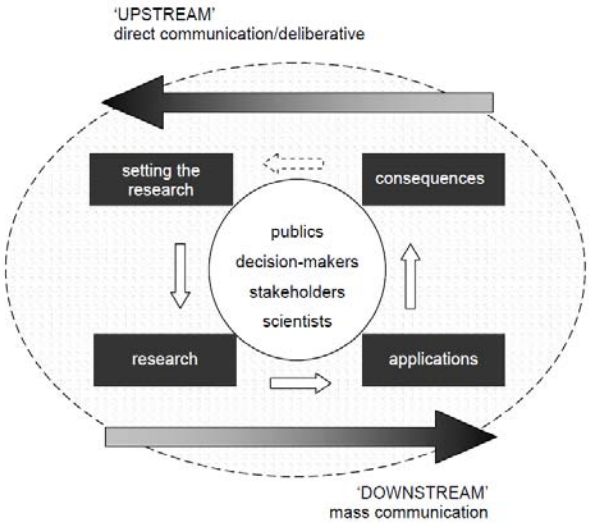
Figure 1: A contextual model of participatory processes' design and evaluation



Source: Adapted from Burgess and Chilvers (2006), in Chilvers (2006).

Figure 2 summarises the ways scientists might use dialogue in science (and hence the stage of the research process at which the public are engaged). The Nanodialogue experiments are an example of dialogue moving 'upstream' to informing decision-making in science investments and futures.

Figure 2: When public engagement should take place



Source: Whitmarsh et al. (2005).

However, the NEG report highlights the challenges in creating meaningful engagement on a topic the general public know very little about. The fact that nanotechnologies were in the early stages of their development meant that discussions often lacked purpose. Deliberations tended to focus on applications that members of the public could relate to, such as consumer goods and medical

applications; this often frustrated scientists. Basic research and technological applications were a gap too wide to bridge for some scientists. This, coupled with the RCUK's ambivalence about its own roles and responsibilities in setting UK scientific research agendas, suggests experiments may have been conducted too early in the development of nanotechnologies (Chilvers, 2006). Some believe the public should be consulted at the stage when value judgements become important, and not necessarily at the first stage of problem identification. Stilgoe (2007) suggests that organisers think through the different forms engagement will take at different points in the cycle of research, development and diffusion.

This is linked to the development of research questions, which will in turn inform the sorts of methods that should be applied. Many of the Sciencewise case studies highlight the importance of asking the right questions in line with public preferences. Some projects started out with too broad a remit – more focused research questions would have enabled the emergence of a stronger evidence base (Sciencewise, 2008g). Organisers of Trustguide, for instance, realised soon after deliberations started that, while Hewlett Packard and British Telecom wanted to talk about trust, participants actually wanted to talk more about risk (Sciencewise, 2008j).

Furthermore, Warburton (2008b) suggests a single public engagement process may not provide all the inputs needed to support deliberation, and hence proposes that public engagement processes draw on a range of methods and approaches to elicit a diversity of views. A review of Trustguide suggests a mixed methodological approach: technological demonstrations, providing hands on experience, together with discussions focused on current stories in the media and provocative quotes on issues of security, privacy and trust acted as a catalyst for discussion (Sciencewise, 2008j). A similar approach adopted by HFEA helped capture a wide range of public perspectives (ibid., 2008d).

Although this paper reviews participatory and deliberative public engagement processes, the fact that these are on occasion confused with other forms of engagement means it is worth discussing, albeit briefly, the three main approaches to public engagement: 1) public communication (where information is transmitted to the public); 2) public consultation (where information from the public is gathered) and; 3) public participation (which we focus on and where scientists and the public collaborate and build consensus) (see Cohen et al., 2008; RCUK, 2010; Rowe and Frewer, 2005).[3]

In **public communication,** information is conveyed from science and/or public institutions to the public. Examples of this include innovative public engagement methods in Latin America, where events have been held in bars and other venues outside the academic circuit, as well as through drama, soap operas, comic books, poetry, games, story-telling, science fairs and even Peru's parades and Brazil's annual Carnival, which aims to put 'science on the street' (Cohen et al., 2008). In New Zealand, however, one-way communication (and consultation) with pre-determined outcomes have eroded trust amongst Maori community, which have resulted in a cynical response to renewed attempts at dialogue.

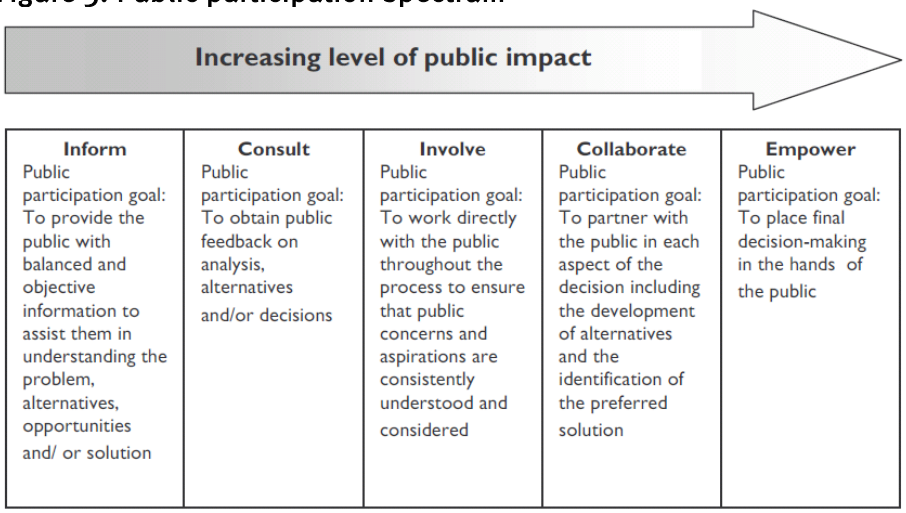
With **public consultation**, information is conveyed from members of the public to science and/or public institutions, following a process initiated by the latter. A common approach to consultation early on in the UK Labour Party's reign in power was the market research model, in which focus groups, workshops or other qualitative techniques are used to determine public views on an issue. Both public communication and consultation suggest the public suffer from a 'deficit' in understanding.

Public participation sees information exchanged between members of the public and members of science and/or public institutions. Here, dialogue appears to be more 'genuine' (Rowe and Frewer, 2005). Wakeford and Hale (2004) add that citizens are allowed some scope to frame the issues under discussion and are given an opportunity to act as advocates for the recommendations arising from their deliberations in a public forum. Winstanley et al. (2005) suggest it implies a more active process of building relationships through direct engagement between stakeholders over time which goes beyond simply two-way communication. Figure 3 outlines a framework developed by the International

[3] See Rowe and Frewer (2005) for a classification (four communication, six consultation and four participation methods of engagement).

Association for Public Participation which describes different levels of participation and increasing level of public impact. Here, participation in Roger and Frewe's framework is broken down into three further categories – involvement, collaboration and, finally, empowerment.

Figure 3: Public participation spectrum



Source: IAP2 (2006), in Tomei et al. (2006).

Participatory methods will often mean participants stepping out of their comfort zone. Methods employed in dialogue initiatives in New Zealand often encouraged participants to step out of traditional roles and historical patterns of interaction. This made people more receptive to doing things differently and encountering different ideas. Furthermore, groups used social interactions outside formal dialogue processes, such as eating together and informal conversations around meal times, as a way to enhance exchange of ideas, information and strategies for action later in the meeting (Winstanley et al., 2005).

Chilvers (2006) describes how members of the public and scientists in an upstream public engagement experiment with the Biotechnology and Biological Sciences Research Council and Engineering and Physical Sciences Research Council generally felt they had little influence on how a dialogue process was framed. As a result, one evaluator questioned whether participants could shape engagements more. Stilgoe (2007) adds that organisers need to relax control of the mechanics of engagement and find new ways for members of the public to frame the debate, remembering that the 'form' of engagement followed its 'function'.

Box 2: Market research methods in public engagement

In the UK, the use of focus group methods in (what was the) Department of Trade and Industry Public Consultation on Developments in the Biosciences (PCDB) conducted by Market and Opinion Research International Plc (MORI) appeared to suffer from their being based on personal and unverifiable judgements of what people really think rather than allowing the public the opportunity to reach their own informed opinion. They also failed to allow participants a voice on the issue, except via the interpretation of their views by a researcher; provide information in the form of a witness they could cross question; and provide the mechanisms of transparency or multi-stakeholder oversight required for the results to be trusted beyond the bodies that commissioned it. To be sure, by ensuring members of the public responded to questions generated by government and the advisory group rather than, for example, members of the government and officials obliged to respond to public questioning, government was effectively insulated from public scrutiny while claiming to be participatory.

The UK BioBank consultation, again drawing on market research methods, also came in for criticism, with a deficit theory element within the exercises suggested. Participants were denied space within the process to frame issues around health care in their own terms. They were treated as reactive members rather than as active citizens, the format assumed that development of the biobank would indeed occur and there was little scope to expose apparently 'hard facts' to critical scrutiny or contestation. Those engaging in the consultation had no alternative trajectories laid out for them, and the exercise was tantamount to an information-gathering exercise. The only policy impact was to change the name of the scheme from BioBank UK to the UK BioBank.

Source: Wakeford and Hale (2004).

While engagement may often be presented as participatory, methods adopted could suggest otherwise (see also Section 4.1). Despite the numerous methods available to those organising engagement processes, *GM Nation?* used opinion polls and focus group discussion, meaning engagement was viewed as yet another exercise in gathering social data rather than as the provision of genuine space for the public and scientists to collaborate and build consensus. Box 2 presents two examples where public engagement was presented as participatory, but turned out to be consultative through market research. As highlighted above, the methods and approaches selected should be based on a number of factors, including those that are contextual. This is the subject of the next section.

4.3 Putting engagement in context

Public engagement practice tends to focus on choosing the correct engagement method for a particular purpose. However, more often than not, it is the context – the political climate, the relevant history, the decision-makers, and the infrastructure that connects them – that determines the ability to succeed. As such, organisers need to understand their context: engagement cannot take place in a vacuum. Some contexts may be more conducive to public engagement than others, and some engagement vehicles may be more conducive in some contexts than others.

The Research and Policy in Development (RAPID) framework – a conceptual framework to help researchers and policy entrepreneurs understand the role that research-based evidence plays in, among other issues, influencing policy – presents a number of questions about context, answers to which can help paint a picture of how this may influence engagement processes (Box 3). Meanwhile, Stilgoe (2007) suggests that off-the-shelf processes tend to exacerbate the distinction between science and society, leaving underlying assumptions untouched. Different dialogue approaches are then needed for national, regional, sectoral and group levels of interaction. These need to occur in environments that are comfortable for a variety of participants, which may involve facilitators and scientists taking the conversation to particular communities.

Box 3: Questions about the context from the RAPID framework

1. Who are the key policy actors (including policy-makers)?
2. Is there a demand for research and new ideas among policy-makers?
3. What are the sources of resistance to evidence-based policy-making?
4. What is the policy environment?
5. What are the policy-making structures?
6. What are the policy-making processes?
7. What is the relevant legal/policy framework?
8. What are the opportunities and timing for input into formal processes?
9. How do global, national and community-level political, social and economic structures and interests affect the room for manoeuvre of policy-makers?
10. Who shapes the aims and outputs of policies?
11. How do assumptions and prevailing narratives (which ones?) influence policy-making; to what extent are decisions routine, incremental, fundamental or emergent and who supports or resists change?
12. Who are main international actors in the policy process?
13. What influence do they have? Who influences them?
14. What are their aid priorities and policy agendas?
15. What are their research priorities and mechanisms?
16. How do social structures and customs affect the policy process?
17. Are there any overarching economic, political or social processes and trends?
18. Are there exogenous shocks and trends that affect the policy process?

Source: ODI (n.d.).

Four projects that made up Nanodialogues tried as much as possible to embed their experiments in their respective contexts. Before inviting public discussion, project teams worked with their partners to map the relevant scientific and policy terrain. The following examples illustrate how the project was both informed and affected by the context:

- Systemic constraints experienced included the apparent mismatch between public deliberation and the evidence mindset of the Environment Agency in the UK.
- In Zimbabwe, Practical Action's work revealed the steps that need to be taken before well-meaning technologies will work in new places.
- The work with a research council pointed to the mass of assumptions and decisions that make up research agendas and the difficulties of permeating these with a sense of public value.
- In the work with Unilever, a multi-national corporation, organisers were left with the challenge of scaling up a conversation about citizens and public value to the level of a global company, which viewed people as one-dimensional consumers.

Understanding the context better can help organisers engage with publics better. But who is represented at these public engagement processes? The next section deals with this.

4.4 How representative are participants?

4.4.1 Breadth versus depth

Public engagement is often criticised for its inability to reach a scale that can meet mathematical notions of being representative of a population (Sciencewise, 2008g). If public engagement in policy processes is to gain legitimacy, it may have to move beyond convening a small group of citizens to include tens of thousands of people (ibid.). The people's panel set up by Downing Street following Labour's election victory in 1997 attempted to achieve this by conducting a market research style of consultation with 1,000 people picked by MORI from the electoral roll. However, this proved too expensive, and was sometimes uncomfortable for senior political figures; it was wound up three years later. Others argue that public engagement need not be a statistically significant research exercise or a nationwide democratic process to be valid. What is gained from smaller, more interactive processes is a depth of discussion that is often lost in large-scale public engagement (Gavelin et al., 2007).

4.4.2 Selecting participants

Scoones and Thompson (2003) suggest the need for clarity about whom the 'public' in public engagement processes represents and how they are chosen. In his discussion of a citizens' jury on food and farming issues in Zimbabwe, Rusike (2005) describes criteria used to select participants: they had to be full-time residents in rural areas and farming had to be significant part of their livelihood; there had to be equal gender representation from each district; and they had to have a broad knowledge of rural issues and be sufficiently articulate and confident in discussion in Shona or Ndebele. These extensive criteria appeared to limit who could participate considerably, raising questions about how representative the group would be. In South Africa, an arguably more 'democratic' tool was used to select participants for the Foresight Programme. Co-nomination – a survey-based selection technique – allowed stakeholders and the broad community to participate in an open exercise of identifying individuals and experts to participate.

4.4.3 Representation versus diversity and inclusion

Favouring poor or marginalised groups is often seen as legitimate. Stilgoe (2007) suggests the Nanodialogue project created conversations among people who did not usually get a voice. However, in the Citizens' Inquiry into the Forensic Use of DNA 2007, tensions were apparent in ensuring participants were both representative and inclusive of minority groups. 'One member in particular objected to the heavy weighting in the list towards young people and people from minority ethnic communities – based simply on the question of how credible the inquiry's findings would be if the panel was not representative of the UK's population as a whole' (Farrar, 2008).

4.4.4 Vocal interest groups

In search of the real consensual (often silent) public, more vocal interest groups have been sometimes sidelined. But Stilgoe (2007) argues that, if public engagement can help organisers understand S&T systems, then interest groups need to be invited back in. Rather than stripping politics away, it needs to be tied to engagement. However, debates where people are not recruited, but are open to all, are

often dominated by people who are interested in the subject (as they have volunteered to come), so the views are therefore not representative of society at large. The challenge then is to acknowledge the diverse interests that make up the public and to learn from 'uninvited' engagement while making the most of organised engagement.

4.4.5 Personal opinions versus representative views

However, those who are selected to represent the interests and views of their communities do not always do so, rather presenting their own views and opinions. It is this diversity of sometimes dissenting opinion that needs to be captured and worked with, rather than assuming that the poor or smallholders necessarily speak with one voice. What is needed, then, are ways of identifying the range of views and opinions within a community, ensuring that all voices are represented and providing support and training for community representatives (Tomei et al., 2006). In participatory processes, there is a danger that certain groups will dominate to the exclusion of other, less powerful, people. For instance, women, the economically disadvantaged, people with disabilities and non-literate members of the population are often sidelined by these processes. We discuss this in the next section.

4.5 Promoting inclusion and diversity

4.5.1 Exclusion from science

Although not all engagement processes aim to be all-inclusive and representative of diverse groups, when they are intended to be, some groups do experience exclusion. This is as common to groups of people in Europe and the US as they are to those in Asia and Africa. Engagement processes such as the RCUK-sponsored dialogue with energy research, the community x-change project and the LA (Local Agenda) 21 initiative struggled to draw participants from diverse and minority groups (Eames et al., 2008; Sciencewise, 2008a; Warburton, 2008b). Institutions are uninformed subsequently of the needs and preferences of such groups. For instance, results of two 'Weekend Away for a Bigger Voice' workshops showed that low-waged citizens articulated a sophisticated critique of the food system that countered the Food Standards Agency's (FSA's) evidence-based statements, suggesting that those on low incomes prioritised food that was cheap rather than that of high quality (Wakeford et al., 2004). Further, a SuScit[4] scoping study suggests existing initiatives were failing to undertake research to help improve the quality of life of the most vulnerable sectors of society (Eames et al., 2008)

The UK Power Commission found that the principal reasons for the disengagement of marginalised groups were the same as for the rest of society – a sense of inadequacy in the political system. Specific reasons varied by groups: those on a low income were perceived to lack skills for political participation and suffered social exclusion; minority groups felt alienated in the system; and young people did not seem to regard electoral participation as something they should be involved in. Listen Hear (2000), in Eames et al. (2008), argues that those in power seemed deliberately inaccessible to those without it, and those without power – those at the bottom of the heap of advantage – lacked the self-esteem to do much about it.

Furthermore, marginalised and socially excluded groups may not be involved in the mainstream societal networks through which participants are usually recruited. Socially excluded people do not feel a part of their community, which is often the focus of consultation activities. Moreover, writing, reading and speaking requirements of some participatory methods will tend to exclude or intimidate people with low literacy skills and second language speakers.

Funding, and hence the power to convene, is usually under the control of organisations seeking participation, and not devolved to communities. Marginalised groups are often apathetic towards engagement, which is often thought of as justifying pre-committed policies. They will also prioritise more pressing commitments over engagement processes. In response to these constraints, the UK

[4] This facilitated dialogue between marginalised groups experiencing environmental problems within their communities and scientists and other professional participating in the EPSRC-funded sustainable urban environments programme.

Power Commission suggested improved political education, better representation for minority ethnic groups, a shift in culture and improved wider use of participatory methods in decision-making.

In the public engagement initiatives assessed, there were few spaces for researchers and marginalised groups to share and exchange information and research (Eames et al., 2008). Consultations that did take place did not provide opportunities for the marginalised to highlight their concerns. Meanwhile, there is little awareness that traditional participatory tools have failed to reach out to marginalised groups. In the context of urban sustainable development, Eames et al. (2008) highlight the plight of black and minority ethnic groups in the UK, which were more likely to be socially and economically excluded and subsequently to live in poorer housing situated in disadvantaged and run-down environments and to suffer a lack of access to open spaces. Although environmental groups exist to campaign for improved conditions, marginalised groups are underrepresented in these.

4.5.2 What has worked

To work, participation needs to enable people to develop a strong collective voice, while ensuring all voices are heard. Policy-makers and science institutions also need to be seen to act on findings. One-off consultations are not enough – effective engagement involves ongoing exchanges that are seen to make a difference. Creative approaches have been adopted to reach out to marginalised and socially excluded groups. Moving Lives, which worked with unaccompanied young refugees and young people living in East London in 2005, used photo-voice – a photography and digital story-telling approach to promote dialogue about community issues through group discussions to reach policy-makers.

More recently, the SuScit project provided local communities with a voice in the future of urban sustainability research. It demonstrated that it was possible to articulate a distinctive community-led agenda for urban sustainability research which responded to the needs and concerns of socially and economically excluded citizens. The project comprised action research and networking activities designed to promote engagement and dialogue between researchers, practitioners and local citizens, particularly socially and economically excluded citizens such as older people, single parents, young people and those from black, Asian and other ethnic minority communities.

The process of deliberation and dialogue brought into focus the needs of such citizens. It highlighted the importance of scientists and practitioners listening, but also the need to use a common language so as not to confuse members of the community. The project highlighted the need to engage marginalised communities more directly in research to better harness their local knowledge, but also to better respond to, and develop practical solutions to, the challenges they face (Eames et al., 2008).

Recruiting participants overcomes nearly all the barriers we have discussed, as in this way one can ensure diversity (or representativeness of which ever group is desired). For instance, RCUK, aware of these concerns, has recruited participants for all their recent dialogues. Additionally, social media can be utilised better. Web 2.0 technologies such as wikis, blogs, social networks and social bookmarking have come to support a vocal and connected society and have significantly increased the opportunities for professional engagement and collaboration (see Carlile, 2011). Concerns about engaging marginalised groups can be addressed by supporting participants to engage effectively, discussed next.

4.6 Supporting the public to engage

As power asymmetries may be apparent among stakeholders, based on information and knowledge, economic strength and resources, political power, negotiation skills or simply motivation and the capacity to take the initiative, the 'weakest' participants or stakeholders may require **capacity development** (Habibie et al., 2002). Often, members of the public may simply need information and training to inform their engagement. Sciencewise (2008i) argues that, if the public receives clear information, they will have few problems understanding and digesting complex science. For instance, information on the different types of human animal embryos provided by the HFEA helped ensure

issues were understood (ibid., 2008d). Scientists who drew diagrams and explained science in lay terms were highly regarded (ibid., 2008f). Translating complex science into understandable concepts and ensuring a degree of flexibility in the programme also increased trust in the process (ibid., 2008e).

The NEG findings suggest that the highly complex nature of nanotechnologies and the high degree of uncertainty about their development made it highly challenging to create public engagement processes that were satisfactory for all parties. Getting the public to engage with scientists and policy-makers on the latter's terms required a high level of support and information. However, letting the public lead discussions would probably have alienated scientists and policy-makers unless they had a high degree of interpretation and analysis.

Care needs to be taken in providing sufficient information to inform public engagement without biasing the process or marginalising deliberations. Participants at the RCUK-sponsored dialogue on energy suggested they wanted more information in advance that was directly relevant to the discussions, including simple handouts they could refer to throughout the event. At the same time, participants felt they had too much information to absorb and use during the deliberations, leaving less time for deliberative discussion. Further, organisers of the RCUK dialogue on nanotechnology, in preparing stimulus material, rejected the creation of different 'futures' in favour of narrower science-centred framing summarising the main types of nanotechnology research and the role of RCUK, as the former conveyed potentially negative messages. However, in sciencehorizons, cartoons were used to illustrate alternative futures, which did not imply they were 'set in stone', allowing open discussion.

Many of the nanotechnology projects allocated considerable time for participants to understand the process and the topic and to get to know each other before deliberations with scientists started. The additional time and support provided resulted in discussions of high quality with useful contributions, as evidenced by participant comments (Gavelin et al., 2007).

The use of appropriate **language** can play an important role in promoting effective public engagement. LA21 initiatives found that the abstract language of sustainable development and a focus on global environmental concerns appeared to hinder rather than help with the engagement of deprived communities. This led to a shift in the language used to communicate and discuss LA21, from sustainable development to 'Quality of Life – Now and for the Future' (Tomei et al., 2006).

Members of the public may not necessarily possess a well-developed **negotiation culture** or practice when they enter the arena. Dialogue projects in New Zealand often started with the assumption that the science community might be unfamiliar with skills such as active listening, but it became apparent that communities were often equally unprepared for mutual and respectful exchanges. In such cases, negotiation, including listening, skills need to be learnt over time, and the weakest participants may need special support to help them negotiate in their best interests (Habibie et al., 2002).

The **internet** is often seen as a key tool to connect and engage with the public. For example WaterEngage is an internet-based global demonstration project on public engagement. Beyond informing, the portal increases users' awareness by providing access to discussion forms and space for individuals and groups to upload or link to their own projects. However, poor connectivity infrastructure, low levels of computer ownership and the cost of bandwidth have all limited access to the online platform in developing countries (Cohen et al., 2008).

Communities may often need **logistical and financial support** to engage effectively. Maori groups involved in dialogue projects in New Zealand were often expected to fit into the schedules of scientists and to provide their time, information and resources, often for little or no remuneration, which had the potential to derail projects (Tanner and Skipper, 2004, in Winstanley et al., 2005). Similarly, women from minority ethnic backgrounds in the UK required English lessons, child care, culturally appropriate food and seating arrangements, door-to-door transport for meetings at night and publicity leaflets in different languages (Listen Hear, 2000, in Eames et al., 2008).

Building **trust** between communities, scientists and institutions can help break down barriers and foster effective engagement. drugsfutures in the UK highlights that building and maintaining trust was very important in encouraging people to engage fully (Sciencewise, 2008c). Similarly, community x-change found creating a constructive and mutually respective atmosphere created a safe environment in which citizens (and scientists) could discover a common language. sciencehorizons was designed to ensure that findings could potentially influence future policy choices and hence built trust in the process. Habibie et al. (2002) argue that one 'cannot overemphasise the role trust plays in allowing heterogeneous actors who do not necessarily know each other initially, to work together over extended periods of time'. Moreover, 'it has to be built up gradually and achieving trust is the consequence of each partner being open about their values and interests and also of perceiving consistency in and hence respecting other actors' values and actions'.

In Islington, North London, researchers and practitioners working on the SuScit project built trust with local citizens by working closely with them, finding a common language and valuing their knowledge and expertise to maximise their value from the project. Building trust and working in partnership meant it was important to involve the local community at an early stage in developing shared goals for the research (Eames et al., 2008). In New Zealand, trust had been eroded through past experiences of Maori groups being told about proposals rather than being engaged actively during their planning. Breaking down negative preconceptions and intergenerational stereotypes was key in building dialogue between Maori and scientists. In an evaluation of these dialogue initiatives, Winstanley et al. (2005) suggest a number of strategies for promoting good dialogue and building trust (Box 4).

Box 4: Promoting 'good' dialogue in New Zealand

Factors that promoted good dialogue in projects funded by the New Zealand Ministry of Science, Research and Technology included:

- Making people feel welcome;
- Providing a safe space/place where interactions are not bound by the usual organisational or individual constraints;
- Getting participants to listen without interruption to other points of view which may challenge their assumptions and points of view;
- Getting participants to work on shared understandings;
- Giving dialogue a structure – this can entail listening, reflecting and communicating what has been learnt to a wider audience;
- Ensuring dialogue is set at a level at which all those participating can contribute meaningfully;
- Ensuring dialogue is designed within a continuum of engagement over an issue;
- Ensuring dialogue is appropriate considering the state of relationships between people at the time.

Source: Winstanley et al. (2005).

Developing and sustaining a **rapport** with participants can help build trust. The following passage from a study on using participatory action research to improve food security among livestock farmers in Indonesia illustrates how this was achieved in a Southern community context (Habibie et al., 2002):

> 'The research team began by developing a rapport with the farmers of the village, this being achieved through formal and informal meetings during village visits. A detailed knowledge of seasonal village activity was unfolded, revealing the time constraints and availability of villagers. Through social learning activities, such as group discussions and workshops, the people's participation was encouraged and fostered. A learning group was formed at this stage, to act as a forum for the community to discuss issues, such as those related to their fodder management. This learning group was representative of the community, and members acted as co-learners in the whole research process. It was made up of seven farmers, all male and all recognised leaders, who volunteered for this role and agreed to be committed to the research project, particularly by allocating time to attend meetings and promote discussion amongst the wider community. Regular weekly meetings were held between the PAR team and the learning group [...] A second group was also formed – the discussion group. This was open to anyone from the village, and was called upon whenever a particular topic emerged which needed to be fully discussed with the broader stakeholder community. In all six meetings of this group were held during the course of the PAR. The function of this group was to test ideas, engage with local

> knowledge about these ideas, and generate acceptable action plans to implement. Both men and women participated in this group, although men were in the majority.'

Often, participants will know the benefits, risks and/or application of certain technologies, and facilitating them to develop and apply solutions may be more relevant than, say, education and motivation (ibid.):

> 'Farmers already knew about the benefits of fodder; they became interested in the technology when information appropriate to their local conditions, such as species of fodder grass and trees that were suitable, and the appropriateness of their land, was unfolded through their participation. The use of PAR as the methodology for this study enabled the people to use their limited resources to improve their own situation.'

Maintaining the integrity of participants and the engagement process is also important to achieve good dialogue. This means providing participants with some **control** over setting the research agenda and process. For Maori people, the research process had to be a mutual exchange where science had the chance to be utilised and debated fully. However, actively engaging the Maori community and ensuring the integrity and effectiveness of the process was challenging.

Control over the process may mean having the funds to establish small-scale initiatives or the power to convene fora that could feed into broad engagement processes. However, this has rarely been available. For example, SuScit's limited resources available to residents and local community organisations limited their ability to participate in research initiatives from which they might benefit, or to which they might make a particular contribution. Funding modes and criteria were often not suited to facilitating effective community involvement – community participants or organisations were often not eligible to receive funding from research grants, whereas large consortia bids often found it challenging to link up effectively with locally grounded, small-scale initiatives.

In a review of action research projects in agriculture and rural development in a number of African countries, where participation of community actors takes centre stage, Halberg and Larsen (2002) find that control of the research process remained with the university people who provided the funds. Scientists needed to change their role from that of leader to one of facilitator, supporting farmers, from prioritising their needs through to developing solutions, implementation and learning.

Some communities state they have been 'consulted to death' (Wakeford and Hale, 2004). In New Zealand, one project team working on a dialogue project was advised that Maori communities would be reluctant to participate owing to consultation burnout and fatigue (Winstanley et al., 2005). In these cases, it is important to make it worth their while – ensure the process is instilled with a **sense of purpose** with decision-makers seen to act on receipt of findings.

Experts may have to **adapt to the cultural norms** of the communities with whom they are engaging. In Dialogue projects in New Zealand, project teams invested energy and time in learning about adapting to Maori customs and practices. For instance, they used Marae (a sacred place which serves both religious and social purposes) as a dialogue venue and tikanga Maori ('The Maori way of doing things') as a basis for engagement methodologies. While most science research institutions in New Zealand remain unfamiliar with these customs and practices, these can enable them to step out of their traditional roles and break historical patterns of behaviour. Researchers who lack understanding of local customs and practices can find it frustratingly difficult to include local community components and people in their research and engagement projects. These issues all have implications for scientists' capacity to engage.

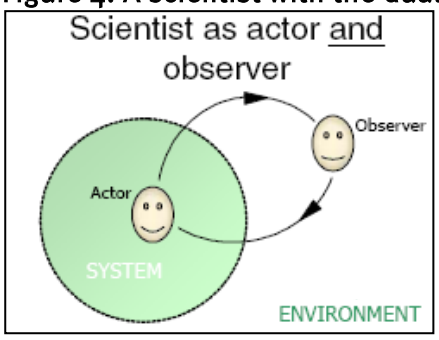
4.7 Supporting scientists to engage

Since the 1990s, there has been increasing pressure on scientists to engage with the public (Sciencewise, 2008a). But scientists who have engaged have not always been clear what their roles have been in public engagement processes. Their attitudes towards two-way public engagement are

often influenced by negative stereotypes about the public's understanding of and attitudes to science. Hence, they see engagement as an opportunity to educate, teach or inform the public about their work, rather than as a form of joint exploration of the public and policy dimensions of S&T. This has often frustrated project organisers, who have built engagement processes on the assumption that scientists will listen to the views of members of the public and will learn from them, with expectations that, through the process, they will become more self-reflective and develop their skills and abilities to engage with the public. Scientists, though, have often found it difficult to understand what engaging in dialogue entails. The NEG suggests that, for dialogue to add value to discourses in S&T, participating scientists must have an **effective brief** and be supported on the role they are expected to play; organisers must be transparent about any expectations they have of scientists (Gavelin et al., 2007). Further, scientists, like the public, may need information to inform their engagement, with information tailored to their different knowledge base (Sciencewise, 2008h).

Where scientists engage with the public in their research, they can be seen as both participant and observer. Drawing parallels with action research approaches in agriculture in DS, taking this approach means scientists are no longer perceived as neutral and objective observers, but take on an active role and admit to be part of a (value-based) decision-making process within the system (Figure 4). **Changing roles** – moving from 'doing research for development' to 'doing research as development' – requires skill, experience and intuition (Halberg and Larsen, 2002).

Figure 4: A scientist with the dual role of participant and observer



Source: Adapted from Alroe and Kristensen (2002) in Halberg and Larsen (2002).

When there are power asymmetries, as discussed earlier, scientists will often have to **take a back seat,** or disempower themselves. Experience has shown that adapting to such an approach takes time. In Costa Rica, researchers had to learn to take a back seat when the process was uneasy – focusing on listening – which eventually allowed some farmers to propose an alternative vision for moving forward with the partnership. Taking a holistic or system-oriented approach, which places citizens at the centre of the research process, means learning new roles and functions, such as negotiation or facilitation. Scientists need to find a balance between conducting quality research and engaging the community.

Stilgoe (2007) argues that, while Nanodialogues provided opportunities for scientists to engage with the public, these tended to be 'manufactured'. That is, engagement was contracted out to think-tanks and consultants. If public engagement is to become normal practice, scientists have to have the **facilitation** skills and be comfortable talking about the wider social and ethical context of their work.

It is unclear the extent to which scientists working on engagement or dialogue have received **support from respective institutions.** In New Zealand, project teams from universities observed little direct support for their work, but commented on the value of the perceived neutrality of the organisation as beneficial in working on controversial issues. Universities were well placed to work on dialogue owing to the wide range of expertise and differing values within a cross disciplinary institution. In contrast, state-backed research institutes saw their projects as an opportunity to 'upskill' the organisation and to extend existing relationships with, for instance, civil society.

Public engagement still tends to play a marginal role in scientists' work. A 2006 survey of scientists by the Royal Society reported that almost half would like to spend more time engaging with the public, but

needed to be **better equipped:** many scientists involved in, for instance, the nanotechnology engagement projects, who wished to engage in more deliberative and two-way forms of dialogue, faced institutional constraints, such as lack of time, support, resources and incentives. Eames et al. (2008), for instance, argue for greater recognition of outputs other than those published in peer-reviewed journals. Most scientists have not been trained to engage with non-specialists such as the public and media. Barriers also included a narrow view of what counts as scientific evidence. Further, in many science institutions, public engagement is not a priority, and it can be difficult for researchers to convince their employers that it is worth investing in.

In a workshop held by the NEG in 2006, participants called for formal recognition of engagement with the public, funding bodies to stress the need for dialogue-focused public engagement alongside one-way engagement approaches such as public lectures and a change in institutional culture in universities and funding bodies to encourage and recognise the value of public input in research and development. In addition, the Royal Society's report on factors that affect scientists' involvement in public engagement makes demands for more specialist training and other forms of practical support, such as mentoring, for scientists taking part in public engagement.

In the UK, changes are beginning to take place, with research councils and institutions taking measures such as the establishment of departments devoted to the promotion and improvement of public engagement and the creation of advisory panels. The Higher Education Funding Council for England has stated it will, alongside the research councils, invest £8 million pounds to enable a number of universities to become beacons for public engagement. Further, Funders of Research in the UK has established the Concordat for Engaging the Public with Research, which outlines the expectations and responsibilities of research funders with respect to public engagement, to help embed public engagement in universities and research institutes.[5] The NEG report, however, argues that institutions need to go beyond formal commitments and build **deeper public engagement capacity** among individual scientists and in science institutions (Gavelin et al., 2007), something the Beacons Project (comprising six university-based collaborative centres working to support, recognise, reward and build capacity for public engagement) have been doing with demonstrable success.

Finally, Winstanley et al. (2005) raise the issue of scientists engaging in public engagement as either individuals or representatives of the organisation for which they work, which in turn is related to issues of **accountability and transparency.** One of the teams working on dialogue projects in New Zealand maintained the anonymity of scientists who participated in their project. However, GE scientists who participated in another project could interact with anti-GE activists as individuals and not as representatives of their research institutes or universities. This separation of scientists from their institutional context was enabled by ways in which the projects structured dialogue. Dialogue projects led by research institutes (and not universities) were more likely to involve scientists identified as themselves and held accountable as members of their institutions. Only one of the four projects built ongoing relationships around a particular issue (waste water management) and involved scientists held accountable for the impact of their scientific work.

4.8 Working with public institutions

Scoones and Thompson (2003) suggest that many participatory public engagement processes (which are intended to influence policy) are often seen as one-off events set up by concerned groups, but without any explicit linkage to other political or policy processes. Developing links between deliberative processes and more formal arenas such as representative politics, bureaucratic processes of policy-making or the legal system is hence crucial. Two examples illustrate types of linkages:

- *Izwi ne Tarisiro* (translated from Shona as 'Voice and Vision') comprised a citizens' jury in Zimbabwe on food and farming futures, linked to government in two ways. First, the convening

[5] See www.rcuk.ac.uk/per/Pages/Concordat.aspx.

partners included a government agency; second, the oversight panel comprised the deputy director and the former head of policy from the Ministry of Land and Agriculture (Rusike, 2005).

- Community x-change invited policy-makers to a 'shaping change' workshop before the x-change event. They were invited to contribute to the x-change workshops and also to the BA Festival of Science to view the video report (Sciencewise, 2008a).

Sciencewise case studies suggest that relevant government departments and/or key policy-makers are identified at the beginning, inputs are secured from them on the questions they want answered and results are written in a way that feeds easily into policy-making processes (Sciencewise, 2008b; 2008j).

How the findings of a public engagement exercise are received, and the extent to which they are incorporated into decision-making, depend largely on the culture and capacity of the institutions they seek to influence. Action researcher Nick Hildyard suggests several potential cultural constraints within public institutions:[6]

> 'The first thing that agencies serious about participation and pluralism might do is not to reach for the latest handbook on participatory techniques, but put their house in order, to consider how their internal hierarchies, training techniques and office cultures discourage receptivity, flexibility, patience, open mindedness, non-defensiveness, humour, curiosity and respect for the opinions of others.'

Many argue that public institutions should be involved more directly in engagement processes. The NEG report suggests that most external contractors or independent practitioners undertook Nanodialogue processes at arms' length. Staff from decision-making institutions frequently lacked the time and resources to connect effectively with public engagement processes, and often found final recommendations and project reports sufficient. However, outputs often failed to capture the richness of deliberations and placed excessive pressure on the process to deliver recommendations that did not reflect accurately participants' views. This had the potential to undermine the quality of deliberations, and in turn limited the ability of those from public institutions to participate in and respond effectively to public engagement activities. The NEG suggests decision-makers would benefit from taking part in a similar capacity to that of the scientists; that is by listening to members of the public, engaging in dialogue and offering their own perspectives on issues discussed (Gavelin et al., 2007). Their attendance can communicate a commitment to considering the end results and provide validity to the process (Sciencewise, 2008c).

Stilgoe (2007) agrees and argues it is not enough for public institutions to encourage the public and scientists to talk to each other. The institutions themselves, he goes, must 'throw themselves into the mix' and join the project of thinking through the lessons of engagement. Despite his criticisms of it, Stilgoe suggests the FSA is one example of an organisation that not only supports public engagement, but also ties it to the live policy and scientific debates in which it is involved. By contrast, the Office of Science and Innovation (OSI, now the Government Office of Science GOScience), despite being the Nanotechnology project's lead funder, showed little enthusiasm for exploring how public engagement processes might connect to its own policy-making and institutional reflection on nanotechnology, or what might be learnt from this domain and applied to wider debates in science and society. Many staff lack the skills and experience to engage effectively with the public, so training, coaching and action learning networks, as for scientists, would be useful. In part this is because the FSA is dealing with issues critical to public health. If anything goes wrong with food safety they will come under severe fire from politicians, the public and the media. On the other hand, GOScience does not. So, there are good substantive reasons for the FSA to engage with the public which is why they do it so much and so well. In contrast there are few incentives for GOScience to engage on nanotechnologies as the risk of not doing so is lower.

[6] See http://practicalaction.org.uk/home/democratising_technology_5.

4.9 Combining expert and citizen knowledge

So far, this review has alluded to the tensions between citizens and experts. This section focuses on the knowledge produced by both groups and how this might be combined. There is significant debate around the merits and drawbacks of community-inspired or indigenous knowledge versus expert analysis. While some see the incorporation of citizen knowledge into analyses as diluting scientific knowledge and subsequently eroding its credibility and instrumental value (Jones et al., 2008), others place citizen involvement alongside expert assessments, seeing it as important but different, and, if incorporated in the right way, capable of providing a more informed picture (see Bentley 2001). Rusike (2005) suggests that views and facts are highly contested, and that simple arbitration on what is right or wrong is impossible. He suggests the process of deliberation, whereby alternative framings and understandings are pursued, becomes key. Diverse views, not just those of mainstream science, must be accepted as legitimate and authentic.

In the Wellcome Trust-funded Kidney Gap project, by balancing a range of specialist and citizen perspectives, a deliberative mapping tool helped promote more productive discussions about technical policy decisions. Manzini (2003), in Jones et al. (2008), suggests that failure to effectively combine scientific and local knowledge with a cultural frame has contributed to the poor implementation of development projects. For instance, UK Medical Research Council- (MRC-) funded trials in The Gambia were interpreted as feeding an 'economy of blood', despite plans to integrate the project into the community. Local communities' anxiety about the project was rooted in their culture, which the MRC had (wrongly) dismissed as a culture of 'the occult' (ibid.).

Geographical Information Systems for Participation (GIS-P) can usefully combine expert and local knowledge. In Namaqualand, South Africa, information on water quality produced by a hydrological surveyor using GIS-P was combined with that from the local community. Combining and overlaying different datasets enhanced the understanding of both the local community and the surveyor. For example, citizens' maps indicated far more water points than the outside agency had identified, as well as the use to which the water was being put – information that was largely unknown to the surveyor. Meanwhile, data on water quality were useful to local communities (Forrester and Cinderby, 2005).

By highlighting where contamination was lowest, use of wells for human consumption could be reassessed and the case for better water supplies could be made more powerfully. Combining multiple viewpoints on the same issue, including those of local communities and those of outside agencies, using visual means, helped democratise decision-making processes. It also provides better insights into the social aspects of management and resource use, enhances science citizenship and promotes more responsible and effective governance (Forrester and Cinderby, 2005).

One key issue relates to intellectual property. The use of community knowledge in science research has the potential to generate tensions and stifle effective dialogue. The extent to which this will be a problem depends on the topic being dealt with and the level of trust between researchers and participants. In New Zealand, the Maori demand their knowledge is protected from use or abuse without consent or benefit. Establishing clear protocols for addressing these issues at the outset of any research project where this may be an issue is essential.

Setting clear boundaries and negotiating parameters is vital in highly sensitive research areas, and skill is needed to understand, and navigate, the politics (Winstanley et al., 2005). The mistrust and anxiety expressed by indigenous peoples globally about the misappropriation of their knowledge is well documented (ibid.). Furthermore, community participants may not be willing to share knowledge for political reasons or because of a lack of trust. They may not know that their knowledge is relevant or, worse still, local knowledge may have been lost. One researcher working on the Dialogue Fund project in New Zealand said, the 'Maori seem to be very protective of their culture and at times I felt they were hesitant about giving too much away' (ibid.). Effective communication can often overcome these obstacles.

4.10 Communicating with participants

Eames et al., (2008), evaluating SuScit, suggest engagement processes need to be clear and open about their purpose and limitations, to avoid unclear expectations for all parties involved. For example, the NEG's research found that members of the public expected findings to be used to inform nanotechnology policy, while decision-makers assumed that public engagement would be aligned with their policy needs (Gavelin et al., 2007). However, there was little evidence that findings were used, while organisers designed engagement processes to meet not only policy objectives but also practical (testing engagement methods) and social research (exploring public opinion) objectives (ibid.).

The gap between explicitly stated objectives and participants' subsequent expectations highlights the need to make clear the intentions of the dialogue, who is listening to the discussion and where the results will go (Sciencewise, 2008f). Understandably, dialogue was more likely to provide insights into questions that need to be addressed rather than straightforward answers (ibid.). For instance, drugsfutures spent time at the start of each dialogue event explaining who was involved in the project, why and how participants views' would be used, which was crucial in gaining people's confidence (and trust) in the process (ibid., 2008c). Managing expectations may also involve acknowledging tensions, prioritising objectives and making clear that, in light of the often complex nature of policy-making, single dialogue events are unlikely to have substantive influence on decision-making.

Limited by their short duration and experimental nature, dialogue projects in New Zealand found it challenging to manage expectations among Maori groups, which would engage only in dialogue that resulted in action and mutual benefits. Subsequently, organisers shifted from a focus on outcomes and convincing others of their views to one on process and learning how to communicate more effectively with those with different views. Thus, expectations need to be carefully managed, not just at the start but throughout the process. The HFEA dialogue made a conscious effort to create transparency at every stage to minimise misinterpretation (Sciencewise, 2008d). Gathering and sharing information at all stages of the process can aid this and facilitate informed public decision-making, as with the SuScit project. Additionally, Warburton (2008a) suggests that early and full feedback to participants helps build support for the process, and trust in engagement processes more generally. It also provides permanent documentary evidence of the public's contribution (ibid., 2008c).

4.11 Promoting wider uptake

Benefits should not be limited to those directly involved (Gavelin et al., 2007). Organisers should do more to distribute widely the learning from what are often small-scale deliberative processes. Doing so can help contribute to wider cultural change in how social dimensions of S&T are addressed among scientists, policy-makers and members of the public.

This can be done through direct involvement of more people in public engagement activities[7] and/or communicating the outcomes and findings to more people. The NEG suggests more needs to be done through work with media partners, use of online tools and greater efforts to distribute printed reports to diverse audiences. Such communication strategies should focus on involving those who took part in deliberations rather than just the final outputs. Face-to-face models, online debates and broadcasting options need to be explored to involve more people in public deliberations (Gavelin et al., 2007). Examples from the Sciencewise case studies include the following:

- The final report of the NEG was launched at a workshop for scientists, project organisers, public participants, NGOs and policy-makers at London's Institute of Physics (Sciencewise, 2008g).

[7] As suggested earlier, dialogue does not have to be about reaching large numbers, as this can limit the depth of discussion.

- Demos found that producing a pamphlet summarising all the experiments was a useful way of encapsulating the learning and moving the debate forward. The pamphlet, which was written for a broad audience, assessed what had worked, what could be improved and what was important in delivering transparency for all participants (Sciencewise, 2008f).
- Trustguide submitted a report to a House of Lords Select Committee on personal internet security and a House of Lords Constitution Committee on the impact of surveillance and data collection (Sciencewise, 2008j).
- Hewlett Packard and British Telecom project managers spoke at key events in the UK, including the Cabinet Office's 2006 touring road show on information assurance (Sciencewise, 2008j).

In addition, experts published papers in relevant journals and posted findings on websites. The organisers of drugsfutures found it difficult to sell its dialogue to the national media but did find the local media willing to provide exposure and raise awareness of events (Sciencewise, 2008c).

4.12 Human resources for engagement

4.12.1 Process-oriented skills

A change of approach to conducting research requires a similar change in the involvement of research expertise (Halberg and Larsen, 2002). Hence, existing science teams wishing to engage on an ongoing basis will most probably need to bring new skills to the team. Although scientists can build their own capacity in facilitation and dialogue, they cannot replace skilled and independent facilitators, regardless of the topic discussed or the setting of the dialogue. Most, if not all, projects require facilitation and conflict management expertise and those with a background in the social sciences.

Skilful, structured, sensitive and independent facilitation of dialogue events is required to create space for conversations among a wide range of participants on often controversial S&T issues. This was achieved to some extent in a dialogue on energy research, where participants commented on the ability of facilitators to make the public feel relaxed and able to express their views in a safe environment (Warburton, 2008b). In addition, good science communicators were often required who could explain complex science clearly to a public audience (Sciencewise, 2008e). Facilitators and communicators needed to prepare carefully and show willingness to embrace diversity in culture and outlook (Sciencewise, 2008a).

The dialogue projects in New Zealand were designed in part to suit the existing capacities of the project team, as well as bringing in 'outside help' that could be accessed relatively easily, through external networks and working relationships built prior to the Dialogue Fund projects. All projects in New Zealand relied heavily on and helped extend existing networks. Project teams built on existing relationships, especially when recruiting facilitators, finding venues for events and/or inviting participation in the project. Outside help external to the core team (and often to the organisation) generally came in the form of those with specific facilitation skills. For example, a dialogue project on wastewater management systems that address Maori cultural and spiritual values brought in an expert in communicating science to a non-science audience and an independent evaluator with Maori origins.

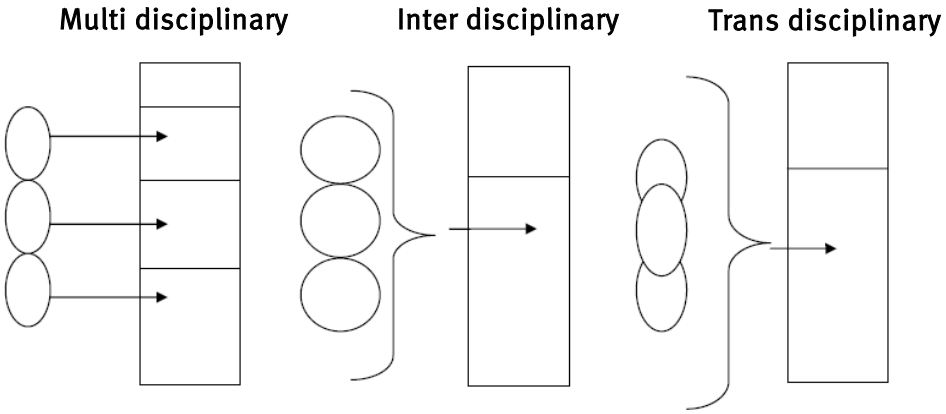
However, skilled facilitators with little or no knowledge of the issues at hand can negatively affect the quality and credibility of the process. For example, while some facilitators working with the dialogue on energy research in the UK were excellent, others lacked the full set of skills to, for instance, focus the small group discussions clearly (Warburton, 2008b). Further, the methods used in the PCDB was criticised for being run wholly by a market research and opinion poll organisations – MORI – rather than by practitioners with any experience of action research or participatory techniques. The complexity of a research theme may require a facilitator to have both process and content expertise, as was the case in New Zealand. In such circumstances, independent and generic facilitation skills may need to be traded off against knowledge of the issues being discussed.

4.12.2 Social science expertise

As public engagement is often seen to focus on S&T's social dimensions, there has been an increasing tendency to draw on social science expertise. However, many authors advise against bringing in social scientists at the end of large-scale projects. Conversations about involving the public in developing projects should take place from the start and need not be the field of social scientists alone. Several sources (such as Winstanley et al., 2005), highlight the danger of seeing dialogue as the responsibility of social scientists rather than (natural and physical) scientists. In fact, both may need to draw on the services of good communicators and facilitators as they work together and with diverse stakeholders. In Eames et al. (2008)'s work, the authors suggest that, although the social dimension of sustainability was rated highly, this should not be equated with social scientific research: (natural) science had a vital contribution to make in developing the interdisciplinary, solution-oriented research necessary to address key issues. Stilgoe (2007) suggests that social research works best as part of an ongoing cross-disciplinary conversation with science. This was shown to an extent in the Nanodialogues project, in which scientists and social scientists worked closely as partners and co-researchers. One might also argue that social science needs to engage with the public as much as with S&T. As such, social science is not just a bridge between science and society but can be seen as 'part of science'.

When scientists and social scientists (from a wide range of disciplines) and specialist facilitators work together on engagement projects, questions regarding cross-disciplinary working or collaboration are raised. Halberg and Larsen (2002) distinguish three different levels of collaboration: multi-disciplinary, inter-disciplinary and trans-disciplinary. In a multi-disciplinary team, researchers work in parallel or sequentially from a disciplinary-specific base to address common problems. In an inter-disciplinary team, researchers work jointly but still from a disciplinary-specific basis to address common problems.

Figure 5: Level of integration in cross-disciplinary work



Source: Halberg and Larsen (2002).

In a trans-disciplinary team, however, researchers work jointly using a shared conceptual framework drawing together disciplinary-specific theories, concepts and approaches to address a common problem (see Figure 5). Considerable resources are required for trans-disciplinary work, as scientists require time to agree on a common methodology and to coordinate data recording and analysis, which means challenges both within and outside the team (Halberg and Larsen, 2002). In a review of action research projects in four African countries, teams found it difficult to establish and maintain cross-disciplinary research projects, for a number of reasons, some of which related to researcher attitudes and traditions and others to funding mechanisms (ibid.). Good leadership and negotiation among researchers then becomes key.

In one project reviewed by Halberg and Larsen (2002), the data-recording phase used a degree of cross-disciplinary work, by coordinating the schedules so socio-economists and natural scientists were present in the villages in the same weeks and had daily discussions on methods and results. Attempts to combine socioeconomic/anthropological with biological/soil science perspectives resulted in synergies around contextualisation of the problem and the fine-tuning of further investigations (ibid.).

The project also highlighted the need for clear agreements regarding communication between different participants and stakeholders regarding language, responsibility and time.

4.13 Managing public engagement projects

The democratisation of science through public engagement comes at a price. Participatory processes, if undertaken appropriately, are time-, energy- and resource-intensive. In the SuScit project, building effective partnerships with local communities required significant upfront investment in time and resources to establish contacts and to build trust and relationships (Eames et al., 2008). Winstanley et al. (2005) argue that dialogue is part of relationship-building and begins before any 'event' and continues afterwards. Dialogue events are, then, part of a longer process. This was illustrated in New Zealand, where teams working on dialogue projects felt a responsibility, having initiated events, to further the interests of new relationships and networks that had evolved. The time taken to build the relationships required was thus considerably more than anticipated.

Moreover, projects can be delayed by unexpected events. In one case, a project team had to resolve difficulties in its own internal communication and networks before it could build a platform for dialogue with an external group. Nanodialogues, the NEG and sciencehorizons all required more time – to prepare, to develop the project, to analyse and interpret and reflect on findings (Sciencewise, 2008f; Sciencewise, 2008g; Sciencewise, 2008h).

Chilvers (2006) describes the 'backstage' negotiations involving sponsors, organisers, facilitators and advisors, which were crucial in constructing who or what was to be included and excluded, with major implications for the process as a whole. Both the content and the process for dialogue events need to be thought through. X-change found it tried to cover too much and some of the material was confusing (Sciencewise, 2008a). Some projects had difficulty overcoming the social barriers between participating groups, demonstrating that mutual understanding did not develop automatically, but took considerable time and planning by organisers and facilitators (Gavelin et al., 2007).

Meanwhile, many projects produce a large amount of data. For instance, the stem cell dialogue produced over 160 hours of conversations to examine in depth. The project used an innovative combination of methods to capture data, but this was time-intensive. The case study on this project suggests that finding a more efficient means to link analytical rigour with the wider contextual analysis of the data will be key for future work (Sciencewise, 2008i).

Moreover, debate among the various actors during the planning phase highlighted the need to give thought to the relationships between the various actors involved in the planning phase. Chilvers (2006) suggests that all parties could have agreed on a process for designing the process or a terms of reference in advance. The dialogue project on energy research established an advisory group which included some key decision-makers, to help link the design and desired outcomes. So too did the HFEA, which helped ensure materials developed for the public were independent and balanced. However, development of a terms of reference could have addressed the lack of clarity of the group's functions (Sciencewise, 2008d). The 'messy' nature of engagement projects places more emphasis on monitoring and learning from the process.

In sum, effective deliberation is time-, energy- and resource-intensive. Drawing on intentions above, if public engagement is seen as purely an instrumental process then it is unlikely to be undertaken as the costs will be too high. If it is seen as normatively a good thing to do then one may not be sufficiently critical about how it can be done as efficiently as possible. And if public engagement is done for substantive reasons one is more likely to be realistic about balancing the costs and benefits.

Clear processes for planning, along with clearly outlined roles and responsibilities of different actors, facilitate an efficient management process. Advisory groups made up of different actors ensure that the

process and content are informed by a wide range of perspectives. And thought needs to be invested in deciding how to collect and analyse what is often a huge amount of data from deliberations.

4.14 Monitoring, learning and evaluation

Habibie et al. (2002) argue that participatory processes are non-linear and unpredictable in their trajectory over time. Throughout the life of the project, 'objectives may change, stakeholders will come and go, while roles and rules evolve according to the specific phase, the learning that is taking place and changing opportunities' (ibid.). Hence, the complexity of the system in which engagement takes place and the shifting relations between the context, participants and process require a high degree of flexibility that is informed by continuous monitoring and learning. This, in turn, requires the establishment of appropriate communication and knowledge management systems to respond to needs internal to the project team and stakeholders as well as to interact with the outside world. Questions of when, why, how and what is working need to be monitored continually by those with appropriate social engagement experience and skills (Sciencewise, 2008j; Winstanley et al., 2005).

Some engagement projects use methods that help teams reflect throughout the dialogue and not just at the end, with the integration of independent but active evaluation into the design process emerging as an important feature (Sciencewise, 2008f). In the Nanodialogues, Demos used evaluators as a valuable resource of additional reflection (and not as a way to 'tick legitimacy boxes'). x-change showed that monitoring and evaluating the process along the way helped to improve the process while there was still time (ibid., 2008a). Continuous learning also helps to manage expectations and maintain the integrity of the participants and process.

Summative evaluation is also important. A detailed review by the Canadian Health Services Research Foundation (CHSRF) finds a lack of evidence on the effectiveness of engagement mechanisms (Abelson, 2010). Some argue that the design and practice of public engagement are less rigorously reviewed than more conventional science activities. Hence, to ensure rigour and relevance, to promote learning in the science community and to increase the willingness and commitment of their institutions to undertake engagement, their efficacy and efficiency need to be evaluated through well-documented case studies, much like those in the Sciencewise online expert resource centre.[8]

Some see evaluation as the responsibility of institutions and funding bodies as opposed to the project team. In fact, the NEG suggests they need to find better ways to assess, fund, support and disseminate the results of public dialogue activities. But research institutions need urgently to put in place adequate motivations and signals for their staff and teams to evaluate engagement projects (Habibie et al., 2002). Stilgoe (2007) warns us not to overdo it – 'if we are serious about engagement becoming part of the software of science, we need to avoid strangling it with evaluation'.

4.15 Implications for funding

Winstanley et al. (2005) suggest that the management of engagement processes is often incompatible with traditional systems of project management. Science projects are usually specified in advance, with contracts outlining predefined outputs and outcomes. Project managers are responsible for delivering outputs in the most resource-efficient way. This approach is usually reflected in funders' proposal templates and pressures to publish in academic journals. However, demanding detailed descriptions of projects in advance of their implementation can limit effective participation (which assumes that participants collaborate to create something new) in the prioritisation of research questions, for instance, as these have to be stated upfront in funding proposals, which, given time constraints, do not always draw on the preferences of participants. Rigidity in project plans can also undermine the viability of a partnership and its operational capacity (Habibie et al., 2002). Halberg and Larsen (2002)

[8] www.sciencewise-erc.org.uk/cms/projects/?phpMyAdmin=oHPjaCSrPMAdIo4AYEPthe913wb.

argue that donors have a responsibility for creating the right conditions and funding mechanisms for action-oriented and cross-disciplinary research projects. Donors, hence, need to reconcile their desire for a detailed project plan with outputs and outcomes with engagement processes' need for openness and unpredictability.

Winstanley et al. (2005) also discuss the implications of engagement for funding. Since relationships, of which dialogue is a part, require time to develop, there is a need to consider how funding is apportioned and for what period of time, as well as the drivers and constraints of organisational change (if there is to be any extension of public engagement with S&T). Moreover, if funding is to remain the same, some aspects of research may need to be curtailed. Alternatively, new funding sources could be used to support the development of new facilitation and conflict management skills among project teams or the contracting of people with such skills.[9]

[9] There is a difference between engagement on a project and engagement as part of the organisation's makeup. For instance, the Food Standards Agency does the latter, many others do the former when they feel they need to. But it is part of the FSA's 'DNA' to engage, essentially (because the risk of not doing so is very great, (they could be abolished if they do not do a good job), and because the wider public has an interest in food safety issues.

5. Public engagement with science: some guiding principles

Rather than summarise the lessons discussed, we present here a set of principles based on what we have found, which can be used to guide deliberative and participatory public engagement work. Before we do so, we must acknowledge some of the other sets of principles produced to date.

Several sources provide good practice principles for effective public engagement. Eames et al. (2008) suggests bearing in mind the following factors: partnership, trust, respect, resources, inclusivity, empowerment, creativity, reflection and hospitality and community value. Lukensmeyer and Torres, in Cohen et al. (2008), adopt seven principles: educate participants, frame issues neutrally, achieve diversity, get buy-in from policy-makers, support quality deliberation, demonstrate public consensus and sustain involvement. Leshner, also in Cohen et al. (2008), gives a set of lessons for science and public engagement, including, simply, the need to listen. Box 5 is one set of principles for action inquiry used by Policy, Ethics and Life Sciences (PEALS), drawing on literature from various areas of practice, including action inquiry, PAR, extended peer review and citizen science dialogue.

Box 5: Nine principles of action inquiry aspired to by PEALS[10]

1. Participants should join those organising the process in setting terms of reference for the whole exercise and framing the questions that they will discuss.
2. The group organising, or in overall control of, the process should be broad-based, including stakeholders with different interests on the subject being discussed.
3. There should be a diversity of information sources and perspectives available to participants.
4. There should be space for the perspectives of those participants who lack specialist knowledge of the area concerned to engage in a mutually educative manner with those possessing specialist knowledge.
5. There should be complete transparency of the activities carried out within the process to those both inside and outside it.
6. Those without a voice in policy-making should be enabled to use the consultation process as a tool for positive political change. This should be embedded in the process by sufficient funds being made available for follow-up work after their initial conclusions have been reached.
7. The process should contain safeguards against decision-makers using a process to legitimise existing assumptions or policies.
8. All groups involved in the process should be given the opportunity to identify possible strategies for longer-term learning, development and change on a range of issues relating to their conclusions.
9. The group organising, or in overall control of, the process should develop an 'audit' trail through the process, to explain whether policies were changed, what was taken into account, what criteria were applied when weighing up the evidence from the process and therefore how the views of those involved in the participatory process may have made a difference. This should be explored together with all the co-inquirers.

Source: www.publicengagement.ac.uk/what/further-reading.

Involve have developed nine principles for deliberative public engagement (see Warburton, 2008a), while the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management in Australia has developed a citizen science programme based on a number of guiding principles (Tomei et al., 2006). Further, the Department for Business, Innovation and Skills has, through the Sciencewise Expert Resource Centre, developed an approach to public dialogue on S&T (Sciencewise Expert Resource Centre, n.d.). Most useful, though, is Gavelin et al. (2007) whose study of the NEG outlines a best practice framework: practical lessons for public engagement in S&T, most of which provide the headings for Section 4 of this paper.

Here, then, based on our work in earlier chapters, we present guiding principles or key issues to be considered, each with a number of questions to help practitioners plan ahead.

[10] This works well if this concerns engagement project, but not so well if it is part of the organisation's 'DNA'

Key principle	Some key questions
Benefits	What intended and unintended impacts will engagement have in the short, medium and long term, for the public, for scientists, for industry, for public institutions and for other actors?
Objectives	What are the stated objectives of engagement? Is engagement seen as normative, instrumental, substantive or a combination? What does this mean for how the costs and benefits of engagement are assessed?
Context	How will the political, institutional, socioeconomic and cultural context inform the project design, and how will implementation be affected by it?
Approach and methods	What methods will be used? What type are they – communication, consultative or participatory? At what stage of the research process will they employed? How will methods be implemented? How are they informed by the context and the stage of the research process? How comfortable are participants with the methods employed? How much control will participants have over the process?
Representation	Who will be represented in the public engagement process? How many participants will be involved? What groups or interest groups are involved? How are they identified, invited and/or recruited?
Diversity and inclusion	Will participants represent diverse voices and views? Are marginalised and socially excluded groups involved? If so, how will the project reach out to them? How will the engagement methods incorporate this?
Supporting the public	What steps will the project take to support the public to engage effectively?
Supporting scientists	What steps will scientists take to support their engagement?
Working with public institutions	What role will public institutions, such as government ministries, departments and agencies, as well as research councils and institutes, have in the process?
Communication	How often will the project team communicate with participants? How and when will the team communicate with them? How will the team manage expectations?
Combining expert and citizen knowledge	How is citizen knowledge viewed by scientists and, conversely, how is scientific expertise viewed by citizens? Are they combined during the processes; if so, why and how?
Promoting wider uptake	Will the project make any attempt to distribute learning from public engagement beyond the group that is convened? If so, how will this done?
Human resources for engagement	What is the composition of the team? Will skills be brought into the team for the project? What is the role of social scientists? To what extent is cross-disciplinary working achieved?
Managing public engagement	How will the team plan and manage the project?
Monitoring and learning	How will the project monitor and evaluate the public engagement process?
Implications for funding	How will managing engagement mesh with the management requirements set out by funders?

References

Abelson, J., Montesanti, S., Li, K., Gauvin, F. and Martin, E. (2010) 'Effective Strategies for Interactive Public Engagement in the Development of Healthcare Policies and Programs.' New Brunswick: CHSRF.

Bentley, J.W. (2001) Honduran Folk Entomology. *Current Anthropology* 42 (2): 285-301.

Brockington, D. (2002) *Fortress Conservation: The Preservation of the Mkomazi Game Reserve*, Tanzania, Oxford: James Currey.

Carlile, L. (2011) 'Development online: making the most of social media'. IIED Briefing.

Chambers, R. (1997) *Whose Reality Counts? Putting the First Last*. London: IT Publications.

Chilvers, J. (2006) 'Engaging Research Councils? An Evaluation of Nanodialogues Experiment in Upstream Public Engagement.' Independent Evaluators' Report. Birmingham: University of Birmingham.

Cohen, E.R.M., Masum, H., Berndtson, K., Saunders, V., Hadfield, T., Panjwani, D., Persad, D.L. Minhas, G.S., Daar, A.S., Singh, J.A. and Singer, P.A. (2008) 'Public Engagement on Global Health challenges.' *BMC Public Health* 8: 168.

Eames, M., Egmose Mortensen, J., Adebowale, M. and Iudicissa, I. (2008) 'Towards a Community-led Agenda for Urban Sustainability Research: Insights from the Citizens' Science for Sustainability (SuScit) Project.' London: SuScit.

Fairhead, J. and Leach, M. (1996) 'Misreading the African Landscape: Society and Ecology in a Forest-Savanna Mosaic, Cambridge: Cambridge University Press.

Fairhead, J. and Leach, M. (2000) ' Fashioned forest pasts, occluded histories? International environmental analysis in West African locales', Development and Change, 31 (1): 35-39.

Farrar, M. (2008) 'A Citizens' Inquiry into the Forensic Use of DNA and the National DNA Database.' Evaluation Report. London: Human Genetics Commission.

Forrester, J. and Cinderby, S. (2005) 'Geographic Information Systems for Participation.' In Leach et al. (2005).

Gavelin, K., Wilson, R. and Doubleday, R. (2007) 'Democratic Technologies.' Final Report of the Nanotechnology Engagement Group. London: Involve.

Genus, A. and Rogers-Hayden, T. (2005) 'Genetic Engineering in Aotearoa, New Zealand: A Case of Opening Up or Closing Down Debate?' In Leach et al. (2005).

Government Office for Science (2010) 'Sharing experience: improving engagement across SAC secretariats'. Report of a series of workshops designed to facilitate greater engagement across the Scientific Advisory Committee Community. London: GOScience.

Habibie, H., Sriskandarajah, N. and Packham, R. (2002) 'Making Best Use of Limited Resources: Using Participative Action Research to Achieve Fodder Security with Smallholder Livestock Farmers in Indonesia.' *Proceedings of the European Branch of IFSA*: 589-600.

Halberg, N. and Larsen, C.E.S. (2002) 'Participatory Development Research: Enhancing Capacity within Applied Research – Case: Livestock.' Aarhus: Faculty of Agricultural Sciences.

Holt-Giménez, E. (2006) *Campesino a Campesino: Voices from Latin America's farmer-to-farmer movement for sustainable agriculture*. Oakland, CA: Food First Books.

Jones, N., Jones, H. and Walsh, C. (2008) 'Political Science? Strengthening Science–Policy Dialogue in Developing Countries.' Working Paper 294. London: ODI.

Jones, H. (2011) 'Taking Responsibility for Complexity'. Briefing Paper 68. London: ODI

Latour, B. (1993) *We Have Never Been Modern*. Hemel Hempstead: Harvester.

Leach, M., Scoones, I. and Wynne, B. (eds.) (2005) *Science and Citizens, Globalization and the Challenge of Engagement*. London/New York: Zed Books.

Leach, M. and Scoones, I. (2005) 'Science and Citizenship in a Global Context.' In Leach et al. (2005).

Mehta, L. (1998) 'Contexts of Scarcity: The Political Ecology of Water in Kutch, India, DPhil thesis, IDS, University of Sussex, Brighton.

Overseas Development Institute (n.d.) '28 Key Questions for the RAPID Framework.' www.odi.org.uk/events/documents/386-handout-rapid-framework-questions.pdf.

Research Councils UK (2010) 'The Public Engagement Triangle.' Public Engagement Tool. http://interactive.bis.gov.uk/scienceandsociety/site/all/files/2010/10/PE-conversational-tool-Final-251010.pdf.

Rowe, G. and Frewer, L,J. (2005) 'A Typology of Public Engagement Mechanisms.' *Science, Technology and Human Values* 30(2): 251-290.

Royal Society (1985) 'The Public Understanding of Science.' Report of a Royal Society Ad Hoc Group endorsed by the Council of the Royal Society.

Royal Society (2006) 'Survey of Factors Affecting Science Communication by Scientists and Engineers.' London: PSP.

Rusike, E. (2005) 'Exploring Food and Farming Futures in Zimbabwe: A Citizens' Jury and Scenario Workshop Experiment.' In Leach et al. (2005).

Sciencewise Expert Resource Centre (n.d.) 'The Government's Approach to Public Dialogue on Science and Technology.' London: Department for Business, Innovation and Skills.

Sciencewise (2008a) 'Community X-change: Case Study.' East Anglia Pilot Phase to Discuss Climate Change Issues. London: Department for Innovation, Universities and Skills.

Sciencewise (2008v) 'Democs for Schools: Democs (Deliberative Meeting of Citizens) Is Part Card Game, Part Policymaking Tool: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008c) 'Drugsfutures: Public Consultation on the Future of Drug Use: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008d) 'HFEA: The Use of Hybrid and Chimera Embryos in Research: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008e) 'Nanodialogues: A People's Inquiry on Nanotechnology and the Environment: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008f) 'Nanodialogues: Four Experiments in Nanotechnology and Upstream Engagement: Case Study. London: Department for Innovation, Universities and Skills.

Sciencewise (2008g) 'Nanotechnology Engagement Group: Research and Coordination of Six Dialogue Projects on Nanotechnology: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008h) 'sciencehorizons: Dialogue on Future Applications of Science and Technology: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008i) 'Stem Cell Dialogue: Case Study.' London: Department for Innovation, Universities and Skills.

Sciencewise (2008j) 'Trustguide: Public Attitudes towards Trust in Information Communication Technologies (ICTs): Case Study.' London: Department for Innovation, Universities and Skills.

Scoones, I. and Thompson, J. (2003) 'Participatory Processes for Policy Change: Reflections on the Prajateerpu e-Forum.' *PLA Notes* 46: 51-61.

Stilgoe, J. (2007) *Nanodialogues: Experiments in Public Engagement with Science*. London: Demos.

Stirling, A. (2005) 'Opening Up or Closing Down? Analysis, Participation and Power in the Social Appraisal of Technology.' In Leach et al. (2005).

Tomei, J., Lucas, K. and Vanner, R. (2006) 'A Review of Tools and Techniques for Community Foresight for Sustainability.' London: SuScit.

Wakeford, T. and Hale, F. (2004) 'Generation Scotland: Towards Participatory Models of Consultation.' Newcastle: Policy Ethics and Life Sciences Research Institute, University of Newcastle.

Warburton, D. (2008a) 'Deliberative Public Engagement: Nine Principles.' London: National Consumers Council.

Warburton, D. (2008b) 'Evaluation of the Research Councils UK Public Dialogue on UK Energy Research.' Final Report. London: Shared Practice.

Whitmarsh, L., W., Kean, S., Russell, C., Peacock, M. and Haste, H. (2005) 'Connecting Science: What We Know and What We Don't Know about Science and Society.' London: British Association for the Advancement of Science.

Winstanley, A., Tipene-Matua, B., Kilvington, M., Allen, W. and du Plessis, R. (2005) 'From "Dialogue" to "Engagement"? Learning beyond Cases.' Final Report for the Ministry of Research, Science and Technology. London: Cross Case Study Learning Group.

Overseas Development Institute
111 Westminster Bridge Road
London SE1 7JD
UK

Tel: +44 (0)20 7922 0300
Fax: +44 (0)20 7922 0399
Email: publications@odi.org.uk
Website: www.odi.org.uk

ISBN 978 1 907288 54 8
Working Paper (Print) ISSN 1759 2909
ODI Working Papers (Online) ISSN 1759 2917