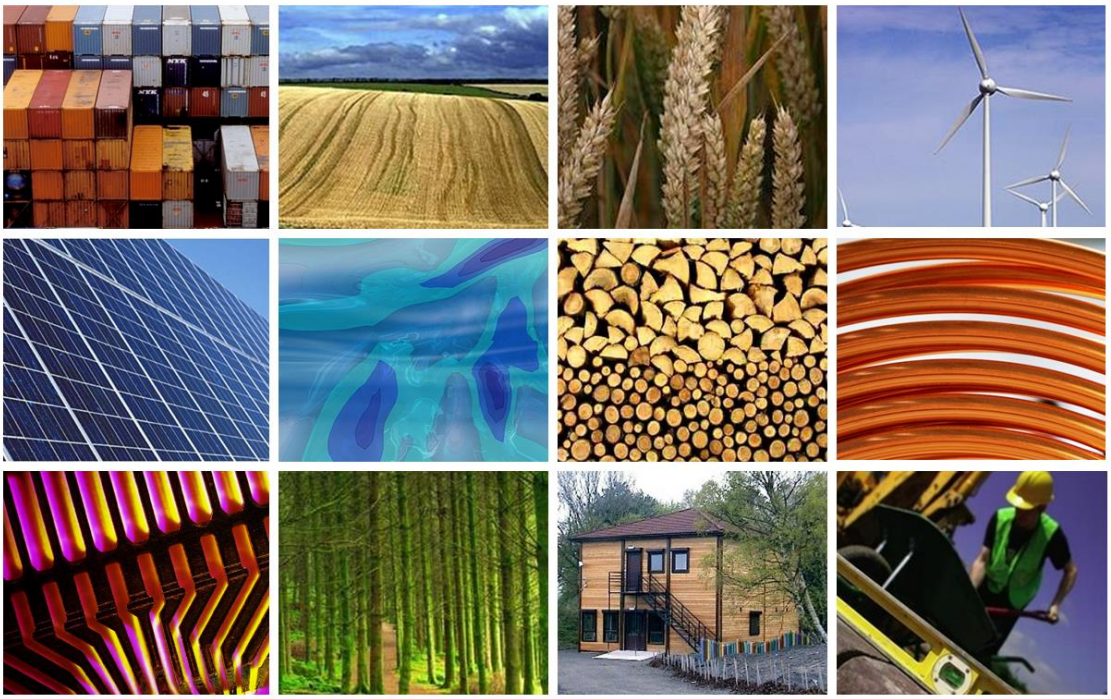
Report to Department for Environment, Food and Rural Affairs and Sciencewise

Evaluation of the Public Dialogue to understand public perceptions of specific nanotechnologies

December 2015



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Contents

Acronyms

BAMA	British Aerosol Manufacturers' Association
BASA	British Adhesives and Sealants Association
BCF	British Coatings Federation
BIS	Department for Business, Innovation and Skills
CIA	Chemical Industries Association
CTPA	Cosmetic, Toiletry and Perfumery Association
Defra	Department for Environment, Food and Rural Affairs
EEF	Engineering Employers' Federation
FDF	Food & Drink Federation
NEHIG	Nanotechnology Environment and Health Industry Group
nZVI	nano Zero-Valent Iron
REACH	Registration, Evaluation, Authorisation and restriction of CHemicals Directives

EXECUTIVE SUMMARY

This report of the independent evaluation of a public dialogue to understand public perceptions of nanotechnologies has been prepared by URSUS Consulting Ltd for the Department for Environment, Food and Rural Affairs (Defra).

The dialogue process was developed by Defra in collaboration with the Chemical Industries Association (CIA), and with support from Sciencewise[1], with the following objectives:

1) To lead a careful and intelligent exploration of public attitudes through detailed qualitative engagement to develop appropriate regulatory and government mechanisms in this field.
2) To provide an opportunity to understand public aspirations for nanotechnology.
3) To explore how the public believe that potential communications can be made relevant, targeted and transparent.
4) To ensure that an insightful and informed discussion can take place between the public with representation from government, industry and academia.

Dialogue and Evaluation Methodology

The dialogue process was delivered by OPM Group and was steered by an Advisory Group with representation from Defra, CIA, the department for Business, Innovation and Skills (BIS), the food and drink sector, academics and non-governmental organisations (NGOs). The Advisory Group was closely involved in the framing of the dialogue and ensuring that the coverage of nanotechnologies was balanced, accurate and accessible and that the public dialogue design would further understanding of the public's opinions of nanotechnologies.

The dialogue process ran from October 2014 to December 2015 and involved a stakeholder consultation event (attended by some 36 representatives of industry, government, regulators and research funders and civil society) and a series of three dialogue events with members of the public from Birmingham and the surrounding rural areas, which ran on three alternate Saturdays during February and March 2015. 40 participants reflecting the age, gender, household income and ethnicity of the Birmingham area attended all three days. Gradually over the three days participants were first introduced to generic technology and society issues, then an overview of nanotechnologies – and their associated opportunities and risks – in 12 broad areas and four specific applications. Through four case studies – paints, sunscreens, fuel additives and land remediation – participants were able to weigh the relative benefits, risks and need for further nano-specific regulation, testing and communication.

OPM Group produced a wide range of PowerPoint, printed, audio, video and role play resources. A balance of expert opinions was provided to participants through experts attending the workshops or recording talking heads video contributions. Experts included industry, academic, government and regulators and NGOs. Defra staff attended all three workshops to present project objectives, answer questions and observe.

The evaluation process ran between October 2014 and November 2015 and involved desk review, event observation, analysis of questionnaires of participants at the stakeholder workshop (36), public participants (40) and experts (9) in the dialogues. One to one interviews were held with 12 stakeholders (Advisory Group members and policy audience).

[1] Sciencewise is the UK's national centre for public dialogue for policy making involving science and technology issues, and is funded by the Department for Business, Innovation and Skills (BIS). See www.sciencewise-erc.org.uk

Key Evaluation Finding

The process design and delivery and in particular the professional and warm facilitation style and the quality and variety of stimulus materials and techniques meant that all participants enjoyed the sessions and felt they were able to make informed contributions and get their voices heard. All participants felt they had learnt a great deal about nanotechnology and were keen to hear how their opinions will inform government decision making. Given the complexity of the topic, the continuity in the five-strong facilitation team across the stakeholder event and three public events was really important in allowing them to probe and get rich material from participants.

The breadth and specificity of the framing, and a well-written and structured final dialogue report, with lots of direct quotes from participants has added to Government and industry's understanding of the public's opinions about the benefits and risks of nanotechnology in general and for the four specific applications. The overall message that emerged was that the public participants were not opposed to the use of nano materials in these applications – indeed they saw many benefits to continuing to develop and test them – but did expect that if products are on the market they are being effectively regulated and potential long term toxicology and environmental impacts monitored. Government was expected to play a central role in regulation.

Impacts

The dialogue project and report meets a long-standing request by Ministers to understand more about the public's views on nanotechnology in general and will enable decision makers in Defra and BIS to react to any likely policy decisions on nanotechnology that they are likely to face over the next few years. Specifically the report is likely to be useful in upcoming decisions on:

- The European Commission proposal on nano registers and the Registration, Evaluation, Authorisation and restriction of CHemicals (REACH) Directives (expected early 2016). The dialogue report will be part of the evidence that Government considers and submits in support of its position and will be shared with the European Commission if, as expected, it decides to launch its own public dialogue exercise.
- The 2005 moratorium on nano Zero-Valent Iron (nZVI) in land remediation. The dialogue findings on attitudes to opportunities for and risks of nano land remediation will be considered alongside emerging scientific and economic evidence and outcomes from the European NanoRem2 programme, if and when there is momentum to lift the moratorium.
- Industry expect the report to be a useful input to the wider debate on Responsible Innovation across the nanotechnology sector and feed into the new Nanotechnology Environment and Health Industry Group (NEHIG) set up in late 2015.

Costs, Benefits and Timing

For the entire public dialogue project, the total value of the contract was £105,420 of which £42,676 was provided from Sciencewise and the remainder from Defra. An in-kind contribution of £3,000 from the Chemical Industries Association was also received. This was later used to cover additional project management costs associated with wider stakeholder consultation and an extended timeframe. In-kind contributions included at least 120 days of time by the Advisory Group and the Defra project management team.

Initially conceived as a six month project, the timeframe was quickly seen as too tight, and was extended to allow for a longer scoping stage to develop stimulus materials. The project has highlighted the challenges for process specialists working in similar topic areas where there is a huge and fast moving evidence base (spanning social science and chemistry, physics, toxicology and environmental impacts) and conflicting interpretations of the data in collating, digesting and turning the evidence into stimulus materials. The role of the Advisory Group, wider stakeholders and the project management team in pulling together material, verifying accuracy and ensuring balance was

a really important success factor in this project, but the process was arduous for the delivery team and time consuming for others.

Key lessons from the project

The evaluation shows the following:

- **Collaborative commissioning** – the extent of partnership between a government department and industry was effective in getting stakeholder buy-in with good attendance at the stakeholder meeting, involvement of experts in reviewing stimulus materials for balance and accuracy, and in being experts both 'in the room' and on video and has been a key element of success.
- **Small but effective Advisory Group chaired by a highly experienced social scientist.** The Advisory Group had a good mix of industry, government and academic representatives and a single (but influential and respected) NGO. The timescale for the project seemed to be the major constraint to wider NGO / consumer group involvement. In the future this could be addressed by seeking NGO involvement before commissioning, e.g. in reviewing business plans and Invitations to Tender. After the publication of the dialogue report it will be useful to reconvene the Advisory Group with Defra and selected stakeholders to plan for the wider dissemination of the findings through meetings, abstracts and peer reviewed papers.
- **Providing access to broad and balanced expert voices for all participants**– for this dialogue with its breadth and complexity of issues the role of experts and Defra presence at the workshops was critical in providing information, balance, credibility and participant belief in the process. The resource implications for identifying, arranging and briefing experts should not be underestimated.
- **Future options for providing comprehensive and balanced scientific evidence**. In the future, in order to deliver within shorter timescales, Invitations to Tender could include requests for alternative approaches to preparing academic literature reviews and weighing and presenting contentious evidence. This could include greater allowance for academic and technical expertise in dialogue delivery teams, separate contracts for developing the technical content for stimulus materials, or greater clarity of the expectations of commissioning departments and Advisory Group members.

1. Introduction and Background

1.1 Introduction

This evaluation report has been prepared for the Department for Environment, Food and Rural Affairs (Defra), which commissioned the public dialogue on understanding public perceptions of specific applications of nanotechnologies with support from Sciencewise[2].

1.2 Background context

Nanotechnologies use materials at tiny scale (1-100 nanometers) because at this size they have properties different to those demonstrated at the larger scale which may make them stronger, lighter or more reactive. Nanomaterials (NMs) do occur naturally but are also being engineered and many new applications are emerging. Nanotechnologies are already in use in some widely available products – such as electronics, sports equipment, sunscreens, paints – and the term 'nano' is now increasingly seen as an advertising unique selling point in some consumer electronics. A huge range of materials and potential applications include almost any application in which conventional chemicals could be used. Innovative applications are being researched and developed in a vast range of applications, such as in medicine, environmental applications and consumer products. A recent evaluation estimated the global market for nanotechnologies at £16 billion with an expectation that it will more than double by 2020.

However, NMs also raise many of the same issues as any new technology or chemical, including concerns about the toxicity to humans during production and use and environmental impacts during use and ultimate disposal. As for conventional chemicals, hundreds of scientific papers by chemists, biologists, physicists and engineers provide evidence – some of it conflicting - on the potential benefits and risks. Uncertainties continue to exist about how some NMs move and interact within the body and the environment and even how their presence can be tested in products.

These concerns have led to ongoing debate among governments, advocacy groups and businesses on whether special regulation of nanotechnology is warranted. Current testing and regulatory regimes for each application field are quite different reflecting the specifics of how to detect, measure, and characterise nanomaterials with consistency and accuracy. Currently, both testing and regulatory regimes are behind the pace of innovation in the field. In the light of uncertainties both the Government and retail sector in the UK have tended to take a precautionary approach to promoting nano applications.

In 2004, the Royal Society[3] first highlighted the need for a programme of public engagement about nanotechnologies. A body of evidence on public views on nanotechnologies has built up over the last 10 years with research projects and public engagement exercises exploring the potential health, social, ethical, and environmental questions that nanotechnologies present for individuals. Key

[2] Sciencewise is funded by the Department for Business, Innovation and Skills (BIS). Sciencewise aims to improve policy making involving science and technology across Government by increasing the effectiveness with which public dialogue is used, and encouraging its wider use where appropriate. www.sciencewise-erc.org.uk

[3] "Nanoscience and nanotechnologies: opportunities and uncertainties". Royal Society and Royal Academy of Engineering. July 2004.

projects such as Nano and Me[4], DEEPEN[5], NanOpinion[6], Nanochannels[7], Different Uses, Different Responses[8] have looked at broad nanotechnology concepts and applications and shown that: the general public still knows relatively little about NMs and nanotechnologies; and holds different views on the relative risks and benefits in different contexts, with greatest support for environmental/energy and medical applications and less appetite for applications where NMs could be ingested or inhaled.

The body of research suggests that the public's views reflect: their wider attitudes towards social issues and cultural context; urgency and necessity; novelty; regulation; equitable distribution of benefits and risks; and privacy and responsibility. However, without focussing-in on specific applications – and what they could mean in people's lives - it is has proved hard to enable more nuanced discussions and understand public preferences for marketing approval, enhanced labelling and additional safety data development. The current dialogue project was therefore designed to look at a few specific applications in much more depth.

Based on the experience of recent years in the areas of Bovine Spongiform Encephalopathy (BSE), Foot and Mouth and Genetically Modified Organisms (GMOs), Defra has been particularly keen to engage early in an area where the exponential rate of change could potentially lead to a public backlash in future if public attitudes were not well understood. Industry, represented through the Chemical Industries Associations' Nanotechnology Supply Chain Forum, was also interested in working with Government to acquire a more nuanced understanding of the public's attitudes to nanotechnology, both to inform their position on policy proposals and inform their wider communications with the public. Since public dialogue research is known to be much more effective when closely tied to an open policy decision, Defra has waited until now for a relevant policy opportunity to arise.

The public dialogue project was therefore designed jointly by Government and industry to feed into two key policy areas:

- **A review of the UK's 2005 Moratorium on the use of nano zero-valent iron (nZVI) in remediation of contaminated soils**. The UK Moratorium was put in place on the basis of scientific uncertainties about how NMs behave in soil and water, although testing in the field has continued in some European countries such as Germany. In the last decade scientific knowledge has advanced and Defra wishes to be in a position to revisit the decision if there is keen interest from stakeholders. The public's views will be one input to this policy decision.

- **Nano Transparency measures**. Recent initiatives by individual EU member states have introduced national requirements for all NMs used in products on the market to be registered with national authorities. While this increases access to environmental and health information for consumers it also imposes 'transactions' or administrative costs on industry and retailers which could have competitiveness implications and stifle innovation. The European Commission is considering whether a harmonised European approach is needed. Evidence on public

[4] Website of The Responsible Nano Forum http://www.nanoandme.org/
[5] FP6 Science and Society Programme funded programme (2006-9) to establish an integrated understanding of the ethical issues posed by emerging nanotechnologies, develop tools for engaging civil society and the nanoscience community in ethical reflection, and help integrate ethical understanding into research practices and governance structures.
[6] Www.nanopinion.eu/
[7] International quantitative polls covering UK, Israel, Spain, Italy, Austria and Belgium (2011-2)
[8] Rogers-Brown et al, 2012

attitudes to communication, labelling and risk about nano applications will be one input to the evidence base informing Defra and BIS's position.

In addition the European Commission was currently reviewing its approach to Registration, Evaluation, Authorisation & restriction of CHemicals (REACH) Regulations and in particular whether to include annexes or apply precautionary principles in relation to nanotechnology. This policy area is considered too complex, dry and dull for a public dialogue process but this dialogue was expected to help inform the UK's position in this area, alongside other technical and economic evidence.

Therefore in October 2014 Defra commissioned a public dialogue with the following objectives to:

1. Lead a careful and intelligent exploration of public attitudes through detailed qualitative engagement to develop appropriate regulatory and government mechanisms in this field.
2. Provide an opportunity to understand public aspirations for nanotechnology.
3. Explore how the public believe that potential communications can be made relevant, targeted and transparent.
4. Ensure that an insightful and informed discussion can take place between the public with representation from government, industry and academia.

2. The Public Dialogue

2.1 Introduction

Governance

A project Advisory Group was convened by Defra during October 2014 in order to bring together a range of specialists from across sectors, disciplines and concerns associated with nanotechnology. Members were selected to bring diverse views, knowledge and expertise to frame and shape the dialogue and included industry and retailers, academics, Government scientists, Sciencewise and a representative from a non-governmental organisation (NGO). A list of members with their affiliated organisations is shown in Annex A. The Group was chaired by Professor Nick Pidgeon, a social scientist and Vice-Chair of Defra/DECC's Social Sciences Expert Panel.

The Advisory Group's Terms of Reference (TOR) were approved at their first meeting in November 2014. The AG's role was to oversee the design and development of the dialogue process and stimulus materials and ensure that the materials were comprehensive, reflective of current evidence, accessible to the public, and relevant to policy makers. All Advisory Group meeting minutes were published on the Sciencewise website.

Between November 2014 and May 2015 the Advisory Group met in person (or by telephone) four times:

- AG1 agreed the objectives, broad framing of the project and criteria for shortlisting case studies;
- AG2 refined the choice of four case studies and the broad dialogue event designs;
- AG3 reviewed and advised on draft stimulus materials; and
- AG4 reviewed the draft final report.

The project was managed by a core management group comprising the Defra project managers, OPM core team, Sciencewise Dialogue and Engagement Specialist and the independent evaluator. The group met frequently with fortnightly teleconference progress meetings, and face- to- face meetings at key points to review dialogue design and pilot stimulus materials.

Framing of the dialogue

During 2014 Defra, BIS and industry representatives of the Nano Supply Chain initially scoped out the broad policy areas of interest. Defra, with Sciencewise support, then took the lead in developing the business case, agreeing the objectives and appointing the delivery contractors, OPM Group. The objectives were further refined by the Advisory Group at its first meeting.

Initially 12 nanotechnology applications were mapped for comparison against a matrix of characteristics including: the current application context and purpose; the level of public debate and interest; the perceived risks, costs, and controversy; and the perceived benefits.

Based on review of these characteristics the Advisory Group selected four specific nano applications which would represent a range of agreed issues including: those already on the market to those still at the R&D stage; public familiarity with the application; a range of human toxicology risks based on likelihood of NMs entering the human body via inhalation, ingestion or absorption through the skin; differing levels of uncertainty surrounding potential risks; and relevance to the open policy questions. The four selected applications were:

- Nano Zero-Valent Iron for remediation of contaminated soils;
- Nano cerium oxide in fuel additives;
- NMs in paints and coatings to give them antibacterial, lightness, longevity, self-cleaning or scratch-resistant properties; and
- Nano Zinc Oxide in sunscreens and creams.

2.2 Methodology

The dialogue process was designed as a short eight month project with a scoping and design phase between October 2014 and January 2015, a dialogue delivery phase between February and March and an analysis and final reporting phase between March and May 2015. A draft report was produced in July and a draft final submitted to Defra for internal review, approval and sign-off in mid-September. A final report is expected to be approved for publication by the end of 2015. Key tasks in the dialogue process have included the following key activities.

Stakeholder mapping and engagement

Stakeholder engagement was a major input to the project. About 100 potential stakeholders were identified by Defra project managers and AG, OPM and their specialist adviser and included representatives from industry, academia, consumer groups and civil society, UK government departments and devolved administrations and the European Commission. An online stakeholder mapping tool (Debategraph) was used for identifying relevant research and participants for a stakeholder workshop.

Development of stimulus materials

The design of the public workshops and stimulus materials started with information gathering by the OPM team from published sources and grey literature, followed by stakeholder interviews. Draft factsheets were presented to the Advisory Group and revised versions were discussed in facilitated small groups at a stakeholder workshop (December 2014) attended by some 40 policy makers, regulators, academics, NGOs, and representatives from industry (see Annex A). Further data and comments were then gathered from individual meetings with the Nanotechnology Supply Chain Forum, TechUK Chemicals Focus Group and the Nanotechnologies Strategy Forum. Materials were then reviewed again by the AG, project management team and industry, academic and government stakeholders from the above processes. Individual AG members and selected stakeholders contributed talking head videos covering the potential benefits, risks and regulatory issues associated with nanotechnology in general and specific nanotechnology case study applications.

The stimulus materials and public dialogue event design were piloted internally by OPM in the week before each workshop with input from the core management group.

Stimulus Materials Days 1, 2 and 3

PowerPoint: • Objectives and agenda, Intro to nanotechnology Printed materials: • Timeline of nanotechnology development • Application posters – 12 nanotechnology areas • Posters – How small is small? Examples of the nano scale • Carousel posters: product lifecycles for paints, sunscreens, land remediation & fuel additives • Case study scenarios (scripts to prompt discussion) • Risk cards • Wall charts to organise Questions Videos • Talking heads contributions on nano science, risks and benefits and regulatory regimes • Animated video on risk and regulation in relation to nanotechnology applications	Supporting materials for facilitators • Nanotechnology Glossary • Longer factsheet on 4 case study applications • Bibliography

Public dialogue events

The dialogue was designed to involve a minimum of 40 independently recruited participants in a single location likely to be reflective of urban and rural populations across England. The group was convened three times on Saturdays mornings with a fortnight between each meeting. Recruitment was according to a brief agreed by the Advisory Group and reflected socio-demographic characteristics (age, gender, gross household income, employment status and sector, ethnic mix) of the greater Birmingham area. Quotas were included for those working in sectors such as bio-technology and pharmaceuticals. A maximum quota was set for members of listed environmental organisations. Over-recruitment was built in to ensure 40 participants would attend throughout and to take account of attrition. The overall design of the three days was agreed with the Advisory Group and project management team during the scoping stage. Detailed designs for Days 2 and 3 were then developed with the project management team as the process unfurled.

Analysis and reporting

Discussions at the public workshops were recorded and transcribed and additional material collected from experts stationed at the carousels, and facilitators' and observers' notes. Other forms of data collection included participants' notes – such as summaries of each individual's position on specific questions, and creative materials produced by participants in the course of the workshops, such as mock-up 'front pages' of newspapers. This added richness to the material drawn on in the dialogue report. Material was analysed by OPM using qualitative data analysis software to support the process. The draft final report – an account and analysis of what was said at the workshops - was circulated to the management team and AG in early July and discussed at AG4. Comments received were incorporated into a final draft submitted to the Defra project management team in September and shared with the Advisory Group in early October. The final report is subject to a Defra internal review and approval process prior to publication. Publication is expected by the end of 2015.

3. Evaluation

3.1 Aims

The aim of the evaluation was to provide an independent assessment of the public dialogue's credibility and its effectiveness against its objectives, including an assessment of its impacts. URSUS was appointed and the evaluation ran from October 2014 to November 2015. The evaluation sought to answer the following questions:

- Objectives: has the dialogue met its objectives? (Section 4)
- Good practice: has the dialogue met the Sciencewise principles of good practice? (Section 5)
- Satisfaction: have those involved been satisfied with the dialogue? (Section 6)
- Governance: how successful has the governance of the project been, including the role of the Advisory Group, key providers groups and the Sciencewise support role? (Section 7)
- Impact: what difference or impact has the dialogue made? (Section 8)
- Costs/Benefits: what was the balance overall of the costs and benefits of the dialogue? (Section 9)
- Credibility: was the dialogue process seen by Advisory Group members as suitable and sufficiently credible for them to use the results with confidence? (Section 10)
- Lessons: what are the lessons for the future (what worked well and less well, and more widely)? (Section 11)

3.2 Methodology

The evaluation has involved a number of activities as follows:

Document review

Documents were reviewed and evaluation comments submitted to the core project management team by email or in person on the following documents:

- Key written correspondence (email traffic and attachments) and working documents such as briefing materials, AG terms of reference and minutes, choice of case studies, stimulus material drafts, video animation and talking head videos etc.
- Event design - preliminary and final designs of events and recruitment briefs; and
- Review of project outputs including: two rounds of the draft final report.

Observation and meetings

The evaluators directly observed a variety of events and meetings including: 4 AG meetings; the Stakeholder workshop; all 3 Public dialogue events; many face-to-face and teleconference meetings with OPM and Defra in London; and a Sciencewise wash-up meeting (November 2015).

Questionnaires and evaluation exercises

- For the stakeholder workshop, written evaluation questionnaires were completed by 34 out of 36 participants. Results are shown in Annex B.
- At the end of Day 1 of the public dialogue an informal evaluation exercise involved participants placing dots to show how far they agreed with three questions: whether it was clear to them why they had been asked to participate; whether they had found it useful to think about the relationship between new technology and society; and as a result of the day's session whether they felt ready and primed to start discussing nanotechnology applications in more detail at the next dialogue events.
- At the end of Day 2, the evaluator explored informally whether people had enjoyed the sessions, found the role of experts useful and whether they were managing to get the answers they needed.

- At the end of Day 3, written evaluation questionnaires were completed by all 40 participants. The results are shown in Annex C. A separate evaluation questionnaire was also completed by 10 experts and results are shown in Annex D.

Individual Interviews

Stakeholder interviews were conducted at key points through the dialogue including:

- Informal baseline interviews with the AG members around meetings and with individuals attending the stakeholder event;
- Informal discussions with two thirds of the public participants and six experts in the public dialogue events themselves; and
- 12 semi-structured interviews with project management team and Advisory Group members after the draft final report was circulated focusing on: whether the project had met its objectives; emerging impacts (expected and unexpected) on their organisations' policies and processes; the robustness of the methodology; and the role and effectiveness of governance arrangements.

4. Objectives

Has the dialogue met its objectives?

4.1 Framing of objectives

The original study objectives were included in the Business case submitted to Sciencewise and were then reviewed and reframed by Sciencewise and presented at the first steering group meeting. These objectives were included in the draft Terms of Reference for the Advisory Group in November 2014. The Advisory Group made some minor changes to the objectives to make them shorter and clearer as follows:

1. To lead a careful and intelligent exploration of public attitudes through detailed qualitative engagement to develop appropriate regulatory and government mechanisms in this field.
2. To provide an opportunity to understand public aspirations for nanotechnology.
3. To explore how the public believe that potential communications can be made relevant, targeted and transparent.
4. To ensure that an insightful and informed discussion can take place between the public with representation from government, industry and academia.

These objectives were then built into the different aspects of the project as summarised in Table 4.1.

Table 4.1 How Overall Objectives are reflected in Process Elements

Process elements	Specific Objectives	Fit with overall objectives
Advisory Group	The role of the project AG was to oversee the dialogue process, it's objectives and framing and help ensure that: • The dialogue material was: comprehensive; balanced; accessible to the lay audience; relevant to policy makers. • The engagement process was: far reaching; accessible; targeted all relevant public and stakeholder groups; • The process benefitted from: diverse views and perspectives to the framing of the dialogue; intelligence from their own organisations to help shape the dialogue; dissemination and promoting of findings through their own networks; advice on appropriate experts to inform the dialogue process, materials and speak at events, where necessary.	1,4
Literature review for agreed applications	• To identify and learn lessons from previous public engagement research in the nanotechnology area • To provide a balanced review of evidence on benefits and risks of a broad range of nanotechnological applications • To underpin stimulus materials development for four specific case studies involving nanotechnology applications	2,3,4
Meetings with stakeholder forums	• To understand their viewpoints on the issues that were relevant to them, identify sources of evidence (i.e. reports and stakeholders), and discuss how the findings from the dialogue could be applicable to their work in the future. • To provide an opportunity to develop criteria for selecting applications, confirm the content to be covered in the dialogue and learn more about nature of the ongoing debates in this field	1,4
Stakeholder workshop	• Engage and build interest in the public dialogue amongst a wide range of stakeholders; • Identify the main debates, aspirations and concerns about specific nanotechnologies; • Inform the development of case studies for use in public dialogue events;	2,3,4

	• Identify stakeholder experts to support and take part in the public dialogue events in 2015.	
Dialogue events Day 1	• To put participants at ease and introduce them to the process in which they were involved, including providing information on the background to the project; • To introduce and discuss nanotechnology and some of its current applications; • To present the specific applications for subsequent workshops.	2,4
Day 2	• To review and consolidate the scientific and technology specific knowledge gained in the first workshop; • To involve participants in detailed discussion on the four chosen specific applications; • To deliberate on the perceived risks, benefits, and social-ethical dimensions potentially associated with each of the four applications.	2,3,4
Day 3	• To explore participants' perceptions of trust and responsibility, and how they are associated with each application; • To delve into participants' views on how potential communications and awareness about developments on nanotechnologies could be made relevant and targeted; • To reflect on participants' journeys of discovery, development in relation to nanotechnology, and evaluation of the chosen specific applications.	1,2,3,4

4.2 Participant understanding of objectives

Stakeholder workshop

Stakeholders attending the initial workshop were almost all clear on the objectives and process (of 33 in total 27.3% strongly and 63.6% tended to agree that the public dialogue aims were clear). Most understood that they had been invited to provide their expert input and views on potential benefits, risks, sources of information and suggestions on individuals to participate in the dialogues. While most participants recognised that stimulus materials were still at an early stage of preparation and development, some had expected materials to be more advanced and a few questioned whether all the assembled expertise could have been better used in a different way, such as through smaller application-specific workshops or working groups.

Public Dialogue events

Public participants were recruited with no knowledge that the events were about nanotechnology or of the specific applications that would be the focus of deliberations. However, the policy objectives of the project, and each specific event were clearly presented by the Lead Facilitator and Defra project teams on Day 1 and restated on Days 2 and 3. As a result by the end of the first day when asked "Is it clear to you why we have asked you to participate in these workshops?" 63% answered "yes, very much" and 34% "moderately". Only one participant was not at all clear and it is likely that this was the one participant who dropped out between Days 1 and 2. By the end of Day 3 all participants agreed (80%, 32 strongly and 20%, 8 tended to agree) that they had understood the purpose of the three workshops. Experts also agreed (5 strongly and 3 tended to agree) that participants understood the objectives and their role in the process.

- *I think once we started it was made clear to the participants, but certainly on the 1st day many were expecting a food tasting or such. They must get well paid to have given up so much time for it! (Expert participant)*
- *"My "evidence" that it seemed to be clear was that many delegates carried out their own, relevant, research between events" (Expert participant)*

Lessons:

- A clear statement of the project and each event's objectives and reiteration by Government's policy advisors was important as it increased the participants' belief that the work had been commissioned because Government was interested and committed to listening to their opinions.
- Given the enthusiasm of participants to be part of the process, in retrospect, it may have been overly cautious to recruit participants without informing them that the dialogue was about nanotechnology.

Achievement of Specific Objectives

1) Enable careful and intelligent exploration of public attitudes through detailed, qualitative engagement to develop appropriate regulatory and governance mechanisms in this field.

The first part of this objective was well met. The design of the process enabled careful and intelligent exploration of public attitudes through the focus on the four case study applications which allowed more detailed qualitative engagement than previous public engagement processes. Several AG members questioned whether the findings go far enough to deliver the second part of the objective, voicing views that "… *not sure how this report would make policy decisions any easier*" or "*as a civil servant I would struggle to get too much new insight*". However, in such a complex technical and regulatory area - where Government decision making is necessarily reactive to EC proposals - public opinion is only ever going to be one piece of the evidence which informs decision making. The Defra policy team is satisfied that this dialogue report will be a useful piece of evidence which can be fed into any future Government decision-making or provision of policy advice on appropriate regulatory and governance mechanisms (see Impacts Section 7).

2) To provide the opportunity to understand public aspirations for nanotechnology.

This objective was well met. Stakeholders interviewed generally felt that the dialogues had generated rich material on the public's aspirations which resonated with findings from previous research. While many felt that the findings were not surprising or unexpected, the analysis does provide more nuanced views because people had a chance to consider the relative benefits and concerns for a range of specific applications rather than nanotechnology in general. The set of stimulus materials (posters, timelines, life cycles and videos) really engaged participants and excited most about the possibilities of nanotechnology while being open and transparent around remaining uncertainties. "Experts" and Defra staff attending the workshops appreciated the opportunity to hear these views, probe what underpinned their opinions and to answer queries. The inclusion of direct quotes in the final report was also seen as extremely useful.

3) Explore how the public believe that potential communications can be made relevant, targeted and transparent

This objective was mostly met. Throughout Days 2 and 3 discussions on consumer products (sunscreens, paints and fuel additives) touched on the type of labelling people expected to see on packaging at point of sale but did not go so far as to reach any consensus on how much information consumers really want to see on a label (e.g. "contains nano" or detailed lists of nano ingredients) and what would really be useful. However, industry and business stakeholders interviewed reported that these insights were useful in informing future communications around nano-based products.

A session on the final day of the public workshops attempted to explore preferences for communication through an exercise for small groups to create their own adverts, or newspaper/ magazine front pages. Although participants clearly thoroughly enjoyed this session, the exercise did not necessarily reflect all their preferences for relevant, targeted and transparent communications. The communications they produced tended to accentuate the positives of specific nano applications, rather than reflecting the concerns expressed throughout the three days about long term risks to humans and the environment.

4) Ensure that an insightful and informed discussion can take place between the public and representatives from Government, industry and academia.

It became clear during the evaluation that this objective had been interpreted slightly differently by members of the AG: some felt that it related to whether the overall process had enabled insightful and informed discussions between stakeholders; while others understood it to be about making recommendations to enable effective nano public dialogues in the future. Most stakeholders interviewed felt that this objective had been well achieved with opportunities for more than 100 government, industry and academic experts and members of the public to be involved in informed dialogue through stakeholder interviews, the stakeholder workshop and public dialogue events. Interviews with public participants in the dialogues revealed that they all felt better informed about nanotechnology and appreciated the chance to talk to experts throughout the three days (see Section 6). One AG member felt that a lesson from the process was that 'expert' stakeholders could have been involved even more through smaller application-specific events or working groups rather than a single workshop.

Those AG members that had interpreted this objective as contributing to the body of academic social research on nanotechnology to enable more informed and insightful dialogue in the future would really have liked to see the dialogue report set more firmly in the context of an in-depth analysis of what has already been learnt from past public engagement on nano, and rounded off with stronger recommendations on how the findings from this dialogue should inform future dialogues. While this would certainly have been a useful outcome, it would have required substantially more time and resource spent on the initial academic literature review in order to draw out the additional insights that have been gained through the current research. This was not achievable within the time and budget for the current study.

Lessons:

- It would have been useful for the dialogue report to refer back to the four objectives and detail how far these had been met. The Executive Summary needed to draw out key messages and findings rather than focus on describing the process.
- For future public dialogue projects it may be worth considering whether value can be added to the process by framing them within a more detailed academic literature review. If this is an explicit objective then it is probably necessary to build at least a week of an academic's time into the initial scoping stage.
- In order to further develop recommendations in building an evidence base it would be useful for the AG and other stakeholders to meet after the findings are presented to draw out the implications for future research, policy and decision making.

5. Good practice

This section presents the evaluation findings on the design and delivery of the dialogue process and whether it has met principles of good practice including the following:

- The choice of locations was clear and representation was of a scale and mix for results to be generalizable;
- The workshops were well designed so that the design flowed and there was sufficient time for deliberation;
- The stimulus materials presented were balanced, accessible and engaging enough for the participants to act as informed citizens;
- The facilitator team was professional, well briefed, consistent and unbiased and enabled all participants to make an active contribution; and
- Specialists were involved to provide information and trust in the process.

1. The choice of locations was clear and representation was of a scale and mix for results to be generalizable

The rationale for the choice of one large group (over 40 participants) reconvened three times (rather than two or three smaller groups in different locations) reflected the budget, timeframe and nature of the topic. Given the breadth and potentially contentious topic areas and the requirement for at least one dedicated expert for each specific application this seems to have been a sensible approach allowing:

- a relatively long period for participants to become fully informed (15 hours compared to 12 hours or less typical of many dialogues);
- access to the same wide range of experts in the room for all the participants;
- fortnightly breaks which gave participants time to reflect on the information provided and do their own research if they wished; and
- enough time between sessions for the delivery team to reflect on outcomes and incorporate lessons in the design of the next session.

Birmingham proved a good central location accessible to both urban and rural residents, and typical of demographic variables and attitudes towards science and technology of other UK cities. The mix of participants achieved reflected the recruitment brief. Over-recruitment meant that of the 48 recruited, 44 turned up on the first day and even with a few dropping out the required sample of 40 participants took part in all 3 days. Table 5.1 summarises the recruitment requirements and the characteristics of those actually recruited. The profile of the 40 that attended all 3 days was observed to be similar to the intended sample.

The AG and project management team were initially anxious that if people knew they were being recruited for a nanotechnology dialogue this would negatively colour their views. Participants were therefore recruited to a 'technology and society' workshop. All participants agreed (80%, 32 strongly and 20%, 8 tending to agree) that the recruitment was well-handled. Experts also generally agreed that there was a good mix of people and that most were very actively engaged in the discussions, with one reporting that "I was surprised by the enthusiasm of the participants" and another that "in terms of backgrounds and experience the coverage was good".

Table 5.1 Recruitment of sample against the brief

Recruitment criteria	Location	Birmingham %	Target number to recruit	Number recruited
Location	Rural	5%	At least 6	15
	Urban	95%	Urban participants drawn from at least 5 different postcodes	33
Gender (Census 2011, Birmingham)		M 50% F 50%	M 20 F 20	M 23 F 25
Age (Census 2011, Birmingham)	Age bracket	Birmingham %	Actual number to recruit (within 25%)	
	18 to 29	20.2	11	11
	30 to 44	20.8	11	13
	45 to 59	16.4	8	15
	60+	17.2	10	9
Ethnicity (Census 2011, Birmingham)	Ethnicity	Birmingham %	Actual number to recruit	
	White	58%	23	25
	BAME	42%	17	13
Gross annual household income (Family Resources Survey 2012/13, United Kingdom)			At least 7 low income participants, mixed of other income groups	B 8 C1 16 C2 11 D 6 DE 6 E 1
Employment status (Census 2011, Birmingham)	Employment status	Birmingham Profile %	Actual number to recruit (At least 3 off work due to disability or being a carer)	
	Employed (incl. self-employed)	88.8	35	36
	ILO Unemployed	11.1	5	12 (incl 4 disability or carers)
Attitudinal questions	Members of environmental organisations. No more than 8			2
	Number of technology gadgets from a list used or owned At least 5 who tick 2 or less At least 5 who tick 5 or more			2 or less - 0 5 or less - 6 5 or more – 42

The large size of the whole group created a lively and exciting atmosphere. Many sessions were organised around table groups of 8-9 representative of gender and ethnic mix but not segmented by socio-economic group. The groups were kept together over the 3 days and participants appeared to feel very relaxed. However, on the first day the room was crowded with five tables of 8-9 participants plus 3 experts/observers within a small room which felt noisy and cramped. For Days 2 and Day 3 the room was enlarged and group discussions felt calmer and easier for more reticent individuals to contribute.

2. The workshops were well designed so that the design flowed and there was sufficient time for deliberation

The process design recognised and was appropriate for the nature of the topic, namely that: nanotechnology would largely be unknown to participants; that there was a very large body of scientific, risk and regulatory information for participants to get to grips with to feel fully informed; that uncertainties about potential risks still exist in some areas; and contradictory views are held by scientists, business and NGO stakeholders.

The design eased participants into the topic very gently and, outside of facilitated sessions, allowed each individual to decide for themselves how much information they needed in order to feel informed. Day 1 started with a warm up session to generate ground rules for the three days, and then table discussions to get participants thinking about social-ethical issues related to technology in general before introducing basic concepts surrounding nanotechnology. Day 2 reinforced this introduction, allowed ample time for questions and answers (Q&A) and then introduced the four specific nano-based applications with written materials, posters and role play. Day 3 then focused on the concepts of responsible innovation, regulatory and testing regimes and communications for nanotechnology in general and for the four specific applications, although risk and regulation had naturally cropped up in the discussions during previous days.

The initial sessions on Day 1 helped to build a very positive group dynamic and respect for the ground rules. However, in retrospect the time spent on very generic society and technology discussions (linked to the recruitment brief) may have been too cautious as people were observed to be genuinely interested and excited by nanotechnology opportunities and challenges. Potentially less time could have been spent on generic discussions and nanotechnology specific material could have been presented sooner. We observed that most people spent quite a lot of time reading wall charts and posters during coffee and lunch breaks.

Overall the three day design flowed well and almost all participants reported that they had enough time (42%, 17 strongly agreeing and 55%, 22 tending to agree) to discuss the issues while everyone (83%, 33 strongly and 17%, 7 tended to agree) that they were able to contribute their views. Most found the full day sessions exhausting but very interesting. Some experts considered that the final day was a bit rushed and this may have contributed to Objective 3 only being partially met.

A diverse range of techniques was used to keep participants engaged and reflect different learning styles. These included expert presentations in plenary, self-guided discovery, carousels, Q&A and reverse Q&A sessions (with experts asking the public what they thought), role play scenarios and a hands-on exercise to produce a newspaper or advert communication on the final afternoon. Throughout the three days participants worked in pre-selected groups, each with a table facilitator, and also worked in pairs and smaller groups during carousel sessions. The group dynamics at all tables were observed to be good with all participants able to participate either at the table or when working in pairs. Many individuals were also very happy to ask questions in the plenary.

Participants enjoyed the range of techniques and particularly enjoyed hands-on sessions such as role plays on Day 2 and making their own communications on Day 3. In retrospect the Day 3 session may not have yielded as rich information as the facilitated sessions and the amount of time allocated to that communications activity meant that other discussions on Day 3 were a bit rushed.

Expert's views on Design and Timing

- *"With such a spectrum of participants it was not going to be easy to have full contribution from all. I left with a feeling that the framing on the first workshop may have been improved to set the scene more clearly" (Expert workshop participant)*
- *"I thought the timing was good, and allowing time in groups as well as in open discussion was good"*
- *"Although balanced there was never enough time! I think that is testament to the participants' interest and commitment. We travelled a lot of tangents though, and perhaps a bit more steering would have helped to focus discussions – always difficult to get that balance right." (Expert workshop Participant)*
- *"Day 3 felt rather rushed, maybe the communications exercise wasn't that useful and it would have been better to give more time to the other sessions" (Government department)*
- *"I think some participants didn't quite have the time to say their piece [on day 3]. (Observer)*

3. The stimulus materials presented were balanced, accessible and engaging enough for the participants to act as informed citizens

A great deal of time and effort went into collating material, producing, testing and designing written stimulus materials and in recording talking head videos for the three days. This reflected the challenging nature of establishing the 'facts' around nanotechnology applications particularly in reflecting the complexity of scientific evidence in a balanced way, highlighting live debates while making this clear and accessible for participants. The Advisory Group, project management team and a range of specialist external stakeholders were involved in several iterations of identifying information and reviewing materials. The content presented to the participants at the stakeholder workshop was at an early stage and still included gaps and inaccuracies: while most stakeholders understood that they were being asked to input to establishing accurate background materials some misunderstood and were critical of the content and presentation of the datasheets. The process of bringing together stakeholder feedback took a significant amount of time, but the end result meant that the stimulus materials and information provided at the workshops were comprehensive and had been quality checked by a number of sources. The delivery contractors felt that no one group of stakeholders was completely satisfied with the final version of content, but in our view this indicated that they were pretty well balanced rather than over emphasising benefits or risks. The materials were piloted internally, with OPM staff not involved with this project, and then simplified and clarified based on the comments received.

The final set of materials presented to the public was comprehensive, and covered all the necessary technical issues, in an engaging way, using graphics and very accessible language. They were visual, clear and easily understood by participants and worked very well on the day. The timeline, materials on size matters and posters on 12 sectors where nano is being applied, all worked well alongside the introduction to nanotechnology by the academic expert on Day 1. On Day 2 the carousel materials showing the life cycles of the four case study applications worked really well in conjunction with input from specialists who provided an introduction to the application and answered each group's questions. On Day 3 the video animation on regulation and innovation was well received by all participants. This was played twice: once straight through and a second time with pauses for questions and clarifications by the experts in the room.

Participants were unanimous in agreeing (68%, 27 strongly and 32%, 13 tending to agree) that they were provided with enough fair and balanced information on nanotechnology in general to enable them to contribute to discussions. They also all agreed (73%, 29 strongly and 27%, 11 tending to agree) that they were provided with enough relevant information on fuel additives, sunscreen, environmental clean-up and paint to enable them to contribute to discussions. Participants also

appreciated being able to view and inspect sunscreen products (both nano-based and non-nano versions).

- *"The case study for environmental cleanup could have been better – it focused attention on issues that would not be relevant during practical application (cabbages), but did bring the issue closer to home". (Expert workshop participant)*

Lessons

- The composition of the delivery team (OPM) and nature of the topic meant the learning curve for designing the process and materials was steep. The feedback received by the team was extensive but often contradictory and inconsistent between industry, government, toxicologists, and NGOs. As a result, the process of compiling and verifying the feedback was arduous for the delivery team and time consuming for others. More realistic time frames are needed for these tasks in future
- Other options for inputting technical expertise in the future could include:
  - more allowance for technical expert resource within the delivery team;
  - a separate contract for a neutral expert (NGO or academic organisation) to compile balanced background data which the delivery team can draw on;
  - detailed review of the state of scientific evidence compiled by or on behalf of the commissioning organisation; or
  - stakeholder involvement through technical sub-groups responsible for preparing background information.

4. The facilitator team was professional, well-briefed, consistent and unbiased and enabled all participants to make an active contribution.

The stakeholder workshops and public dialogue events were led by a five person team of professional, well-briefed and highly competent facilitators. For the initial stakeholder event most facilitators were new to nanotechnology topic areas, but this did not prevent all participants (64% strongly and 36% tending to) agreeing that the facilitation was independent, professional and effective. During the public dialogue events a warm and purposeful style of facilitation created a good atmosphere in which people were able to contribute fully to the discussions. The ratio of facilitators to table groups was good and allowed rich seams of useful material to be captured. All conversations were recorded and transcribed allowing quotes from the sessions to be used extensively throughout the dialogue report and themes to be analysed across sessions.

There was unanimous agreement amongst public participants (88%, 35 strongly and 12%, 5 tending to) that the facilitation over the three days was independent, professional and effective. Largely as a result of this facilitation style, all participants agreed (83%, 33 strongly and 17%, 7 tending to agree) that they were able to contribute their views and have their say, one describing "*easy two way engagement*" and another that they had "*good discussions*". Facilitators managed individuals who tended to dominate or get side-tracked so that everyone was able to contribute.

The depth of facilitator resource and scheduling of events on alternative Saturdays meant it was possible to have continuity of facilitators across all four events. As a result facilitators were able to take on one case study application each and gradually build their knowledge, while maintaining a clear separation between the role of the facilitator and experts at each table. This allowed both

table facilitators and the lead facilitator to probe why participants held particular opinions, pursue topics of interest and ensure that most discussions remained focused and relevant.

Lessons:

- Continuity of facilitators between events is very important in such a wide ranging and complex topic area and increased the team's ability to probe and get the richest material from the discussions.
- Non-segmented groups worked well in making participants feel that the process was hearing from all walks of life and did not appear to inhibit anyone's participation.

5. Specialists were involved to provide information and trust in the process

Amongst the Advisory Group, stakeholders consulted and core management group there was a range of views on the appropriate expertise to include in the dialogue, who held it and how to make sure balanced expertise was represented 'in the room'. There was agreement that experts were needed to make a generic introduction to the science behind nanotechnology, to represent each of the four case study applications, and to explain regulatory and testing regimes. Beyond that it was agreed that views on the remaining scientific and ethical risks and uncertainties needed to be represented.

Across the three events a good balance of those with different expertise and views were represented and made a very positive contribution. Experts were well briefed by the facilitator team before each session. Generally they made excellent contributions and academics, industry and regulator experts presented balanced views which recognised both the potential benefits and risks in their respective areas. A strong presence of Defra policy and scientific expertise for all 3 days was also extremely useful and appeared to contribute to participants' general confidence in the regulatory regime and that their inputs would help to inform policy decisions (see Satisfaction, Section 6).

The one voice missing from the 'specialists in the room' was that of NGOs. This was not due to lack of NGO interest in nanotechnology and the toxicology and environmental risks, but more because of the tight timetable and scheduling of public workshops on Saturdays. In order to extend the range of expertise available to participants and make sure some NGO voices were heard a number of Advisory Group members and participants in the stakeholder workshops were invited to contribute talking heads videos. This included contributions from regulators, academics and Greenpeace.

To further address the NGO gap the delivery team approached NGOs in the UK and Northern America to send in their questions and identify issues they felt the public should take into account. These were designed into discussions alongside contributions from experts in the room. A last minute submission from a Canadian NGO drew attention to a recent World Health Organisation (WHO) report which highlighted remaining uncertainties about the potential human risks of sunscreens if absorbed through the skin. However, this was introduced on Day 3 with some Advisory Group members feeling they had not had a chance to review the evidence and provide balancing evidence from other sources.

Participants appeared to learn the most from their conversations with scientists and other specialists, and from the different views they expressed on similar issues. Participants were unanimous in finding expert inputs useful (90%, 35 strongly agreeing and 10%, 5 tending to agree), remarking that there was "*a good selection of experts both present and by video*", that "*their comments were very useful at times*" and that they had "*had really interesting and informative chats*

at every session" and "*fantastic discussions with the professionals*". Specialists' inputs were largely trusted and informal discussions suggested that participants' interactions with specialists instilled a greater sense of accountability and trust in the technology. There was a particularly positive response to the video from Greenpeace. For many this seemed an endorsement of the benefits of nanotechnology, because it appeared to take a much more positive stance than people might have expected. The Greenpeace representative was surprised at this response and, on reflection, felt that more time should have been allowed to reflect on and review the messaging that they wanted to convey.

Lessons

- Expert inputs in person and by video were crucial to the overall success of the project. The dialogue design of one group over three days made it possible to recruit an appropriate number and range of experts, which could not have been replicated for more than one set of meetings with different public participants.
- It is important to recognise the huge effort required by the project management team (commissioners and contractors) in identifying a balanced range of experts, contacting them and arranging their participation which was more time consuming than anyone anticipated. The same was said for the development of the Advisory Group and identifying and contacting stakeholders to attend the stakeholders' meeting.
- It is important that relative responsibilities for identifying and contacting experts are agreed between commissioners, delivery contractors and Advisory Group members at the outset.
- Video presentations by experts can be useful in filling gaps in expertise in the room but sufficient time needs to be allowed for recording, reviewing and editing contributions.
- Tensions can arise between fully transparent/representing all uncertainties and introducing bias or confusion by late inclusion of information: the case of sunscreen suggests that some participants wondered if they had been manipulated or been given incomplete information in other areas.
- One expert participant suggested that a "mop up surgery" would have been useful for individuals to pose questions to the relevant expert**.**

6. Organisation and Venue

Participants received advance information, and the room set up, wall displays and audio visual stimuli were pre-tested and worked well. The logistics for welcoming participants and food and refreshments were all excellent. The room set up was a bit cramped for Day 1 but was addressed for Days 2 and 3. However, managing five large tables without any break-out spaces proved a challenge in terms of noise levels, but did not appear to be a problem for participants. One remarked that it was "*a great location and a good selection of participants*".

6. Satisfaction

Have those involved been satisfied with the process?

This section evaluates whether those involved have been satisfied with the dialogue process and covers the perspectives of the public, experts and stakeholders.

6.1 Public participants

All 40 participants that attended all three public workshops were satisfied (79%, 31 strongly agreeing and 21%, 8 tending to agree) with the events they attended. By the end of Day 1 respondents to the evaluation exercise almost all reported that they found it useful to be asked to think about the relationship between new technology and society (83% responding Yes, very much and 17%, responding moderately) and all (63% very much and 37% moderately) agreed that they felt ready and primed to start discussing nanotechnology applications in more detail. Figure 6.1 shows the results of participants being asked to describe how they had found Day 2 in three words (the larger the word, the more often it was used to describe the day).

The events also met Sciencewise's good practice principles that those involved in the process are enabled to increase their knowledge and understanding of the subject under discussion. Participants were overwhelmingly positive about having learnt a lot as a result of taking part at the end of the three days making comments on the evaluation forms (see box) with 95% of participants strongly agreeing and 5% tending to agree that they had learned something new about nanotechnology as a result of taking part. Informal discussions confirmed that they had thoroughly enjoyed the sessions and atmosphere and – as expected on the basis of previous research – that very few had known anything at all about nanotechnology before taking part.

Figure 6.1: Participant's Description of Day 2 of the Public Dialogue Events

Specific examples of what participants felt they had learned included: what nano can do; that it is about size rather than a thing; that is already being used in many applications; that the potential benefits mean it is likely to be used in many other applications in the future; the importance of (and

in some cases lack of) regulations; and the importance of looking at labelling and ingredients in the future.

Typical participant comments:	
"Fantastic and interesting workshop" *"Found the 3 days very informative"* *"Really enjoyed the process"* *"Really engaged in all 3 sessions"* *"Very interesting 3 days"* *"I have learnt a lot"* *"A fantastic 3 days of nano information"*	*"Last session worked well. Good to have an activity straight after lunch"* *"Given me things to think about"* *"Everything was professionally executed"* *"Thank you, I would like to receive the report when it is out"*

Lessons:

- The variety of stimulus material and the different levels they were pitched at meant that people could learn as much or as little as they felt they needed in order to be informed. The variety of methods – written, videos, role play – meant that all learning styles were catered for. Most members of the public had the capacity and interest to take on more complex information than had been expected.

6.2 'Expert' participants in the dialogue

Over the three days 12 individuals and a Defra team of four or five were involved, many of whom had already attended the Stakeholder workshop. Experts ranged from those who already had experience of public dialogue and were supportive of it, to those who had not previously been involved. All of those completing evaluation forms (9) reported that they had been satisfied with the sessions and had got a lot out of participating both personally and in terms of enhancing their perceptions of the usefulness of public dialogue processes. Most enjoyed the chance to hear a range of views that they would not normally have access to, and gaining a deeper understanding of why people held these views. They also found it useful to see how complex nanotechnology information could be communicated to the public in a way that was engaging and accessible. Many reported that they were impressed with the process, found it very worthwhile and saw the role for more public engagement in science policy and research in general.

Expert views on participating in the public dialogue

What did you get out of it personally?

- *"A good insight into public awareness of nano"*
- *"Increased my understanding and helped to access views not otherwise ascertainable"*
- *"Learning varied views"*
- *"Deeper understanding of people's perceptions"*
- *"It was very helpful to see the public's perception of nanotechnology and a good exercise in learning to communicate about it in a clear way"*
- *"I found it very interesting and informative, and it's useful to work with Defra on these sorts of aspects".*
- *"I hadn't been involved in anything like this before so interesting to take part in the process. Learnt about public engagement, which will be useful in future as I am becoming involved in other project in which PPI&E are important".*
- *"Grounding. It is always a challenge to relay complex issues in an understandable way, and fulfilling when it works".*

How has it affected your views on the usefulness of public dialogue?

- *"Started off very supportive (previous involvement) and remain so"*
- *"Much better than I initially thought"*
- *"Favorably impressed"*
- *"Very worthwhile process"*
- *"It's a continual learning curve"*
- *"It showed me just how beneficial such engagement can be to all involved and how it can be done"*
- *"I have a better understanding of the extensive preparation that is needed to get it right, and how rocking up unprepared, or just to tick an "outreach" box for one's CV is completely counter-productive and serves only to further alienate people".*
- *"There is a clear need for science engagement generally, which should definitely be an outcome of interest to Defra / government".*

6.3 Satisfaction amongst policy makers

The box below highlights the comments made by interviewees from the Advisory Group and from Defra about their overall satisfaction with the dialogue process and the dialogue report. Those that had been closely involved recognised that there had been some challenges in developing stimulus materials within the original timeframe and that this had involved more of the Defra team on supporting project management and the process than they had expected. The (draft) final report is widely agreed to be well-written and structured, and meets Defra's overall policy objective (see Section 8), but for some would have been even more useful if resources had allowed further analysis in the context of comparing and contrasting outputs from the current work with those from previous bodies of published evidence.

Policy Audience satisfaction with the process:

- *"Great report" (AG member)*
- *"Read very well, clear structure and flow" (Advisory Group member)*
- *"OPM did a great job getting stimulus materials together under such tight deadlines" (Commissioners)*
- *"Great process to have gone through, deserved more time. Time for more reflection between the sessions would have been useful" (Advisory Group member)*
- *"Useful process which demonstrates partnership working" (Industry Association)*
- *"Well written report, deserves to be read more widely – now need a discussion on implications and where next" (Industry Association)*
- *"Internally reviewed (draft report) and all concluded was very well written and structured and reflective of all that we had heard over the 3 days … but an extra layer of analysis in interpreting observations and conclusions or messages would have been really helpful" (Commissioners)*
- *"Very good exercise. Good coordination between industry and government" (Industry Association)*
- *"Draft final report didn't fully reflect the analysis (e.g. participants reactions to the Greenpeace talking heads video) but this was addressed in the final report"*
- *"Great in so far as it goes but needed more references to the literature, context and where the conversation had already got to" (Commissioners)*

Lessons:

- The extended timeline made it possible to develop stimulus materials which were comprehensive, accurate and balanced and a process that everyone was finally happy with - but also impacted on the overall project delivery scope and resources to achieve this in full, in particular, on expectations on the extent of stakeholder involvement and scope of final reporting.

- Different expectations of what a dialogue report should cover (and in particular the difference between academic social research and a policy-relevant engagement process) need to be surfaced at an early stage and resourced accordingly. Where an additional layer of academic analysis is required then different routes (and additional resources) for including this in delivery teams will be needed.

7. Governance

How successful has the governance of the project been, including the role of advisory groups, wide stakeholders and the Sciencewise support role?

Advisory Group

The Advisory Group was set up after the contractors had been appointed. Defra took on the main responsibility for identifying individuals to approach while OPM convened meetings, provided secretariat services and published Advisory Group minutes on Sciencewise's website.

The Advisory Group was a manageable number (initially 11 and then 9 regular members) and provided a good balance of academic (nano and social science), industry and government representatives. It was very positive to have Greenpeace involved, however - despite considerable time and effort spent trying to involve others – it did not prove possible to get any consumer organisations to join the Advisory Group. This wider perspective in framing questions would have been a useful input. Lack of wider NGO participation appears to have reflected the tight timeframes for the project, but perhaps also the limited number of individuals in NGOs with specialist knowledge within the nano area.

All Advisory Group members took an active role in the early stages in agreeing the objectives of the project, the framing and content of the project, attending the stakeholder workshop, reviewing stimulus materials, the recruitment brief and the outline narrative for the public dialogue events; and contributing talking heads videos for the events. Several members fell away after the first meeting (one business representative had expected the focus of the research to be rather different, another changed job), but all others remained engaged but given the timing of the public workshop events only Defra and one other non-Defra Advisory Group member were actually able to attend workshops as experts or observers. The range of perspectives and representation on the Advisory Group and the role of a highly experienced chair were invaluable to the dialogue process.

Stakeholder 'provider groups'

Stakeholder engagement was a major input during the design phase through group and individual meetings with industry forums and through the stakeholder workshop attended by a mix of 36 stakeholders (see Annex A). Attendees were a good mix of regulators, academics, UK and European policy advisors/makers and funders, business and industry, NGOs and media. Of those attending the stakeholder workshop 94% felt the mix was diverse enough, although several highlighted that there was not sufficiently strong representation of civil society or NGOs with adverse points of view on nanotechnology. This was not for want of trying, with a great deal of effort by Defra in sending individually targeted invitations.

Two thirds of workshop participants (21) reported that they were willing to participate further and many did in the form of signposting sources of information, reviewing stimulus material, attending events (as experts or observers) or preparing talking head videos for showing at the workshops. This level of participation was a real contributor to the success of the process.

Project management team

Oversight of the daily running of the dialogue was carried out by a small project management team comprising Defra, OPM Group, Sciencewise and the independent evaluator. The team met fortnightly by teleconference or in person throughout the intensive stages of the project. This was

very helpful on a project of this scale and complexity to plan and make decisions on the approach, scope, and content on an ongoing basis. This allowed the contractors to bring well thought through issues, questions, plans and materials for the Advisory Group to consider.

Lessons:

- Setting up even a smallish Advisory Group is time consuming and resource intensive during the most intensive part of a short dialogue project. Future short (6 month) projects should consider setting up the Advisory Group before recruiting consultants. The benefits would include a stronger sense of ownership of the process, longer lead times for involving NGOs or other 'hard to reach' organisations, reducing the burden on commissioners, and less diversion of contractor time during the intensive design and stimulus materials development stages.
- It would be valuable for more Advisory Group members to participate in workshops to help extend understanding of how dialogue processes work amongst those who sit on AGs and also to demonstrate to participants the interest and respect accorded to their contributions.
- It would be useful for the Advisory Group, Defra, Sciencewise and interested stakeholders to meet again after Defra approval and publication of the final report to prepare a response to the report and an action plan for publication, dissemination and any follow up events (e.g. feeding the findings into any planned consultation process).

8. Impact

What difference or impact has the dialogue made?

As noted in Sections 4 (objectives) and 6 (satisfaction) the project has been successful in leading a careful and intelligent exploration of public attitudes through detailed qualitative engagement to develop appropriate regulatory and governance mechanisms in the nanotechnology field.

8.1 Workshops Participants

Public participants

By the end of Day 3 the majority of participants (87%) felt confident (41%, 16 strongly agreed, 46%, 18 tended to agree) that the events they had taken part in would inform how government regulates and informs people about nanotechnology and applications in the future. A small minority (13%, 5) were not sure or did not have a clear view. A few expressed some scepticism "*not sure that government will listen to what we have said*" while others thought "*it will be supportive*".

Most participants (94%, 37 out of 39 respondents) felt more convinced of the value of public participation in topics such as nanotechnology than they had at the outset, only two participants either tended to disagree or were not sure. Likewise 94% reported that they were likely to get involved in these types of dialogues in the future, if asked. In follow up questions: 79% (30 out of 38) were prepared to be re-contacted for a short follow up interview; and two thirds (25 out of 38) would like to receive other information from Sciencewise, including possible opportunities to be involved in other topics of dialogue.

Lessons:

- The inclusion of specialists (academics and regulators) explaining how responsible innovation works gave people confidence in the regulatory process and government's role in this.
- The extent of Defra engagement including a large presence at all three workshops, a reiteration on each day of how Defra intended to use the outcomes, and the approachability of individuals involved, helped give confidence to most participants that their voice would be listened to.

Stakeholders

During the stakeholder workshop participants were asked whether public dialogue processes should be used by government and industry to ensure responsible innovation in nanotechnology. The majority agreed (45% strongly and 33% tended to agree) but 21% were unsure. There was less certainty about whether the outputs of this process will help inform responsible innovation in nanotechnology with 30% unsure, 39% tending to agree and only 24% strongly agreeing. This appears to reflect fairly common views that the regulation of nanomaterials (e.g. through REACH) is too difficult or complex an area for the public to be expected to take a decisive position on. As one expert stakeholder interviewee put it "I hope it [will inform policy], but I think one of the main outcomes was that most people don't really want to know [about the details of regulation and testing], and just want to trust the system to ensure products are safe!" (academic).

8.2 Policy Impact

The outcomes from this public dialogue are expected to contribute to policy decisions in the medium and longer term.

From Defra's point of view, despite a much extended timeframe in finalising and publishing the report, the dialogue has been timely and valuable in terms of policy impact. The dialogue process was commissioned ahead of the curve in terms of making an active decision and for Defra, has delivered on a long-standing high level request to provide policy makers with a better understanding of public views on nanotechnology.

The value of the dialogue report lies in both its breadth and specificity. The coverage achieved through the four carefully chosen case study applications means that the findings can be usefully deployed in almost any nanotechnology related policy decision facing Defra or BIS. As policy processes unfurl the report will prove useful in demonstrating that public opinions have been sought and in providing evidence of the public's perceptions of relative benefits and risks, and what underlies them, for different types of applications. A key message seen to emerge from the public dialogue is the high level of confidence that the public has in regulatory processes and their expectation that any products that are available on the market will have been subject to the necessary testing to ensure their safety. However, the findings were only ever expected to provide one piece of the evidence base, sitting alongside scientific toxicology and environmental impact studies, and economic evidence on cost effectiveness and benefits to the UK economy.

The two most immediate – although still open-ended - policy processes where the public dialogue evidence will be of most value are:

- **The European Commission Nano Transparency and REACH proposals**. During 2014 the Commission carried out a stakeholder consultation and impact assessment to identify and develop the most adequate means to increase transparency and ensure regulatory oversight on nanomaterials. The Commission is expected to bring forward its proposals on nano registers and the REACH annexes based on its assessment and consultation responses. Timing is not yet confirmed but an internal European Commission decision is likely in December 2015 with proposals published for member state and wider stakeholder consultation early in 2016. The UK Government expects to formulate its own response once the Commissions' proposals and timetable are clearer. Defra consider that this dialogue report will be a useful input to informing that position. It is not yet clear whether or how the findings would sit alongside, or be actively used in, any wider stakeholder consultation process.

- **The 2005 moratorium on nano Zero-Valent Iron (nZVI) in land remediation**. The choice of case study applications was intended to generate useful evidence for any future decision by Defra on the 2005 moratorium. Defra detect no immediate external pressure to lift the moratorium and so do not see the dialogue report having an imminent policy impact on this issue. However, Defra reported that if and when there is more momentum to restart testing nano approaches to land remediation in the UK, the report will be a useful piece of evidence to the decision process. The key messages seen to emerge about this application are that there is no strong public feeling against using nano remediation, indeed many participants saw real benefits, but there is a very clear expectation on the part of the public that Government would only allow nano remediation in land once any uncertainties over long term environmental and human safety risks have been resolved, at which point they would expect appropriate monitoring regimes to be in place. The outcomes of the public dialogue would be used in conjunction with scientific and economic findings from research and development at the European level (e.g. from the NanoRem project which will include regulators, service providers, and site owners but not the public).

In addition to these two policy processes, stakeholders interviewed suggest that the public dialogue will be of value as part of the broader evidence base:

- **Contributing to responsible innovation across the nanotechnology sector**. Defra is setting up a new group during November 2015 with industry and Innovate UK - the Nanotechnology Environment and Health Industry Group (NEHIG) – which will be looking at how responsible innovation that takes into account societal views and potential environmental and health impacts can help to develop the regulatory Roadmap and ensure that the economic growth and employment benefits of innovation in this area can be optimised in the UK. Industry considers that the public dialogue project will be a useful input to that partnership.
- **Demonstrating a pathway for Responsible Innovation in other emerging technology fields** (such as systems biology, quantum technology and even GM); and
- **Aligning [European Commission] research and development** to the values, needs and expectations of society.

High level findings based on participant responses included:

Stakeholder views on potential impacts of the dialogue

- *"The great value of this work is that, whatever nano-related decisions Government has to deal with, the dialogue gives a good indication of what the public thinks and will help policy makers and Ministers develop their position" (Government Department)*
- *"Something useful that can be deployed as and when" (Government Department)*
- *"Will be using the report in reactive rather than active mode" (Government Department).*
- *"How government regulates is very driven by EU legislation framework so options for affecting control fairly limited so only minor input expected". (Advisory Group member)*
- *"Contains a real mine of information from the public, incorporating direct quotes in the report is extremely useful" (Government Department).*
- *"No great revelations [the findings] are what we would have expected but for us it was interesting that people picked up what they felt was positive NGO endorsement in the videos – an interesting finding for other science and technology areas" (Advisory Group member)*
- *"Understanding public concerns will be very helpful in preparing to deal with any issues arising for products containing nanomaterials" (Industry)*
- *"Useful for clarity of message on nano in general and on key case studies" (Industry)*
- *"Depends on what government want to do in the end" (Expert workshop participant)*
- *"We are submitting an application to Horizon 2020 [European R+D programme] which could link to this initiative*

Lessons:

- Even although the policy impacts will not be immediate, it would be useful for the policy sponsor to prepare a short briefing at the time of publication to explain to participants (public and stakeholders) what they intend to do with the report and the messages emerging from it.

8.3 Wider impacts

The Defra project management team report that the time invested in the project has had the added benefit of broadening contacts between the Department and academics and industry representatives. Industry representatives also view this as a good example of partnership working and demonstrating how industry and government thinking on how to take nanotechnology innovation forwards responsibly is aligned.

A further impact is that the Defra project management team consider that, with the assistance of a strong Advisory Group chair, they would now be able to commission and run a public dialogue process without further process support from Sciencewise. Potential areas where this learning could be applied – budgets allowing - include public engagement on hazardous substances in water and air quality.

8.4 Dissemination

Table 8.1 summarises plans for dissemination after the report has been finalised following the Defra internal review and publication (expected before the end of 2015). We understand that Defra will publish the dialogue report at .gov.uk website and that the stimulus materials (printed materials, talking heads videos and the video animation on regulation) will be available at the Sciencewise website. One Advisory Group member also foresees a use for some of the stimulus materials as resources for university courses. The report will be formally shared by Defra with the European Commission.

Table 8.1: Planned Dissemination of Report and Key messages (after Defra Gateway approval)

Organisation	
Defra	• Publication of report at Defra page on @gov.uk • Ian Boyd Blog summarising Government response based on summary of key findings (prepared by Steve Morris) Presentation of key findings: • Cross governmental Health and Safety Executive • Nanotechnology Strategy Forum (NSF) an ad-hoc expert advisory body with a membership drawn from industry, regulators, academia and NGOs. • University of Birmingham hosted Science, Policy and Evidence conference (late 2015) Ian Boyd, presentation • International Conference on Nanotechnology (Richard Vincent) • UNITAR (UN Initiative for Training and Research) https://www.unitar.org/cwm/nano • OECD Working Party on Nanotechnology (WPN) • Short Article to be presented to NanoRem2 European programme (Steve Morris)
Chemical Industries Association	• Report published to be published at website • Presentation of findings to Nanotechnology Environment and Health Industry Group (NEHIG) • Report published at interested member associations websites (e.g. British Adhesives and Sealants; Cosmetics, Toiletry and Perfumery; British Coatings Federation; British Aerosol Manufacturers' Associations) • Blogs to members
Sciencewise	• Publication of report at Sciencewise website • Publication of stimulus materials and talking heads videos at website

The Chemicals Industries Association anticipate that they and other industry associations interested in the production of NMs in general and those related to the case study applications in particular (Cosmetic, Toiletry and Perfume Association, British Coatings Federation) will also prepare short press releases highlighting key messages and disseminate the report through their websites.

Greenpeace is also likely to provide links to the report, highlighting that it is part of the evidence base available for understanding public attitudes to nanotechnology.

Lessons:

- It would be useful to develop an impact and dissemination plan with the Advisory Group and core management group at draft final report stage. This would also be the stage to fully explore gaps and further research needs. A lengthy finalisation process (May until November 2015) makes it difficult to maintain interest and momentum.
- Given the breadth and quality of the final stimulus materials it would be good to see these disseminated and reused (e.g. through existing nano websites or academic research).

9. Costs/Benefits

What was the balance overall of the costs and benefits of the dialogue?

9.1 Costs

Financial costs

For the entire public dialogue project, the total value of the contract was £105,420 of which £42,676 was provided from Sciencewise and the remainder from Defra. An in-kind contribution of £3,000 from the Chemical Industries Association was also received. This was later used to cover additional project management costs associated with wider stakeholder consultation and an extended timeframe. The independent evaluation budget was about £10,000 and this was equally split between Defra and Sciencewise.

The resources allocated were reasonable in relation to the number of participants (44 recruited for a sample of 40) and the number of events and hours (one location and 15 hours over three days). The budget covered: a literature review with a small allocation for an expert with past knowledge of nano research and dialogue; stakeholder mapping, consultation and workshop; stimulus materials development (including an out-sourced video animation on nanotechnology applications, regulation and testing) and internal piloting; venue hire, refreshments and participant incentives; hosting four Advisory Group meetings; and data analysis and reporting.

Given the ambition for the dialogue in terms of breadth of early stakeholder involvement, the number of experts and observers involved in the workshops; and the anticipated depth of analysis and quality of reporting, resources were tight. In terms of the quality of process, the numbers of stakeholders involved (over 100 in total), and the quality of stimulus materials the contractors have delivered real value for money.

However, it was clear from an early stage that the amount of time needed to get up to speed across four very different nano applications with a lot of contradictory scientific evidence had been under-estimated. Since the timetable was driven by budget considerations (with the comprehensive spending review on the horizon) rather than policy decisions it was possible to be flexible in extending the timeframe, but with very little contingency for extending the budget. Compromises therefore had to be made in the amount of time allocated to final analysis and relating the findings to the previous level of knowledge on public perceptions about nanotechnology.

In kind inputs

A large contributing factor to the success of the project was the contributions in kind through:

- **The Advisory Group**. Half of the 11 members attended every meeting either in person or by telephone, seven were very active in reviewing stimulus materials, three recorded talking heads videos and one attended the public dialogue workshops. Several members committed substantial time – four or five days each – while others spent about two days attending meetings and reviewing reports. We estimate that the total time inputs by the Advisory Group (including Defra members) were about 24 person days.

- **Defra project team** made significant time inputs to framing the dialogue, identifying and contacting individuals to join the Advisory Group and stakeholder workshops, managing expert inputs to the delivery team, reviewing stimulus material and participating as experts in the

public dialogue events (more than 1.5 months full time equivalent (FTE) during the scoping stage) and reviewing final reports. There was also significant time input attending all three dialogue events (at least four Defra participants for each day) and for four Defra participants to sit on the Advisory Group. The Defra team also responded to questions raised by participants between events. In total it is estimated that the project management team and wider project team (policy lead, scientific adviser, and social research advisers) spent almost 100 days of staff time. This exceeded expectations, but this level of engagement was very important in the success of the project.

- **Sciencewise** time inputs on this project were seen as fairly light touch with most input during the business plan, invitation to tender and early shaping of the process, review of stimulus materials and final reports.

Although time inputs exceeded what some Advisory Group members and the project management team had anticipated all reported that they felt it had been worth the effort in order to get the framing right and ensure that stimulus materials were accurate, balanced and accessible. Without these inputs the dialogue would not have gained the necessary support of industry.

9.2 Benefits

As noted in Section 8, this research is likely to be one input to the overall evidence base which informs Defra, industry and European Commission positions on policy and decision-making, regulations and communications around nanotechnology. Since these processes are not expected to conclude for 12-24 months it is too early to identify and value the benefits. Nevertheless, industry representatives consider that the report could have economic benefits if it informs a Government and EU position in favour of not imposing mandatory registers for nano materials. The Nanotechnology Supply Chain forum has previously highlighted that nano reporting is likely to be costly for industry, reflecting the difficulties in saying definitively what is and is not a nano material. The Supply Chain is concerned that the introduction of compulsory (or even bilateral voluntary) registers could lead downstream industries (such as car manufacturers) to avoid transactions costs by avoiding nanomaterials or nano-based technologies. This could constrain innovation and mean that the UK misses out on capturing a substantial share of the estimated $75 billion market in the UK, US and South East Asia by 2020[9]. A message from the public dialogues that the UK public appears to be generally supportive of nanotechnologies - where there are clear advantages and known and manageable risks from using it - and does not seem strongly in favour of registration would be considered a valuable contribution by the industry.

Lessons:

- **Trade-off between financial costs and in-kind time**. There are huge challenges for dialogue delivery contractors in taking all the available science in an area like nanomaterials and associated technologies and developing balanced and accessible stimulus materials. The time and costs for doing this were under-estimated in the original budget and tender. Extended timelines also resulted in greater expectations met largely through in kind time contributions by the project management team. In future it would be useful to have greater clarity about the relative responsibilities between commissioners and contractors; the time inputs expected and the trade-offs between financial costs and in kind contributions.

[9] http://www.researchandmarkets.com/research/kv6mm5/nanotechnology

- **Consider alternative approaches to pulling together the evidence base** (literature review and weighing up the evidence) such as:

    - including academic expertise in the contractor teams with longer contracts covering several dialogues so they can build up topic area expertise;
    - contracting universities with dialogues delivered by process specialists;
    - commissioning the literature review as a separate task; or
    - recognising and building in upfront time from project funders.

  We understand that the shortly-to-be-published paper on "Weight of Evidence" for Defra's Hazardous Substances Advisory Committee (HASC) may suggest ways of doing this which could be reflected in the design of future Sciencewise-supported and other public dialogue projects.

- **Involving policy makers in identifying implications**. A final event involving more policy makers and selected stakeholders after the final dialogue report is completed to explore the findings and tease out the implications for different policy areas and future research would have been useful and could further have enhanced the value added in contributing to the body of evidence on nanotechnology. Such an exercise will most likely take place in the short to medium term future and when the development and need for policy decisions become pertinent.

10. Credibility

Was the dialogue process seen by Advisory Group members as suitable and sufficiently credible for them to use the results with confidence?

10.1 Overall views

This dialogue report follows on from 10 years' experience of public engagement and dialogue in the nanotechnology area (see Section 1 for references). Both Defra and the Chemical Industries Association (CIA) were very clear that to add to this body of evidence would require a medium sized dialogue process with a focus on specific nanotechnological applications that allowed ample time for participants to get up to speed with the issues so that the nuances of what underlies their attitudes to risk and benefits could be explored. The resulting public dialogue process was a fairly standard Sciencewise approach with participants reconvened twice. Particularly valuable features here were the extent of stakeholder engagement during the scoping phase and the use of qualitative data analysis software to support the analysis of the dialogue results. This enabled several rounds of interrogation of the data by running queries to explore initial coding rounds in more detail.

Defra policy makers and CIA were pleased with the resulting process, mix of participants and the quality of debate within the groups. The policy audience interviewed found the process robust and the sample size sufficient for them to use the results with confidence.

10.2 Underlying factors

From the point of view of Defra and the Advisory Group members interviewed, the credibility of the process was enhanced by:

- The involvement of a respected social scientist as chair of the Advisory Group ;
- The Advisory Group and project management team being closely involved in scoping the case study applications, reviewing recruitment briefs, reviewing process designs and the framing and balance of stimulus materials;
- Extensive stakeholders engagement and involvement of sector specialists in rigorous review of the accuracy and completeness of fact sheets which underpinned the stimulus materials;
- The number and range of experts available to participants both in the dialogue room and on video;
- Recording of table and plenary sessions and professional transcription providing a full and accurate dataset for analysis and allowing extensive use of direct quotes in the final report; and
- Sciencewise contribution's in the early stages in developing the business case, tender documentation and recruiting contractors.

Stakeholder views on credibility and robustness

- *"It is not easy to do this and very difficult to frame risk and uncertainty in relation to nanotechnologies because there is so much science and so much of it conflicting – overall a good job" (Advisory Group member)*
- *"I felt that there was a good range of people involved so results probably representative of population. So improved my perception of the validity of public engagement conclusions" (Expert participant)*
- *"Very good to have industry so involved" (Advisory Group member)*

- *"Early drafts of stimulus materials seemed biased in favor of advantages – in the end they were fair and balanced, they didn't misrepresent views but did still tend to accentuate the positives" (Advisory Group member)*
- *"Direct quotes from participants in the final report are really helpful" (Defra)*
- *"Robust in terms of small sample and some insights but there are dangers of over-interpreting: Defra can't go away and make decisions [on the Moratorium] in a dark room now – they need to get input from industry, NGOs and academics before making decisions" (Advisory Group Member)*
- *"Last minute inputs from very different voices for sunscreens were not really appropriate – didn't fit with the established process for reviewing balance and accuracy of stimulus materials and appears to explain a change in mood from largely positive to negative views between Days 2 and 3" (Advisory Group member)*
- *"On the final day more focused sessions and smaller groups could have pushed participants and delivered more detailed reflections on trade-offs"*
- *"[Sciencewise input] useful but would have expected a slightly more hands on engagement"*
- *"Sciencewise brand is well respected" (Defra)*
- *"Initially promising, well delivered, more mature learnings under-looked [i.e. under-analysed]" (Advisory Group member)*
- *"[in future] we need to find better ways of reflecting the 1000's of papers and body of evidence that already exists in the nano area" (Advisory Group member)*
- *The preparatory stage was difficult – lots of info from lots of sources and very difficult to bring it all together – a difficult task to digest down to bite sized chunks" (Industry Association)*

Lessons:

- In framing the dialogues there was early concern that people would have negative preconceived ideas about nanotechnology if they were recruited knowing the topic. In the event people were fascinated by nano, even if they found some information complex or confusing. Future dialogues may be able to have a quicker lead in to nano issues, higher expectations of participants' ability to cope with complex information and push more on understanding the trade-offs between perceived benefits and risks.
- The involvement of a large number of experts in the room or on video gave real credibility from the point of view of the public. They were particularly interested in the views of regulators and the Greenpeace video which appeared to be more positive than expected. The credence given to independent voices underlines the importance of including them in such processes.
- Where dialogues are undertaken over a very short time frame there are likely to be tensions between being open, transparent and representing all views and available information versus rigorous evidence review. Some concerns were expressed by Advisory Group members about the late introduction of human toxicological information on sunscreens. Ideally this information and voice would have been identified earlier, with enough time for review by the Advisory Group.

11. Conclusions and Lessons

What are the lessons for the future (what worked well and less well, and more widely)?

- **Framing and reporting** – the broad framing covering 12 sectors where nanotechnologies are being applied and utilised and the four case studies of specific applications (land remediation, fuel additives, paint and sunscreens) resulted in a well-written and structured report. The outcomes of the work will contribute to the evidence base in terms of public opinion on benefits and risks of both generic and specific nano-based applications.

- **Scoping and developing stimulus materials**. Topics of this nature with extensive existing literature - often conflicting – across many scientific disciplines, industries, regulators and NGOs, will always be a challenge for process specialists to collate, digest and turn into stimulus materials. Stakeholders and Advisory Group members played key roles in pulling together material, verifying accuracy and ensuring balance. But the process was arduous for the delivery team and time consuming for others. Future options worth considering include: a separate contract for a neutral expert (academic organisation or NGO) to compile balanced background data which a delivery team can draw on; a detailed review of state of scientific evidence compiled by/for the commissioning department; resources for stakeholder involvement through smaller sub-groups in each case study area; or building up expertise in delivery teams through a longer term approach to commissioning.

- **High quality stimulus materials and the variety of techniques** developed by OPM for the workshops (including self-discovery wallcharts, carousels, role play, video animation and talking heads videos) meant that people could learn as much or as little as they felt they needed in order to be informed. Most had an appetite for more rather than less information, and were genuinely enthusiastic about learning more about nanotechnology, rather than having negative preconceptions, as had been feared. In future dialogues it might be possible to get into nano more quickly, provide more detail and push further on trade-offs between benefits and risks.

- **Facilitation by OPM was professional, independent and effective**. The warm, approachable style made participants feel at ease, able to contribute and to ask questions even in large plenary sessions. For such a wide and complex topic the continuity of facilitators between the stakeholder workshop and the three public workshops proved really important in building knowledge, confidence and the team's ability to probe and extract rich material from the discussions.

- **"Expert" inputs in person and by video were crucial to the overall success of the project**. Participants appreciated the opportunity to ask questions and hear different viewpoints. The large Defra presence helped increase participants' confidence in how the outcomes would be used and in Government's role in regulation. The process design with one centralised group over 3 days made recruitment of the necessary range and number of experts possible and could not have been replicated if the approach of more locations and smaller workshops had been taken. Nevertheless, the time involved for the project management team in finding and recruiting experts should not be underestimated.

- **The project delivered Value for Money (VFM)** in terms of the financial costs for contractor budget. This was made possible by the significant in-kind time contribution by Defra, Advisory Group members, and experts (in the room, on video and in reviewing stimulus materials). Convening the Advisory Group, involving the right experts, developing stimulus materials (commissioners and contractors) were all more time intensive than expected. In future relative responsibilities for these tasks between commissioners, delivery contractors and Advisory Group members need to be clarified from the start.

- **A small Advisory Group** represented a good mix of social and scientific academics, government, industry and NGO members and played a valuable role in framing the dialogue, shaping the design and materials and reviewing final outputs. In future for short projects it would be helpful to set up the Advisory Group in advance of commissioning contractors to increase ownership, reduce the administrative burden on commissioners and delivery contractors, and enable more participation from NGOs. A final extended Advisory Group meeting with policy makers would also be useful in teasing out the policy and research implications of the dialogue results, developing dissemination plans and agreeing next steps.

- **Timing**. Initially an eight month project, this project extended to over a year. The initial delivery timescale was unrealistically tight and was extended early on to allow more time for scoping, engaging with a wider range of stakeholders, collating their input and developing and piloting of stimulus materials. Deadlines for analysis, reporting and the Defra's final approval process were also extended. The process benefited overall from an extended timetable and essentially this enabled sensible timeframes to ensure the best quality outputs. Future dialogue projects should ensure that delivery timelines are realistic in relation to policy timetables.

- **Creeping expectations**. Time slippage has undoubtedly contributed to high expectations of the final dialogue report from the commissioners. In future, aspirations for a more academic social research report will need to be clearly built into the tender documentation including allowance for a robust literature review and additional layer of analysis of the findings. This might require specifying academic input in delivery teams or commissioning literature reviews separately. It would also be helpful to reconvene selected stakeholders after the draft report, with time to review the findings and help tease out the implications for future research.

- **Impact**. All participants learnt something new, both about nanomaterials and nanotechnologies (public participants) or public dialogue processes (experts and policy advisors), and the vast majority feel that this dialogue process should and will inform government policy. The report fulfils a long-standing request by Ministers to understand more about the public's views on nanotechnology in general and will allow decision makers to react to any likely policy decision they may face in the future. In the medium term it will feed into two open policy questions:

    - The **European Commission proposal on transparency and nano registers, and the REACH Directive**, which is likely to be published in early 2016. The report will provide evidence of the public's views and - in conjunction with wider stakeholder evidence on legal issues and economic costs and benefits - will help to inform Government's response.

    - The **2005 moratorium on nano Zero-Valent Iron (nZVI) in land remediation** which will be reviewed when there is momentum for Government to lift the moratorium, probably when

more evidence is available through the European Commission-funded NanoRem project. At this point the dialogue report will be part of the evidence alongside the latest scientific and economic evidence to emerge from the project.

- More immediately the dialogue report is expected to be a useful input to the wider debate on Responsible Innovation across the nanotechnology sector. Outputs and outcomes will feed into the new Nanotechnology Environment and Health Industry Group (NEHIG) being set up by Defra, Innovate UK and industry.

Annex A: Stakeholder Participants

Advisory Group Members

Nick Pigeon	(Chair) Cardiff University
Roger Pullin	Chemical Industries Association
Barry Park	GBP Consulting
Terry Wilkins	NanoManufacturing Institute, Leeds University
Patrice Mongelard	Defra
Phil Townsend	Marks and Spencer's
Linda Crane	British Retail Consortium
David Santillo	Greenpeace
Kieron Stanley	Defra, Senior Social Scientist
Daniel Start	Sciencewise
Hilary Sutcliffe	Matter

Project management team

Diane Beddoes	OPM Group, Project Director
Caitilin McMillan	OPM Group, Project Manager
Zoey Litchfield	OPM Group
Steve Morris	Defra, Project Manager
Steve Morgan	Defra, co-Project Manager and Senior Policy Advisor
Kieron Stanley	Defra, Senior Social Scientist
Ian Sutherland	Defra, Observer
Daniel Start	Sciencewise
Anna MacGillivray	Ursus Consulting (Evaluator)

Expert participants in public workshop events

Richard Vincent	Defra
Alex Price	BSI
Bob Lee	University of Birmingham
Alison Mohr	University of Nottingham
Blake Plowman	University of Oxford
Iseult Lynch	University of Birmingham
Rachel Smith	Public Health England
Paula Mendes	University of Birmingham
Darren Budd	BTC Europe
Richard Compton	Oxford University, Compton School
Tom Bartlett	Oxford University, Compton School
Qianqi 'Ivana' Lin	Oxford University, Compton School
Kristina Tschulik	Oxford University, Compton School

Annex B: Stakeholder Workshop Attendees 11th December 2014 and evaluation responses

Peter Dobson	Material scientists, Oxford University
Nicole Grobert	Department of Materials, Oxford University
Vicki Stone	Environmental scientist, Heriott Watt University
Bob Lee	Birmingham University
Trevor Howard	Environment Agency
Richard Hawkins	Environment Agency
Stephen Holgate	Hazardous Substances Advisory (Committee) HSAC Chair
Nick Boley	Laboratory of the Government Chemist (LGC) technology and policy consultant
Martin McVay	Natural Resources Wales; Policy Advisor (Environment, noise and chemicals)
Rachel Smith	Public Health England (PHE)
Jon Graves	Dept. for Health (DH)
John Wilkinson	Medicines and Healthcare Products Regulatory Agency
Quasim Chaudhry	Food & Environment Research Agency (Fera)
Roger Pullin	Chemical Industries Association (CIA)
Barry Park	GBP Consulting (materials specialist)
Darren Budd	BASF plc, BTC UK, paints and coatings
Alec Reader	SME-Nano Knowledge Transfer Network
Lien Ngo	InnovateUK, Research Council UK, advanced materials
Chris Flower	Cosmetic, Toiletry & Perfume Association (CTPA)
Paul Jackson	British Aerosol Manufactures Association (BAMA)
Trevor Fielding	British Coatings Federation (BCF) - regulatory affairs manager
Keneth Chinyama	Food & Drink Federation (FDF), food safety executive
Jim Palmer	British Adhesives & Sealants Association (BASA)
Terry Woolmer	Engineering Employers' Federation. (EEF)
Judith Natanail	Land Quality Management Ltd. (land remediation)
Stuart Challenor	Tesco
Ellie Gilvin	Quantum Technologies, Engineering and physical sciences research council
Pieter van Broekhuizen	Nanotechnology and Chemical Risks IVAM UvA Amsterdam
Steffi Friedrichs	Nanotechnology Industries Association, Dir Gen, Brussels
Andrej Kobe	DG Environment
Erica Poot	DG Research & Innovation
Donald Bruce	EdinEthics
Sunita Gordon	Head of External Affairs-University World News (previous EU Projects Nanotechnology and NanOpinion)
Alex Price	British Standards Institute
Charles Clifford	National Physical Laboratory
Gary Hutchison	Edinburgh Napier University, Centre for nano safety
Denis Koltsov	BREC Solutions Ltd

Stakeholder Event, 12th December 2014

37 stakeholder attendees, 33 fully (34 partially) completed questionnaires.

1	The aims of the public dialogue project and the objectives of this event were made clear	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree**	**Strongly Agree**	**Don't Know**
		0%	**3%**	**6%**	**63.6%**	**27.3%**	**0%**
	Comments: • "It became clearer as the day went on, but not so much initially" • "Would have been useful to present more background - why now?" • "Need to make clear extent of detail aimed at the public" • "The choice of case studies was rather Defra orientated. Food/drink and pharmaceuticals would have been good"						
2	The mix of stakeholders was diverse enough to explore the full range of debates, aspirations and concerns about nanotechnology	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree**	**Strongly Agree**	**Don't Know**
	Academics – 4 Government (non Defra) 9 Regulators – 4 Grant and policy makers – 3 NGO/media – 2 Industry and business – 14	**0%**	**3%**	**3%**	**39.4%**	**54.5%**	**0%**
	Comments: • "Yes, very good" • "Good mix, but full range was not reachable due to time and format" • "the groups were too large for everyone to contribute fully" NGOs and civil society representation: • "more NGOs?" • "limited number of people with significant adverse view points" • "Absence of NGOs critical of the technologies" • "Strong public representation missing" Industry sectors: • "Food sector could have been better represented" • "Food/drink industry missing" Disciplines: • "Missing psychology/social sciences" • "Ethics was not covered. Psychology would also have been important to include"						
3	There was sufficient time overall to discuss the issues properly	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree**	**Strongly Agree**	**Don't Know**
	94% felt timing was OK	**0%**	**3%**	**3%**	**57.6%**	**36.3%**	**0%**
	Comments: • "A little more time to tie up the discussions was needed" • "Longer breaks would help. It was rather rushed"						
4	The materials presented cover the key benefits and concerns with nanotechnology in a balanced way	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree √**	**Strongly Agree**	**Don't Know**
	30% didn't agree that the materials presented were yet balanced	**0%**	**21.2%**	**9.1%**	**57.6%**	**12.1%**	**0%**

	Comments: • "For the morning session this was the case". • "Remediation case study needs improvement, especially for accuracy" • "Materials need to be developed somewhat - unclear in many parts" • "Nanotechnologies as a concept (rather than an actual example) was less discussed and should be considered"						
5	There were sufficient opportunities to inform the development of case study materials	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree √**	**Strongly Agree**	**Don't Know**
	Most (88%) agreed but a sizeable minority (9%) tended to disagree	**0%**	**9.1%**	**3.0%**	**60.6%**	**27.2%**	**0%**
	• "I felt the materials provided were good but with a few minor points that I commented ahead of the meeting". • "Too little time to develop ideas"						
6	The facilitation was independent, professional and effective	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree**	**Strongly Agree √**	**Don't Know**
	Unanimous agreement on quality of the facilitation.	**0%**	**0%**	**0%**	**36.4%**	**63.6%**	**0%**
	Comments: • "Professional on managing but the nano papers were not yet fully professional"						
7	This type of process <u>should be</u> used by government and industry to ensure responsible innovation in nanotechnology	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree √**	**Strongly Agree**	**Don't Know**
	79% agreed but 21% not yet sure	**0%**	**0%**	**21.2%**	**33.3%**	**45.4%**	**0**
	Comments: • "It's not clear yet" • "Yes, a great idea" • "Nanotechnology is such a broad issue - maybe more useful to focus RI on more application specific ideas"						
8	The outputs of this process <u>will</u> help inform responsible innovation in nanotechnology	**Strongly Disagree**	**Tend to Disagree**	**Neither**	**Tend to Agree √**	**Strongly Agree**	**Don't Know**
	30% not clear whether or how the dialogue will actually inform policy	**0%**	**0%**	**30.3%**	**39.4%**	**24.2%**	**6%**
	Comments: • "I hope so. The concern I have is that with the upcoming election a change in politics will again stop this dialogue, especially if there are further Departmental budget cuts" • "I am not sure everyone really understands the term "innovation" and this remark applies to Govt and investors!" • "Not sure how helpful the public will be" • "Not clear yet" • "Depends on application areas"						

9 Benefits stakeholders identified that this process could have for the nanotechnology areas they are interested in

Part of a responsible process (policy and innovation strategy)

- "Part of a process of responsible innovation. May help to avoid pitfalls"
- "Responsible innovation has more far-reaching implications than solely for nanotechnology or any other emerging technology. However, the example set by nanotechnology is a good one to follow for other new technologies such as systems biology, quantum technology and even GM!"
- "Allow lifting of moratorium [on land remediation]"
- "Support in effective communication [in EC policy making]"
- "Aligning [European Commission] R&D to values, needs and expectations of society"
- "Engagement of citizens/CSO/professionals"
- "Engagement with consumers and education on the benefits of nano"
- "Many across medicines and devices"

Better understanding of the publics' concerns

- "Clearer understanding of public perceptions and concerns and the best way to communicate benefits"
- "Understanding public concerns will be very helpful in preparing to deal with any issues arising for products containing nanomaterials"
- "[personally] greater awareness of pros and cons. Hearing other people's points of view. Networking opportunities"
- "Clarity of labelling and ethical positioning of nano projects"

Informing the public

- "Informing stakeholders and public"
- "Clarify issues with consumers/media"
- "Clarifying thinking about aligning public presentation of use of nano"
- "Clarity of message on nano in general and on key case studies"

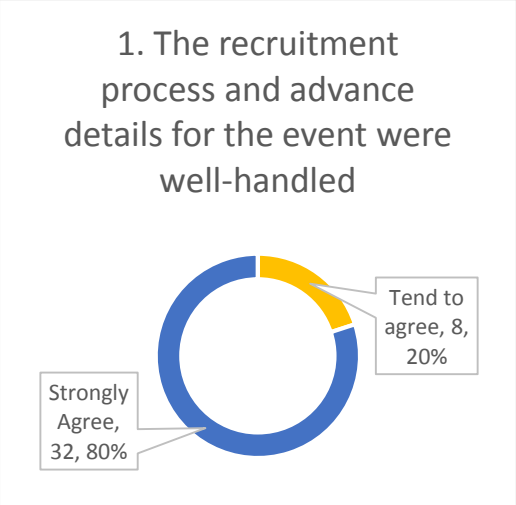
11 Additional comments

- "We have to get across that in dealing with nanotechnology we are deeply concerned about public safety and at the same time we are able to identify and contribute to "risks" in many other aspects of consumer products that do not necessarily involve nanostructured material in the usual sense".
- "We are submitting an application to Horizon 2020 on Nano governance that could link to this initiative"
- "A great start"
- "Hope outputs useful for informing/engaging our stakeholders"
- "Good meeting - interesting and experienced group"
- "Balanced" information for the public please"
- "The case studies need to be simplified and made shorter or to be structured so that the attendees to the workshops can access information to the level that they can understand"
- "Would have been useful to have had a list of delegates"
- "Good initiative"
- "Some reflection may follow in GMAK (e.g. on materials)"

Annex C: Evaluation responses for public dialogue events

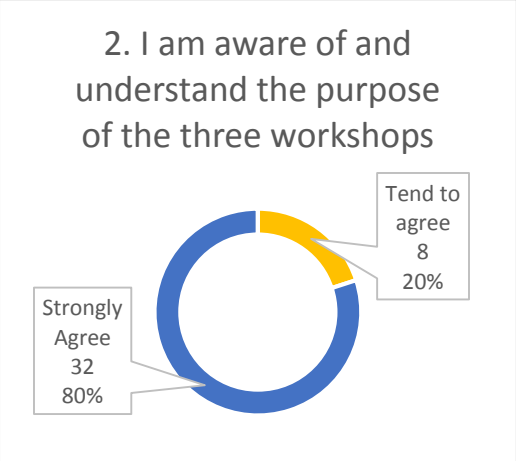
SUMMARY

3 days: 10-1pm, 10-4 and 10-4 every other Saturday February and March 2015.
1 Location: Austin Court, Birmingham
Total 44 participants first day, 43 second day, 40 final day
40 evaluation forms (but 1 participant only completed half the questions)
Total £160/participant reward made as three payments (£40, £50, £70).



Out of 40 respondents 80% strongly and 20% tended to agree that recruitment was well-handled. Two participants dropped out from Day one, both for family and health reasons, but due to over-recruitment the target number was achieved.

Experts generally agreed that there was a good enough mix of people. Specific comments included:
"I am not sure that "serial participants" who are doing it for the money are necessarily the best cross-section, but I guess in terms of backgrounds and experience coverage was good".

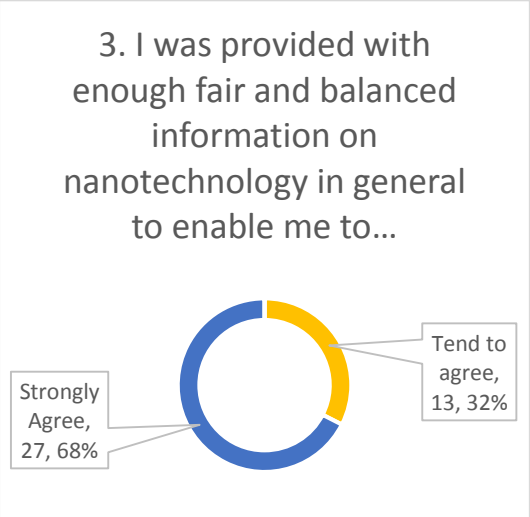


All participants reported they understood the purpose of the three workshops. The introductions on Day 1 included and slide and during recaps on Days 2 and 3 Defra participants reiterated what they hoped to get out of the process.

Experts also agreed (3 tended to 5 strongly) that participants understood the objectives of the meetings:

- *I think once we started it was made clear to the participants, but certainly the 1st day many were expecting a food tasting or such. They must get well paid to have given up so much time for it!*
- *(Yes) but difficult to say as I missed the context of the first workshop. My "evidence" that it seemed to be clear was that many delegates carried out their own, relevant, research between events*

Lessons:
Not clear whether not mentioning nanotechnology in the recruitment brief was necessary as people were interested and reportedly some thought they were coming for a food tasting!



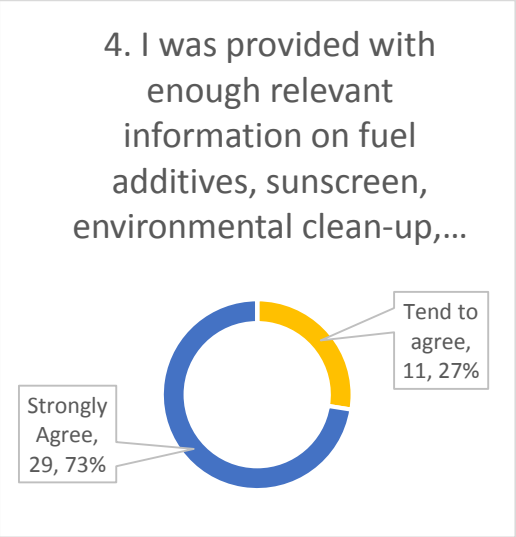
100% (27 strongly, 13 tended to agree out of 40) agreed that stimulus information on nanotechnology in general was fair and balanced to enable them to contribute to the discussion.

Lessons:
Stimulus materials on all three days had a lot to cover including an introduction to the science of nanotechnology, its applications in 10 different sectors and the potential risks and benefits of nano compared to conventional approaches.

Q All the main issues were covered and the time spent on each was balanced: 4 tended to agree, 3 strongly and one wasn't sure. Comments included:

- *"I thought the timing was good, and allowing time in groups as well as in open discussion was good".*

- *"Although balanced there was never enough time! I think that is testament to the participants' interest and commitment. We travelled a lot of tangents though, and perhaps a bit more steering would have helped to focus discussions – always difficult to get that balance right".*



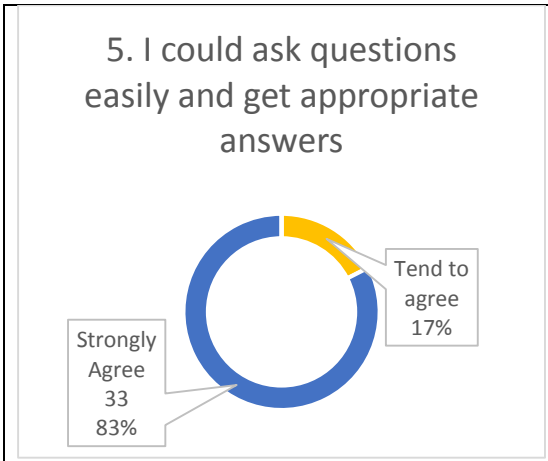
Stimulus materials on the four case study applications were well received with 70% strongly agreeing and 27% tending to agree that they were provided with enough relevant information to allow them to contribute to discussions.

- *"real sunscreen made available"*

Experts view:

- *"The case study for environmental clean-up could have been better – it focused attention on issues that would not be relevant during practical application (cabbages), but did bring the issue closer to home".*

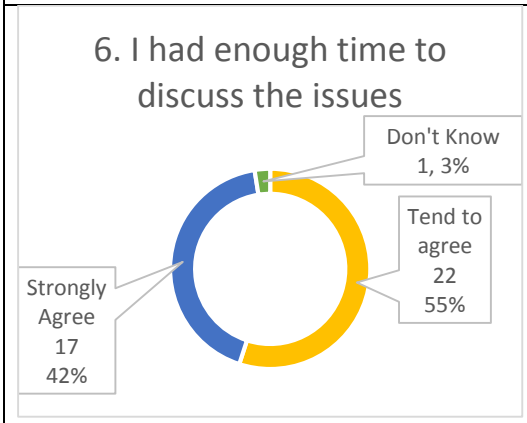
Case study materials were visual, clear and easily understood by the groups during the carousel sessions. The talking heads sessions on the benefits and potential risks of the case study and the video animation (played twice) were well received.
Lessons: Stimulus materials went through many iterations, with active contributions and comments from members of the AG, wider stakeholders (industry group) and the project management team who invested a lot of time in reviewing materials and making suggestions. Internal piloting useful in further simplifying materials.



All 40 participants (83% strongly and 17% tended to agree) felt they were easily able to get appropriate answers to their questions.
"scientist readily answered any questions"

Lessons:

- Experts able to provide balanced views having been individually briefed in advance by the PD and then briefed as a group on the day. All were able to be in listening mode and only respond to questions when asked to do so.
- Quite of a lot of effort into taking questions on day 1, answering all of them in the room. Questions were then grouped into common categories on Days 2 and 3 and were part of the stimulus materials around the room, with the lead facilitator picking out some and asking experts to answer them as a form of recap.



There was a huge amount of material to cover but participants were almost unanimous (42% strongly agreed, 55% tended to agree, 3% didn't know) that they had enough time to discuss the issues.
"Sometimes we were moved on long before we had finished our discussion"

Lessons:

- From the early stages AG and project management team, the delivery team and the evaluator were aware that 4 case studies would be challenging and so a lot of thought went into planning the approach and designing sessions so that they would not feel too rushed.
- Carousel sessions good use of time.
- Groups moving around for scenarios useful for movement and keeping session lively but these did feel a bit rushed
- Some concerns about whether enough of the discussion at the carousels for the individual case studies was being captured as these sessions were not recorded.
- Internal pilot sessions useful in adjusting timings.
- Full design of each session in the 2 week period based on lessons from the last one useful in making sure that the timings worked.
- Flexibility in ending Day 2 a little early helpful in keeping people engaged and enthusiastic.

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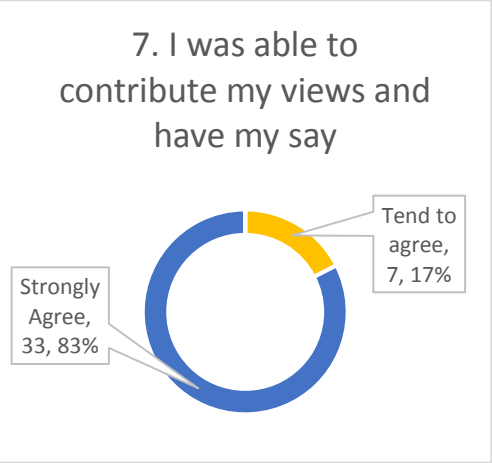
<td> 
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<td>All participants (40/40) felt that they were able to contribute their view and have their say. Facilitators managed groups successfully so that everyone felt they were able to contribute and a few participants who tended to dominate or get side-tracked were successfully managed.
“Easy 2 way engagement”
“Good discussions”

Lessons:
• Warm up session on developing the ground rules was successful in setting the tone and creating a very collaborative atmosphere.
• Groups of 8-9 were representative of the gender and ethnic mix but not segmented by socio-economic group. The groups were kept together over the 3 days and participants appeared to feel very relaxed. Most participated very actively and did not appear shy talking in their group or plenary.</td>
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<td>There was unanimous agreement (88% strongly and 12% tended to agree) on the independent, professional and effective facilitation.

Lessons:
• Appropriate ratio of facilitators to participants (1:8) with note taking mainly on stickies and recording of discussions for transcription.
• Continuity over the 3 events (and stakeholder workshop) with the same Lead Facilitator and 4 table facilitators for all 3 days (and indeed with the initial stakeholder event so that facilitators were well informed about their case study area).
• Warm, purposeful style of facilitation
• Clear separation between role of facilitators and experts.
• Facilitators had to do some role play and over the different sessions energetically probe responses.</td>
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<td>All participants (90% strongly and 10% tending to agree) found ‘expert’ participants helpful in answering questions
“Good selection of experts both present and by video”.
“Their comments were very useful at times”
“Excellent answers in particular the scientists”
“Except Spanish lady accent, hard to hear and understand”
“Very helpful”
“Had really interesting and informative chats at every sessions”
Having observers in the room: “Didn't even notice”

Lessons:
• Huge effort in getting a balanced range of experts (academics, industry specialists and Defra and regulators) to all three meetings
• Individually briefed in advance by the PD and then briefed as a group on the day</td>
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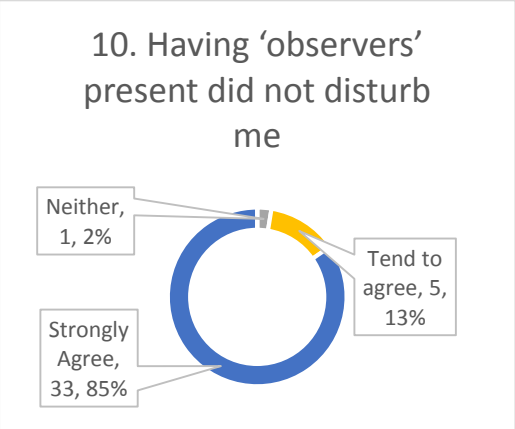
<td> 
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- All were able to be in listening mode and only respond to questions when asked to do so and from as neutral a perspective as possible.

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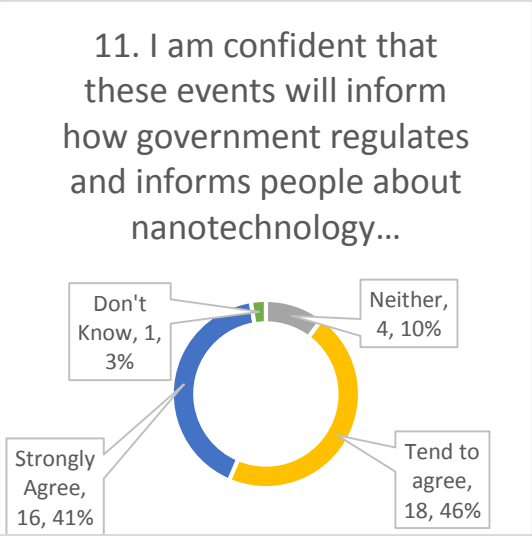
<td> 
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<td>Although 87% (34 out of 39) of respondents felt confident that the events will inform how government regulates and informs people about nanotechnology applications a small minority (5 out of 39) were not sure. Some felt sceptical about the role of government. "Not sure that government will listen to what we have said" while others thought "It will be supportive"
Lessons:

High number of Defra participants and reiteration of how they intended to use the results gave the vast majority confidence.
Day 3 session which was designed to counter-balance the very positive discussions on Day 2 when very few participants identified any real challenges or risks from using nanotechnology.
Inclusion of specialists (academic and BSI) on regulation was useful in explaining how responsible innovation processes work.
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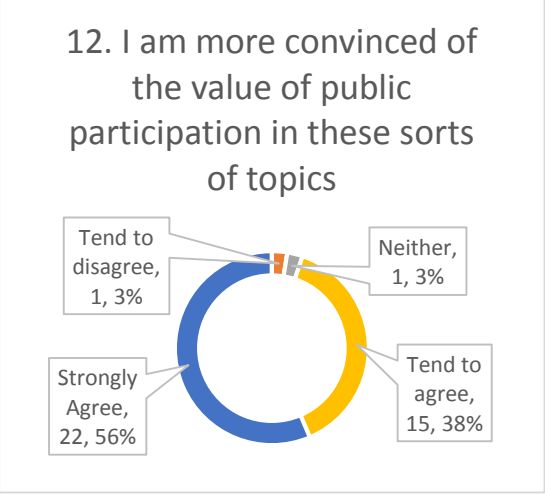
<td> 
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<td>94% (37 out of 39) of participants (56% strongly, 38% tended to agree) felt more convinced of the value of public participation in topics such as nanotechnology than they had at the outset. One participant tended to disagree and another was not sure.

94% (37 out of 39) also reported they were likely to get involved in these types of dialogues in the future.

In follow up questions:

79% (30 out of 38) were prepared to be re-contacted by the evaluator for a short follow up interview
65% (25 out of 38) would like to receive other information from Sciencewise including possible opportunities to be involved in other topics of dialogue
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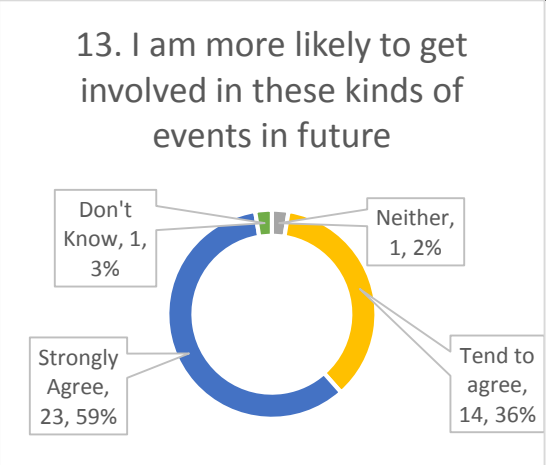

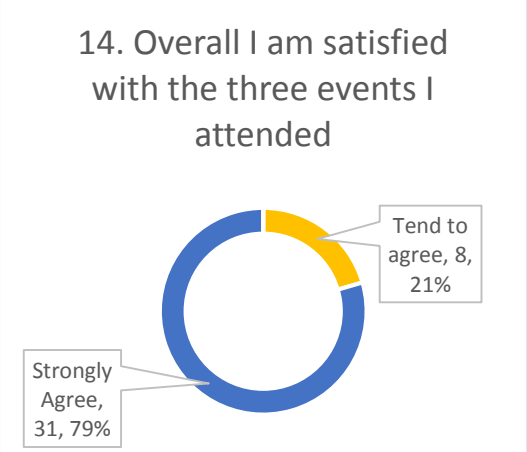

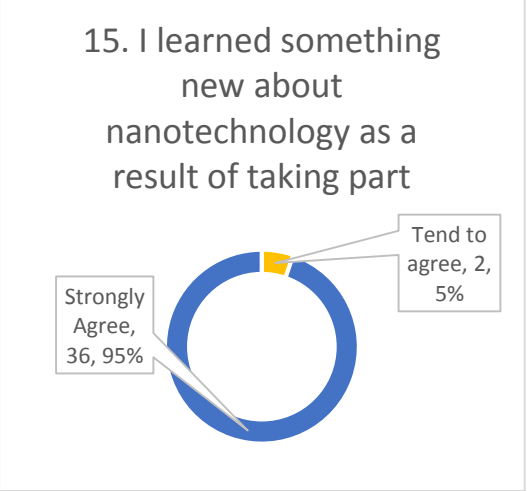

Participants were unanimously satisfied (39 out of 39) were satisfied with the three events they took part in. Typical overall comments about the events are shown in the word cloud.

"Really enjoyed the process"
"Really engaged in all 3 sessions"
"Very interesting 3 days".
"I have learnt a lot".
"Enjoyed"
"A fantastic 3 days of nano information".
"Fantastic discussions with the professionals"
"Given me things to think about"
"Many thanks for the opportunity to take part"
"Great day"
"Thank you, I would like to receive the report when it is out"
"Everything was professionally executed"
"Good sessions".
"Last session worked well. Good to have an activity straight after lunch"
"Great location. Good selection of participants".
"Fantastic and interesting workshop"
Found the 3 days very informative"

Participants were overwhelmingly positive about having learnt a lot as a result of taking part. 95% (out of 39) strongly agreed and 5% tended to agree. This was confirmed by informal discussions with participants throughout the 3 days with people reporting that they had known almost nothing about nanotechnology and felt they had learned a lot with specific examples as follows:

"The importance of regulation"
"To look at ingredients more"
"Lack of regulation"
"Risks and benefits - what it is and how it's different"

"That nano tech is involved having no knowledge before"
"That nano is quite possibly the future"
"Nano is actually about size rather than a 'thing'"
"It's advantageous to future longevity"
"What nano can do"

	"(Nano) flexibility of use" *"What nano means!"* *"That nano is already in many products and the potential for nano is great"* *"That nano is a size, but that the small size increases surface area and increases reactivity. They can be natural and manmade. Can bring many benefits to us all that we are unaware of what we have"* *"It opened my eyes to the uses (nano) has that are already in daily use* *what nano is"* *"The benefits of nanotech and how it is used"* *"Everything. I didn't have a clue (before)"* **Lessons** • Variety of stimulus materials and level they were pitched at • Variety of learning methods – written, videos, role play, Q+A
Logistics and sustainability	The rooms set up, food and overall professionalism of the event was very good on all three days. The room was expanded for the second and third events which made it easier to hear experts, view stimulus materials and move around. IT (talking heads and animation videos) worked well **Lessons:** • Second day finished half an hour early as participants were exhausted and facilitators judged further discussions would not be as productive. • Refreshments provided were healthy, ample and with plenty of vegetarian choices.