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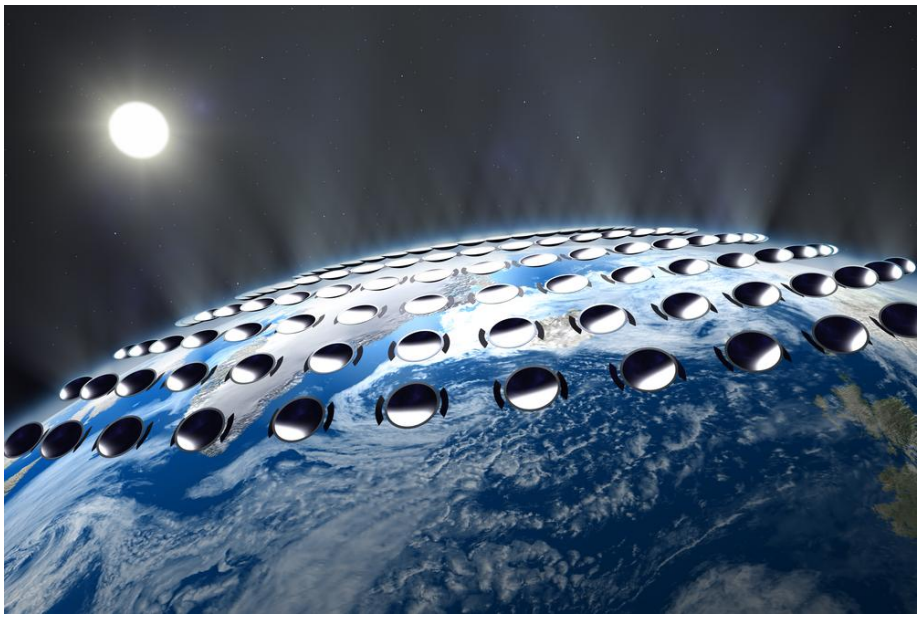
FINAL REPORT
Prepared for the Natural Environment Research Council and Sciencewise-ERC

Evaluation of 'Experiment Earth?' Public Dialogue on Geoengineering



Experiment Earth? Public Dialogue on Geoengineering

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Executive Summary

This report provides an account of the evaluation of the Public Dialogue on Geoengineering commissioned by the Natural Environment Research Council (NERC) with co-funding from the Sciencewise Expert Resource Centre (ERC). The public dialogue was carried out between February – May 2010 and consisted of three sets of 30 (90) members of the public meeting twice to discuss geoengineering technologies and issues, supported by scientists. A sample of those (31) came to a third event to meet and discuss the issues with scientists. In addition there was an on-line survey, and three public access events. The evaluation was carried out during and after the dialogue process from February – November 2010. The objectives of the evaluation, as set out in the specification, were:

a) To establish whether the dialogue had met its objectives.

b) To identify whether the dialogue had met standards of good practice (Sciencewise-ERC principles[1]).

c) To assess the views of participants as to whether the dialogue had been of value to them.

d) To assess the success of the governance of the project, including the role of advisory panels, stakeholder groups and the Sciencewise-ERC support role.

e) To identify what, if any, difference/impact the dialogue had.

f) To identify the balance overall of the costs and benefits of the dialogue.

g) To identify any lessons for the future (what worked well and less well, and more widely) arising from the dialogue process.

The Sciencewise-ERC principles of good practice for public dialogue were used to evaluate the process. The five principles are: Context, Scope, Delivery, Impact and Evaluation and they seek to ensure that: the conditions leading to the dialogue process are conducive to the best outcomes (Context); the range of issues and policy opinions covered in the dialogue reflects the participants' interests (Scope); the dialogue process itself represents best practice in design and execution (Delivery); the outputs of dialogue can deliver the desired outcomes (Impact) and that the process is shown to be robust and contributes to learning (Evaluation). In addition, aspects of governance and costs and benefits of the dialogue were examined.

Observation of stakeholder meetings and a sample of the dialogue events, questionnaires and telephone interviews with public participants, and interviews with other stakeholders and the delivery team were used to evaluate the dialogue process.

In terms of the findings, overall, the objectives of the dialogue project were considered to have been met, although some greater clarity in communicating those objectives to participants would have been helpful. There was a consensus that the timing of the dialogue process was appropriate, in that it was linked into the NERC research development process as well as the "sandpit"[2] on geoengineering research. This together with the active involvement of key personnel from NERC provided very good conditions for the dialogue process to have influence. In terms of scope, whilst issues of climate change mitigation were raised by participants and there was some desire to situate the discussions in a wider context of environmental change, the participants felt able to raise key issues and felt the exchanges with scientists were extremely valuable. All participants agreed that the facilitation of the Events met the objectives of transparency, deliberation, and inclusivity very well. The design of the Events was very good but the amount of information provision in Events 1 and 3

[1] Sciencewise-ERC has developed a set of principles for public dialogues on science and technology which were used in this evaluation. They can be found http://www.sciencewise-erc.org.uk/cms/guiding-principles/

[2] A sandpit is a residential interactive workshop over 5 days involving 20-30 participants, the director, a team of expert mentors and a number of independent stakeholders. An essential element of a sandpit is a highly multidisciplinary mix of

limited time for longer discussions between participants, but perhaps this was inevitable given the complex nature of the topic. Finally, in terms of impact it was clear that the process had a positive impact on participants (both expert and members of the public) in terms of learning and experience. Further, the immediate impact on the "sandpit" event was considered important. However, there was ambivalence over the extent of the wider impact that the dialogue process would have on decisions about geoengineering research in the longer term, but it should be remembered that this was a relatively small-scale one-off activity, and one of the conclusions in the dialogue report was that it should be an on-going process.

Six learning points were drawn out from the evaluation research and summarise learning about what worked well and what worked less well in the dialogue process:

- Learning point 1: Value and cultivate the multiple benefits of bringing the public and scientists together in scientific discussions
- Learning point 2: Ask members of the public to use their own expertise and don't expect them to become scientists
- Learning point 3: Be clear about what the public can influence and make sure they are clear throughout
- Learning point 4: Engaging with the public involves practical responses
- Learning point 5: It's worth investing in making partnerships work
- Learning point 6: Dialogue and market research have different purposes

1. Introduction

1.1 This report provides an account of the evaluation of the NERC Public Dialogue on Geoengineering. The public dialogue was carried out between February – May 2010 and the evaluation was carried out during and after the dialogue process from February – November 2010.

1.2 The Sciencewise Expert Resource Centre[3] (ERC) (part-funders of this public dialogue) requires independent evaluation. Collingwood Environmental Planning with Elham Kashefi[4], Kathryn Rathouse[4] and Joanna Haigh[5] were appointed to carry out that evaluation.

1.3 This report presents:

- Evaluation aims and approach
- Background to the dialogue process (what, where, who, how)
- Evaluation findings:
  - Objectives
  - Context
  - Scope
  - Delivery
  - Impact of the dialogue
  - Dialogue governance
  - Dialogue costs and benefits
- Learning points for the future arising from the dialogue process

[3] The Sciencewise Expert Resource Centre (Sciencewise – ERC) is funded by the Department for Business, Innovation and Skills and helps policy makers to understand and use public dialogue to inspire, inform and improve policy decisions around science and technology.
[4] Independent researcher
[5] Imperial College Consultants Ltd

2. Evaluation Aims and Approach

Aims of evaluation

2.1 The overall aim was to provide an independent evaluation of the NERC public dialogue on geoengineering. The objectives of the evaluation, as set out in the specification, were:

i) To establish whether the dialogue had met its objectives.

i) To identify whether the dialogue had met standards of good practice (Sciencewise-ERC principles).

ii) To assess the views of participants as to whether the dialogue had been of value to them.

iii) To assess the success of the governance of the project, including the role of advisory panels, stakeholder groups and the Sciencewise-ERC support role.

iv) To identify what, if any, difference/impact the dialogue had.

v) To identify the balance overall of the costs and benefits of the dialogue.

vi) To identify any lessons for the future (what worked well and less well, and more widely) arising from the dialogue process.

2.2 The Sciencewise-ERC principles of good practice for public dialogue were used to evaluate the process. The principles seek to ensure that:

i) The conditions leading to the dialogue process are conducive to the best outcomes (Context).

ii) The range of issues and policy opinions covered in the dialogue reflects the participants' interests (Scope).

iii) The dialogue process itself represents best practice in design and execution (Delivery).

iv) The outputs of dialogue can deliver the desired outcomes (Impact).

v) The process is shown to be robust and contributes to learning (Evaluation).

2.3 This report fulfils the fifth Sciencewise-ERC principle of undertaking evaluation. More details on each of the other four principles are given in the findings sections relating to each principle.

2.4 To use these principles effectively a number of questions for each principle were devised and these were used to structure observations of meetings and dialogue events (see Appendix 1 for observation schedule); questionnaires (see Appendices 3 and 4); and as the basis of the interview schedules used with participants after the dialogue process.

Evaluation approach

2.5 To collect data for the evaluation three methods were used:

i) Meeting and event observations

ii) Post-event feedback forms

iii) Post-dialogue Interviews

2.6 In addition, the materials that were developed for use with the public during the dialogue project were reviewed.

Observations

Data collection

2.7 The following events were attended and observed by members of the evaluation team:

- Two Steering Group and two Management Team meetings
- NGO materials development meeting
- Dialogue Event 1 and 2 meetings in Birmingham
- Dialogue Event 2 meeting in Cardiff
- Dialogue Event 3 meeting in Southampton
- Discussion group with young people in Birmingham
- Public access meeting in Oxford

2.8 For each event:

- Notes were taken throughout, of what was said and also immediate reflections on the events.
- Those notes were used to fill in the evaluation table (see Appendix 2).

Analysis

2.9 To analyse the observation data, the evaluation tables were circulated and then a half-day data clinic with members of the evaluation project team (Paula Orr, Clare Twigger-Ross, Kathryn Rathouse and Elham Kashefi) was held. At the data clinic the different events and the findings from each type of event were combined into one summary table each for a) the public dialogue events b) the material development sessions c) Steering Group and Management Team meetings d) the public access event. These summary tables are drawn on in the findings section of the report.

Feedback forms

Data collection

2.10 As well as the observation, at each public workshop event feedback forms were distributed to all participants. A number of the questions were drafted by the evaluation team in collaboration with the dialogue team to enable gathering of data on participants' views on the process of the dialogue, as well as on the subject matter of geoengineering (see Appendix 3 for a sample questionnaire). The questionnaires were filled in at events by all participants so they reflect the views of all the members of the public who participated. A summary of responses is provided in Appendix 4.

Analysis

2.11 The key questions that were of interest were analysed using Excel. Selected statistics are presented in the findings section.

Post-dialogue interviews

Data collection

2.12 Once the report of the dialogue had been finalised (August 2010) twenty-six post-dialogue interviews were conducted with public participants (16) Steering Group members, Management Team members, scientists, and dialogue team members (10). Interviews were conducted by telephone lasting 30-40 minutes.

Analysis

2.13 The interviews were recorded, transcribed and analysed to assess responses to research questions and to draw out additional themes. The interview data is used throughout this report. All participants' identities are anonymous. In this report the Steering Group members, Management Team members, scientists and dialogue team members are grouped as "expert interviewees" (EI) to distinguish them from the public participants (PP). Throughout this report quotes are identified with either EI or PP and a number e.g. EI-5, representing the different participants.

Review of materials

2.14 The materials used in the events were reviewed by Professor Joanna Haigh of Imperial College who is a recognised expert in this area of research. Joanna's comments were fed back to the project team as the materials were being developed.

3. Background to the Dialogue Process

Objectives of the dialogue process

3.1 The objectives of the dialogue were:

> *To identify the public's preferences around the future of research into geoengineering, in particular the moral, ethical and societal implications of funding decisions.*
>
> *This, in order to influence NERC's strategic decision making, and the decision making of other key policy makers. To contribute to knowledge and insight on public views of climate science and principles and priorities relating to geoengineering.*

Activities undertaken as part of the dialogue process

Stakeholder engagement and materials development

3.2 Two facilitated meetings were held to support the development of the materials that would be used for the events with the public participants:

i) With the project Steering Group and Management Team (see Project Governance section below for details).

ii) With a group of 9 NGO stakeholders (CAFOD, New Economics Foundation, E3G, Zoological Society of London, Global Warming Policy Foundation, Greenpeace, WWF, World Development Movement, Researcher / Ex Friends of the Earth).

3.3 These meetings were facilitated by the dialogue contractors and designed to get input and feedback on the materials to be used in the dialogue process. Members of the evaluation team attended each of these events.

Public Workshops – Events 1, 2 (Birmingham, Cardiff and Cornwall) and 3 (Southampton)

3.4 The dialogue involved three groups of members of the general public totalling 85 people overall. The table below shows a breakdown of the dialogue participants by gender and age.

Table 1: Breakdown of the dialogue participants by gender and age

Location	Male	Female	Age range
Birmingham	15	15	19-69
Cardiff	15	13	18-70
Cornwall	16	11	18-72

3.5 In each location the public participants came to two events: Event 1 and Event 2. At Event 1 they learned about climate change and geoengineering approaches. At Event 2 they discussed values, principles and ethics and viewed video clips of responses from science ethicists. Event 3 (Southampton) was a reconvened event, attended by about one-third of the public participants from each of the three areas (31 people in all). This final event was held at NERC's National Oceanography Centre at the University of Southampton, in order to meet NERC representatives, scientists and other stakeholders to discuss their thoughts and findings.

3.6 A member of the evaluation team attended Event 1 and Event 2 in Birmingham, Event 2 in Cardiff and reconvened Event 3 in Southampton.

Discussion groups

3.7 Targeted discussion groups were held with specific groups within the general public. Both groups covered a shorter version of the first public event.

- In Cardiff a three hour discussion was held with ten residents living in an area considered to be at-risk of flooding.
- A three hour discussion was held with 10 young people, aged 16 to 18, in Birmingham, to ensure the views of the future generation were captured in the dialogue.

3.8 A member of the evaluation team attended the discussion group with young people in Birmingham.

Online qualitative survey

3.9 A qualitative online survey was conducted. Invitations for the survey were sent out to stakeholders in community groups such as Green drinks, Community Action Network, Women's Institute and were posted on various websites such as Living with Environmental Change, ScienceOxfordLive, Sustainable Development Research Network as well as the websites of all the organisations directly involved in conducting this research. 65 people (both individuals and representatives of organisations) responded to the survey.

3.10 The survey question pages contained a brief summary of each technology, a link to a document outlining the pros and cons of the technology and questions asking participants what they liked and disliked about the technology.

Open Access Events

3.11 Three open access events were held in Cardiff, Birmingham and Oxford. In Cardiff events were held with school children, one group of around 20 children in Year 8 and one group of 20 children in Year 9. The events involved a demonstration of some techniques such as dissolving CO2 in water and reflecting light from the sun back into space. The children were given some of the materials used to explain a range of technologies and worked in small groups to decide on the 'pros and cons' of each. They completed 'Have your say' cards answering the question: What should scientists studying climate research be doing to save the environment?

3.12 The open access event in Birmingham took place in the city's science museum, Thinktank and it was a two hour drop-in event from 12-2pm on Sunday 14 March, during National Science & Engineering Week. Information on the various geoengineering technologies was available via handouts and through informal discussions with the two staff. Participants completed the 'Have your say' cards as above.

3.13 The final open access event took place at Science Oxford on Wednesday 14 April from 7.30-9pm. Dominic McDonald, Head of Public Engagement at Science Oxford facilitated a discussion with scientist Andy Ridgwell from Bristol University. The event was free to attend and was advertised on both the British Science Association and Science Oxford websites, the local Oxford newspaper and through a number of e-newsletters. 8 members of the public attended. Notes were taken of participant questions and they also filled in comment cards.

3.14 Materials for these three events were based on the materials used in the dialogue Event 1 and redesigned in conjunction with the venue hosting the open access event to make them suitable for each event.

3.15 A member of the evaluation team attended the event in Oxford.

Project Governance

Management Team

3.16 The Management Team was made up of funders of the project, and/or funders of closely related activities. The team was responsible for commissioning the public dialogue and ensuring delivery. The team worked to the advice of the Steering Group and was ultimately accountable for the outcomes of the project.

Table 2: Members of the Geoengineering Public Dialogue Management Team

Name	Organisation / Role
Tim Jickells	NERC Theme Leader
Chris Franklin	NERC Science & Innovation Manager
Faith Culshaw	NERC project manager
Peter Hurrell	NERC (secretary to group)
Daniel Start	Sciencewise-ERC Dialogue and Engagement Specialist
James Tweed	Sciencewise -ERC Projects Manager
Nick Cook	Engineering and Physical Sciences Research Council (EPSRC)
Andy Parker	Royal Society

Steering Group

3.17 The Steering Group included science community representatives, NGO representatives, policy / regulation experts, public dialogue/ media experts and a representative of the Living with Environmental Change (LWEC) programme. Its role was to draw on the wide range of expertise and perspectives represented in its membership to contribute to the dialogue process. It was intended that the Group would work closely with the contractor, especially in overseeing the design and delivery of the project and ensuring compliance with best practice.

Table 3: Members of the Geoengineering Public Dialogue Steering Group

Name	Organisation / Role
Professor Charles Godfray (Chair)	Department of Zoology, University of Oxford, NERC Council
Jon Drori	Independent, Director, Changing Media Ltd
Dr Mike Edwards	Climate Change Advisor, Catholic Fund for Overseas Development (CAFOD)
Professor Gideon Henderson	Professor of Earth Sciences, University of Oxford
Professor Tim Jickells	Professor of Environmental Sciences, University of East Anglia, NERC Theme Leader
Miranda Kavanagh	Director of Evidence, Environment Agency
Melanie Knetsch	Senior Science in Society Manager, Economic and Social Research Council (ESRC), LWEC
Duncan McLaren	Chief Executive, Friends of the Earth Scotland
Professor Nick Pidgeon	School of Psychology, Cardiff University

Name	Organisation / Role
Professor Catherine Redgwell	Professor of International Law, University College London
Dr Chris Sear	Head of Climate Science, Department for Energy and Climate Change
Professor John Shepherd	Research Fellow, National Oceanography Centre, Southampton
Dr Mike Sheppard,	Schlumberger Fellow, Schlumberger Cambridge Research Ltd
Professor Phil Williamson	Science Co-ordinator for UK Surface Ocean / Lower Atmosphere Study (SOLAS) and Oceans 2025, University of East Anglia
Dr Steven Wilson	Director, Strategy and Partnerships, NERC

4. Evaluation Findings: Dialogue Objectives

4.1 This section discusses the extent to which the public dialogue on geoengineering was considered to have met its own objectives, the extent to which those objectives were understood by participants, and whether it met the participants' objectives. The objectives of the dialogue were presented to the first meeting of the Steering Group[6] and used in subsequent information on the dialogue[7]. In examining how well the public dialogue on geoengineering met its objectives, this section discusses the following aspects:

i) How clear were the objectives to different participants in the process (Steering Group, scientists and members of the public)?

ii) How well did the process design and materials reflect the objectives?

4.2 The way in which these project objectives were met specifically is covered in Section 8: Impact.

Clarity of project objectives to dialogue process participants

Steering Group

4.3 The Steering Group met on two occasions:

i) A meeting before the start of the public events[8]. This meeting included a facilitated session on the materials to be used in the public events (first Steering Group meeting).

ii) A meeting after the public events were completed, to review the draft reports on the dialogue process[9] (final Steering Group meeting).

4.4 There was no specific agenda item on the objectives of the dialogue process as a whole within the first meeting of the Steering Group. However, the objectives were considered under several agenda items:

i) The papers circulated before the meeting included a summary from the contractors of the aims of the dialogue process.

ii) Faith Culshaw from NERC raised the issue that NERC did not have a clear strategy for geoengineering research and that this process would input to the development of that strategy.

iii) Faith Culshaw circulated a draft paper with Frequently Asked Questions (FAQs) on the purpose and rationale for the dialogue process.

iv) During the facilitated session in the first Steering Group meeting, on the materials to be used, the key objective of the dialogue inputting into the setting of research priorities for geoengineering was discussed.

[6] Steering Group meeting, 5th February 2010: Meeting Papers.
[7] Interestingly, the objectives of the dialogue process were stated in slightly different terms in the introduction to the draft report on the online dialogue where the objectives are described as to: Better understand the public's perceptions and opinions of geoengineering research; Identify areas of particular public concern about geoengineering, and ensure new research takes account of the needs and concerns of society on this topic; Increase public awareness of geoengineering and its potential implications Inform the development of geoengineering research in NERC's strategy, based on the widest range of views and opinions.
[8] Held on 5th February 2010.
[9] Held on 11th May 2010.

4.5 During the facilitated session in the first Steering Group meeting there was a discussion about whether specific technologies would be dropped from the research agenda if the public did not like them. It was clarified that the dialogue process was and should be viewed as only one input into the development of the research agenda.

4.6 At the final Steering Group meeting, the extent to which the objectives of the dialogue had been met or not was explored. Although there was no explicit discussion, some members suggested that the outcomes of the dialogue had provided the go-ahead for carrying out research on geoengineering and had provided input on what should be taken into account in developing a moral and ethical framework for this research. However, others of the Steering Group questioned whether this could be provided by a dialogue of this scale (i.e. too few public participants).

4.7 The objective of influencing decision-making was felt to have been achieved: reporting back on the EPSRC sandpit[10], one Steering Group member commented that the first day had "...focussed on the ethical issues and findings from the dialogue. It was very good to have at the beginning of the sandpit" (from final Steering Group observation notes). One project that came out of the sandpit has a stakeholder involvement element and is going to use data collected from the public dialogue process. Also, that project will carry out public engagement for a second project that was funded through the sandpit.

4.8 From the interviews with Steering Group members, the objectives were understood to be focussed on understanding how members of the public think about geoengineering (as opposed to scientists and policy makers), how public opinions might form around geoengineering, how members of the public might consider any future practical application of geoengineering and given these views how to present geoengineering research to members of the public in the future.

> *"The question was, how do the public feel about geo-engineering in general? At the back of this, there have been a few recent things like GM, where public antipathy was so high that it really complicated trying to do the research, so I think the idea was to, from the beginning explore with the public how they feel about this... And secondly, to learn a bit about how the public would consider this when it comes down to a practical step. In some years' time we may be in a position where we're considering doing geo-engineering and then it would be really useful to understand how the public form an opinion in this area."* (EI-8)

4.9 These objectives were considered to have been broadly met through the dialogue events by those Steering Group members interviewed.

Scientists

4.10 A number of scientists participated in the dialogue events. Their role was to provide information for participants and to answer questions

4.11 The scientists' understanding of the objectives of the dialogue varied between events and across the dialogue process.

4.12 In most of the observed events, scientists appeared to have a good understanding of how their role contributed to achieving the dialogue objectives. Most of the scientists were effective at providing

[10] A sandpit is a residential interactive workshop over 5 days involving 20-30 participants, the director, a team of expert mentors and a number of independent stakeholders. An essential element of a sandpit is a highly multidisciplinary mix of participants taking part, some being active researchers and some being potential users of research outcomes, to drive lateral thinking and radical approaches to addressing particular research challenges. The EPSRC ran a sandpit on geoengineering research in March 2010.

information in a challenging way and pointing out where there are questions about geoengineering that haven't been resolved.

4.13 On the other hand, there seemed to be some ambiguity in terms of the capacity in which scientists were attending the dialogue events. Scientists were sometimes presented as "experts" and called on to answer questions on a diverse range of topics, irrespective of their own area of expertise. Two members of the Steering Group thought they were attending as observers but both ended up being called upon as experts (one more formally than the other). Both were happy to take on these roles. In terms of the scientist who attended in the capacity of expert he felt that his role was *"not 100% clear…"* (EI-8) and was uncertain as to how he should answer questions, whether more information should be given or not.

Members of the public

4.14 The feedback forms completed by members of the public at the end of each of the convened events indicate that most public participants felt that they understood the objectives. Of the eighty five people who participated in workshops, all but one said they had understood the purpose of the first event and all but five said they had understood the purpose of Event 2. Initially a few participants expressed some mistrust of the motives behind the dialogue process. For example, they queried informally, *"is the government going to do this anyway?"*, *"are they going to put up our taxes and justify it through this research?"* This mistrust was not expressed in later events and participants were generally happy to engage with the tasks.

4.15 Members of the public had different objectives for participating in dialogue processes from those of the organisers. In the post-dialogue interviews, members of the public mentioned a number of different reasons for participating: interest in the topic, concern about environmental issues, wanting to have an input or just curiosity. More than half said that they wanted to learn something new. Participants were given a small payment for attending events (normal practice for this kind of process) but this was only mentioned by two people and even in those cases seems to have been a facilitating factor rather than their main motivation.

4.16 Across the events the specific objective of finding out people's preferences was covered but was not always made very clear.

4.17 Most of the public participants felt that their own objectives for attending the dialogue events had been met. People appreciated the opportunity to find out about and discuss geoengineering:

> *"It was more interesting than I expected."* (PP-16)
>
> *''I just thought it would be a general discussion, I didn't think that you would have scientists there explaining different things to you...that was the best part about it really."* (PP-8)

4.18 One of the interviewees had started a course on geoengineering since being involved in the dialogue events. Most of the others had made less use of the information after the event although most said they had talked about it to their friends and family.

4.19 Most of the participants were clear that the objectives of the dialogue process were to get the views of members of the public on geoengineering, although some felt that they were being asked for their opinions on which technologies were the best:

> *"I think it was to give information to the government as to which the public will see as the best way of fighting global warming."* (PP-7)

4.20 Participants who did feel that they were being asked for their views on which were the best technologies generally felt that they were not best placed to give that kind of input because they didn't have enough knowledge of the subject:

> *"...we don't have enough information to be able to make that decision. Do you see what I'm trying to get at? ...Us lay people could only go by what the scientists tell us."* (PP-2)

4.21 Participants came to the subject of geoengineering from different starting points. While some said that they found the topic interesting and that this had been a motivation for their involvement, the majority said that they either knew nothing about it or had never heard of it:

> *"I didn't know what I was letting myself in for but I think it was just more interesting and more informative for myself because it wasn't something really that I knew a lot about – everybody hears about global warming but that's as far as it goes,.."* (PP-8)

4.22 Learning something new was an important motivation for participants. Before the first event 58 participants gave 'To learn more about climate change research' as one of their reasons for attending. When discussing what they got out of the process some months later, 13 of the 16 people interviewed mentioned gaining awareness, information or learning as benefits of their involvement. Being able to learn directly from scientists was a particular highlight for many people:

> *[Q: What worked best?] "We had a chance to talk [at the reconvened event] to the scientists, oceanographers, people from NERC, and that was really an opening window, which I felt was really good."* (PP-9)

4.23 A number of the public participants interviewed explained that they had a general concern about environmental issues and that they had initially thought that the dialogue would help them address those issues. Some people were frustrated that this turned out not to be the focus of the discussion:

> *"It just seemed like the furthest thing from trying to save the planet I suppose"* (PP-5)

4.24 But many participants seem to have accepted that the dialogue was being framed in a different way. One person said that although their initial objectives hadn't been met, they felt that the process was valuable:

> *"[My objectives] were not met in the same way as I had hoped. I thought it would be about what the public could do – but it wasn't about that. But it was good to see what may happen in the future."* (PP-17)

4.25 Feedback from participants, both immediately after the events and in the interviews held later, indicates that most people had come to feel that the subject was very important and were glad to have had the opportunity to learn about it. People talked about being 'enlightened' and the dialogue being an 'eye-opener', reflecting how significant the discussion had been for them. Learning was highly valued by many people, not so much for utilitarian reasons like contributing to professional development or increasing standing among peers, but as something intrinsic to wellbeing:

> *"The fact that I've learnt. I'm 70 years of age now, but you never stop learning and my philosophy is... life should be one long lesson, one long learning process."* (PP-3)

Reflecting the objectives in the design of the materials and dialogue

4.26 In the expert interviews there was a question relating to the specific objective of the dialogue: "Do you think the overall design of the dialogue events was effective in generating the kind of information

that NERC needs to inform its decisions on geoengineering research? Please say why?" In response to this the general feeling was that the design was very good and fitted with this objective, in so far as, being a new area of research *"it ticked that box in three out of four counts"* (EI-1). The way that the materials and dialogue were designed was considered to have generated useful information from the public.

4.27 It was acknowledged that the need to provide a lot of information to the public on this topic was a challenge: *"A few people got bamboozled [by the amount of information]"* (EI-9) but that overall this had been successfully managed. It was also noted that in any future geoengineering dialogue, people would generally know more about geoengineering and it would not be necessary to cover so many technologies in such detail.

5. Evaluation Findings: Context

5.1 The following section looks at Context, the first of the Sciencewise-ERC guiding principles for public dialogue, and the extent to which the public dialogue followed those principles. The Sciencewise-ERC principles suggest that, on issues of Context, as far as practicable, public dialogue on science and technology should aim to:

i) Be clear in its purposes and objectives from the outset.

ii) Be well timed in relation to public and political concerns.

iii) Commence as early as possible in the policy/decision process.

iv) Feed into public policy - with commitment and buy-in from policy actors.

v) Take place within a culture of openness, transparency and participation with sufficient account taken of hard to reach groups where necessary.

vi) Have sufficient resources in terms of time, skills and funding.

vii) Be governed in a way appropriate to the context and objectives.

5.2 This refers to the wider context in which the dialogue process is being undertaken and in the case of events the focus is on the objectives of the dialogue, specifically on the clarity of their expression and their comprehension by participants. Context is also about timing (did the dialogue take place early enough to influence policy and link to other developments) and governance. A further key issue of context is how the results of the dialogue process are to be used. Ideally, the findings should be feeding into a clear process of decision-making so that participants know that the time they are spending on the dialogue process will have an influence on a wider process.

5.3 Given that the geoengineering dialogue was tied to a process of decision-making around research priorities, a key issue for the events was how those links and the influence participants could have, were expressed and experienced.

Links between the dialogue process and decision-making

5.4 Participants need to know how their input will be used and how – if at all – it could influence decision-making. In this case, the decisions that could be influenced were decisions to be taken by NERC or other research councils about funding research on geoengineering in general, and the kinds of conditions that might be applied to that funding, and about funding research on different geoengineering technologies.

5.5 In their responses to questionnaires applied at the end of Events 1 and 2, the majority of participants said they understood how the results of the meetings would be used (over 85% after the first round of workshops and slightly more after the second workshops). The link between the dialogue and research decisions was explained at all the events observed. At one of the Event 2 sessions, one of the scientists illustrated the explanation by saying that the research council didn't want to make the same mistake as in the case of Genetically Modified Organisms (GMOs).

5.6 Nevertheless, participants had a mix of views of the use that would be made of their input. Many felt that it would be used to help scientists get an idea of how the public would respond to different geoengineering technologies and which technologies might have more support. One person suggested that the dialogue process would help the scientists explain geoengineering to people with

little scientific background. Two people saw the process as a utilitarian exercise that would help NERC or scientists more generally:

> *"obviously to try and encourage the government…to give NERC funding for…experimenting really in geo-engineering."* (PP-8)

5.7 Although people from NERC were present at all the events we observed, they only gave a full explanation of how the dialogue results would be used in Event 3 (Southampton) the reconvened event. In the other events they seemed to want to remain as external observers which, although understandable, suggests that the dialogue was being understood as more an experiment which could be observed as long as the observers take care not to 'contaminate' the process, rather than a dialogue. This seems to have been reflected on by some of the participants who felt more like they were in a goldfish bowl than in a dialogue; as one said,

> *"Well they were listening to what we were saying more than interacting with us. The first one [event], they were really making us discuss the subjects that they brought up, all right, and then listening to what we said. But they didn't really give us any input then."* (PP-2)

5.8 There was little input for the participants on the practical aspects of the way that research funding is decided prior to Event 3, and questions and comments from members of the public suggested that this was quite new to them. As a result, comments on this were taken into account and Event 3 (Southampton) included a discussion of research funding showing the responsive nature of the process.

5.9 In addition, at Event 3 (Southampton) there were a number of presentations on how the outcomes of the dialogue fit in with the decision-making processes that NERC go through in deciding on research themes which was very useful.

5.10 When asked, most of the people we interviewed felt that they did now understand more about scientific research. One person explicitly talked about having a better understanding about the funding process:

> *"I think it gave an idea with regard to funding and various things as to how they go about it, and how there may well be any number of various scientific options available, but the difficulty is deciding how you're going to split the cake between so many various ideas and requests for money, so it was useful from that point."* (PP-13)

5.11 Several said that gaining this knowledge made them feel more involved in the decision-making and more empowered (PP-11). On the other hand, several people interviewed seemed to feel uncomfortable about their views being given particular importance, either because they felt they didn't know enough or because they felt that this wouldn't be democratic:

> *"I think [my views] may be taken into consideration but I don't think there will be too much weight attached to them...I'm not sure that's always a good thing necessarily for scientists to listen to the public."* (PP-15)

Maintaining the links between the dialogue process and decision-making

5.12 A number of opportunities for the dialogue to have continuing influence on decision-making were built in to the process:

i) A film made of dialogue Events 1 and 2 is available on NERC's and Sciencewise-ERC's websites. This allows a wider group of people to see how the dialogue worked and to become aware of how some members of the public view these questions.

ii) The Event 1 held at the Eden Centre in Cornwall was timed to coincide with the 'sandpit' run by EPSRC. Several of the scientists participating in the 'sandpit' came along to the Event and were impressed by the views being put forward. It was felt that this experience contributed to increase support for one of the sandpit proposals to do further work on public perceptions. At Event 3 (Southampton) it was announced that Professor Nick Pidgeon would be funded to look at the data from the dialogue and that would be incorporated into a longer project exploring stakeholder engagement in geoengineering research funded by the EPSRC, NERC and STFC.

iii) Tim Jickells was a member of the Management Team and took an active part in the public events. He is the NERC Theme Leader for Earth Systems Science and could therefore take the findings of the public dialogue into the research decision-making process.

5.13 Members of the Steering Group had quite a significant input into the Report of the dialogue, to put it into a form that would be useful. Members of the Steering Committee felt that the final version of the report was good. Some were less sure about how it would influence decision making on geoengineering at this stage:

> *"I won't say I have read all of it but I thought it was quite a good…, quite a useful report. The difficulty is how do we use it?.....that is the real big question. My own personal opinion is that it doesn't necessarily impact the direction of the research but it does impact how we approach that research."* (EI-8)

5.14 Participants' ideas on how the results of the geoengineering dialogue would be used were in many cases different from those of NERC and the project team. Several public participants said that the purpose of the dialogue events was to:

> *"give a public perspective as to what we felt, whether it was worthwhile putting research into some of the particular projects."* (PP-13)

5.15 Others saw the process as a form of market research, whose intention was to find out how best to communicate with the general public about geoengineering, or:

> *"To find out what people think is good for our planet: what is cost-efficient and what would work with our lifestyles."* (PP-16)

5.16 Perhaps reflecting a suspicion of public bodies, a few people said that the purpose of the dialogue was to enable scientists to see how far members of the public would be prepared to accept different geoengineering technologies:

> *"... it was for the scientists really, to find out what they could get away with I think, or what the public would accept."* (PP-15)

5.17 Another suggested that the process was being manipulated to get 'the right' results for NERC:

> *"Some of the discussion, far from being open-ended, was engineered to justify some of the preferences...I had the feeling that we were being led to a pre-determined conclusion."* (PP-10)

Commitment to ensuring the dialogue process is taken into account

5.18 While there was a clear commitment on the part of NERC to take the results of the public dialogue into account in its decision-making that we can trace through other statements, this did not come out clearly in Events 1 & 2 although there were short talks from NERC at those events. In Event 3 (Southampton) NERC clearly stated their support for the dialogue and how they felt it had impacted them.

6. Evaluation Findings: Scope

6.1 This Section covers Scope, the second of the Sciencewise-ERC guiding principles for public dialogue, and the extent to which the public dialogue followed those principles. The principles suggest that, on issues of Scope, as far as practicable, public dialogue on science and technology should aim to:

i) Cover both the aspirations and concerns held by the public, scientists in the public and private sector, and policy makers.

ii) Be focused on specific issues, with clarity about the scope of the dialogue. Where appropriate we will work with participants to agree framings that focus on broad questions and a range of alternatives to encourage more in-depth discussion. For example, we might start by asking, "How do we provide for our energy needs in the future?" rather than starting by asking "should we build new nuclear power stations?"

iii) Be clear about the extent to which participants will be able to influence outcomes. Dialogue will be focused on informing, rather than determining policy and decisions.

iv) Involve a number and demographic of the population that is appropriate to the task to give robustness to the eventual outcomes.

6.2 Scope refers to what is discussed, how issues are framed and whether or not there is room for discussion of related topics. A key question is the extent to which the public can influence outcomes. It is also about ensuring that the dialogue covers public participants' concerns and aspirations and whether or not there is time and space to examine and discuss the scope to the satisfaction of the participants and how those discussions shape the dialogue process as it progresses. This can be observed through how materials are presented, how questions that are outside the presented scope are answered and managed, together with how much flexibility there is in the programme for change in timings or approaches to discussions.

Questions about scope

6.3 Questions about scope voiced by public participants were observed in three different contexts. Firstly, questions were raised about the scope of the dialogue in the Event 1 (Birmingham): these questions tended to be factual and about trying to understand the climate change context. The contractors framed the subject of climate change very tightly to avoid having to talk about whether or not it has happened. Events were kept task-oriented. For a number of the public participants, who said they had gone to the events because they were interested in climate change and in finding out what could be done about it, this framing felt narrow. However, most people seemed to accept the scope defined:

> *"I think probably a lot of people were saying 'why aren't we talking about prevention?'. But obviously that wasn't the purpose of the weekend. It did take a while to get some people to accept that I think."* (PP-15)

6.4 Secondly, at the start of Event 2 (Cardiff), some participants mentioned having continuing doubts about whether climate change was happening and whether it was man-made. As in Event 1, this was not explored. There was also no discussion about how much can be achieved by mitigation and what the relative importance of geoengineering might be. Some participants felt that the balance should have been different:

"The big thing was that nobody put forward the case for consuming less (of everything)...The way I saw it was not these Heath-Robinson crackpot schemes. And that the way is to think about real solutions – nobody talked about the advertising industry and how it encourages consumption. However difficult they are, these are the directions that should be taken." (PP-10)

6.5 Although in general participants were satisfied with the amount and scope of the information provided, a common theme in the interviews was that as participants, they did not have enough knowledge to be able to define the scope of the discussions or to say whether they had been given enough information. When asked later whether the scope of the discussions at the workshops had been wide enough, one participant pointed out:

"I would think so, but it was something I didn't know much about. I probably wouldn't have understood much more." (PP-3)

6.6 At reconvened Event 3 (Southampton) the scope of project was part of the discussion and questions on it were answered well. One participant described how the team running the event had responded to requests to spend more time looking at a particular aspect of geoengineering:

"because the majority of the people wanted to know more about the actual processes, they did change it, they changed a lot of the programme to be what the people… wanted to know really, which was very good I thought." (PP-8)

6.7 Overall the experts interviewed considered that the scope was clearly expressed and well managed given the complexity of the topic. There was one comment around the desire to locate discussions in a wider context of other environmental issues:

"I think it's important that we contextualise climate change, so that's one thing I felt perhaps was missing. …Yeah, probably in the introductory days, just a little bit on how earth works, why is the climate system important, how it's linked? Rather than, "This is the greenhouse effect, this is what greenhouse gasses do." I would have liked to have seen, almost a little bit of philosophy, a little bit of earth science, but giving a picture of earth as it stands now and then tease out climate change and say why we need to look at this issue." (EI-5)

Clarity of materials

6.8 It was important to find out whether the participants found the materials clear and understandable and allowed them to explore the topic from different angles.

6.9 It was observed that in Event 1 (Birmingham) there was a comprehensive and informative initial presentation. Participants were encouraged to ask questions in discussion with the scientist. Discussions of nine technologies centred on materials that in general were accessible and understandable though maybe without depth. Pros and cons were presented in different ways. Some facilitators presented these at the start, others had a discussion then read out pros and cons. As evaluators we felt some concern about the sheer volume of information given out in a short space of time.

6.10 In the observed Event 2s (Birmingham and Cardiff), the materials were varied and interesting and the scenarios which explored conflicts and tensions of the geoengineering technologies provoked interesting and relevant comments from participants. The short 'talking heads' films were used to introduce new angles (e.g. issues for international law, equity in the distribution of the effects).

6.11 For Event 3 (Southampton), there was no pre-prepared material. The scientists presented their own material and it was not clear how accurate it was or whether it had been peer-reviewed. This was

especially true for the afternoon where in order to accommodate the participants, the programme was changed and more technologies were discussed than had been planned for, so the scientists presenting that information were even less prepared. There was little time for discussion and deliberation of the material presented, partly because of time and partly because the groups were quite large (between 13 – 15). However, it was clear that participants enjoyed and appreciated having the scientists there as "participants" with them.

6.12 Participants gave positive feedback on the materials provided: across all the Events 1 and 2 (Birmingham, Cardiff and Cornwall), around 94% said that they understood the material:

> *"...there was loads of [print-outs], acid rain and like, more brief information that we could actually get involved in."* (PP-6)

6.13 In general the materials facilitated a good exploration of the topic but there seemed to be limited time to discuss the scope of the dialogue and participants were not asked about their own aspirations for the dialogue. Some felt that the information provided was pushing them towards more technological (rather than 'natural') options:

> *"Some of the high-tech options are so tricky that it is very difficult to break them down in to terms that Joe Public can understand. I think they did as good a job as they have to. I understand the limitations of that. Someone who hasn't got a science background – can they really understand? They did try but it did seem to be weighted in favour of high-techy stuff."* (PP-10)

6.14 In terms of the presentation of information and time for considering and reflecting on it, most participants indicated in their feedback at the end of the events that they felt that there had been adequate time for discussion. However, across the three locations, more people felt there was not enough time to fully discuss the issues after the Event 1 compared with after Event 2.

7. Evaluation Findings: Delivery

7.1 The following section looks at Delivery, the third of the Sciencewise-ERC guiding principles for public dialogue, and the extent to which the public dialogue followed those principles. The principles suggest that, on issues of Delivery, as far as practicable, public dialogue on science and technology should aim to:

i) Ensure that policy makers and experts promoting and/or participating in the dialogue process are competent in their own areas of specialisation and in the techniques and requirements of dialogue. Measures may need to be put in place to build the capacity of the public, experts and policy makers to enable effective participation.

ii) Employ techniques and processes appropriate to the objectives. Multiple techniques and methods may be used within a dialogue process, where the objectives require it.

iii) Be organised and delivered by competent bodies.

iv) Include specific aims and objectives for each element of the process.

v) Take place between the general public and scientists (including publicly and privately funded experts) and other specialists as necessary. Policy makers will also be involved where necessary.

vi) Be accessible to all who wish to take part with special measures to access hard to reach groups, including considerations of appropriate venues and technical equipment in line with the Disability and Discrimination Act 1995. Where the objectives require it, media partners may be needed to ensure that the process reaches the wider population.

vii) Be conducted fairly with no in-built bias; non-confrontational, with no faction allowed to dominate; all participants treated respectfully; and all participants enabled to understand and question others' claims and knowledge.

viii) Provide participants with information and views from a range of perspectives, and access information from other sources, thus making them informed.

ix) Be deliberative - allowing time for participants to become informed in the area; be able to reflect on their own and others' views; and explore issues in depth with other participants. The context and objectives for the process will determine whether it is desirable to seek consensus, or to map out the range of views.

x) Be appropriately 'representative' - the range of participants may need to reflect both the range of relevant interests, and pertinent socio-demographic characteristics (including geographical coverage). At times, there may be a need to enable participants to be self-selecting. In these circumstances, there will be measures in place to take account of any potential bias this may cause. NOTE: Public dialogue does not claim to be fully representative, rather it is a group of the public, who, after adequate information, discussion, access to specialists and time to deliberate, form considered advice which gives a strong indication of how the public at large feels about certain issues. The methodology and results need to be robust enough to give policy makers a good basis on which to make policy.

7.2 Specifically, delivery refers to all aspects of the events: organisation, facilitation and presentation of information. It also refers to the absence of bias, no-one dominating the discussion and the range of expert views presented. For an event to be deliberative the facilitators will ensure that everyone gets a chance to speak, that there is sufficient time for the topics to be discussed fully and that the amount

of information given is proportionate to time for discussion. These issues were focussed on when considering delivery together with how public views were recorded and how participants engaged with the dialogue process (i.e. were they asking questions, looking interested etc).

Selection of public participants

7.3 IPSOS-MORI selected participants using criteria which resulted in a good cross section of ages, gender and ethnicity, which was appreciated and commented on by several people.

7.4 Most of the people we interviewed said that they had been recruited in the street or by someone knocking on their door, with one or two reporting that they had been invited by people they knew. No-one was screened for their views on climate change.

7.5 The experts interviewed were complimentary about the selection process of participants. They felt that it was a well balanced group of participants, representing a wide range of opinions, ages and backgrounds:

> *"Yes I do, I think the sampling was well done; it did seem to mean that we got a really good cross section in each area. I don't think it would have been doable for bigger numbers you know and I think the fact that we got similar results in each location showed that it was reasonably representative."* (EI-2)

7.6 The exception was in Cornwall where an expert who attended commented: *"Okay, so in terms of participants, when we went round the room there seemed to be an awful lot of people from the same village…. Whether it was like a geographical thing because of Cornwall being, you know, slightly more remote"* (EI-7). But this was not considered a real issue *"But...having said all that, there seemed to be a range of opinions, so different people had different opinions on climate change and things like that. So from that perspective it seemed to be a healthy mix of people if you see what I mean"* (EI-7).

7.7 While the total number of participants in the dialogue events was relatively small (just under 90 people), overall the range was sufficient to make the results of the process credible.

Selection and briefing of experts

7.8 There does not seem to have been a systematic process for selecting scientists to attend the events. Specifically, participation seemed dependent on volunteers from the Steering Group and their contacts. There may have been strategy for recruitment of scientists for the events but that was not made clear to the evaluators. The areas of expertise covered and the numbers of scientists varied at each event, and for Event 2 (Cornwall) there were no scientists present. Several of the scientists involved commented they had not been clear about their role, although all experts found it a positive experience:

> *"Interviewer: So could they [the contractors] have done anything to make it easier for you?*
>
> *Expert Interviewee: Well knowing, and briefing about, it's almost impossible to brief people about what you're going to be asked because the nature of this is that people will have their own issues and questions. I would probably have spent a bit more time reading through the Royal Society report to make sure I was as accurate as I could be."* (EI-8)

Presentation of information and the role of scientists

7.9 The dialogue was designed to bring participants up to speed quickly about the potential role of geoengineering as a response to climate change, to provide information to enable participants to

recognise nine different geoengineering technologies (Event 1), to consider future scenarios and how geoengineering might contribute to different outcomes and to explore some moral, ethical and legal dilemmas associated with the use of geoengineering technologies (Event 2).

7.10 A number of key issues emerged from the observation of the dialogue events. Firstly, and not surprisingly given the topic, the amount of material that was covered was vast and complex. As well as the presentations, in Event 1 (Birmingham) more information was gathered by smaller groups going round different stations and hearing about the range of technologies. As a result, there was superficial information on many technologies with little discussion of uncertainties. It was perhaps not very meaningful to ask participants to express their preferences after such little information and deliberation. This sometimes meant that the events felt rushed and over-processed (i.e. there were too many tasks):

> *"....some of the group meetings .. seemed a little rushed, but I think that was probably down to ... trying to get through so much in the time. It would have been nice to have a little bit more time to discuss things,.."* (PP-13)

7.11 Secondly, the process showed the importance of timing discussions relative to the provision of information. The discussion of ethical issues came in the middle of the Event 2s when participants had had more time to digest the material. The design, stimulated by the use of a video with 'talking heads' and supported by the participation of scientists in the small group discussion, produced a rich exploration of themes and this was observed in Event 2 in Birmingham and Cardiff.

7.12 Thirdly, in Events 1 and 3 the need to communicate a lot of information meant that the balance between presentation of information and deliberation was perhaps skewed too much towards the presentations leaving less time for discussion between the scientists and members of the public. In Event 3 (Southampton) there were a number of presentations which reduced the time available for discussion.

7.13 Having the experts as participants in the small groups in Event 3 (Southampton) was considered a good idea by public participants:

> *[Question: What worked best?] "...where we had a specific scientist with us. He could guide us more, if you see what I mean. He could give us the information or some of the information we were looking for."* (PP-2)

7.14 However, in practice it was easier for scientists to answer questions from members of the public rather than get into discussions, and when discussions did begin there appeared to be little time for them to develop. This meant in some cases the scientists dominated the groups in Event 3 (Southampton).

7.15 In the interviews with the experts they discussed how useful the information provided was in facilitating discussion in the dialogue events. In general it was agreed that the information was useful, well delivered and appropriate for the events especially given the complexity of the topic *"And when you consider the breadth of the different technologies that we were looking at I think you had to keep it fairly simple but not sort of patronisingly simple, but provide enough information to have an intelligent conversation about."* (EI-7). Further, having experts at the events was considered to be very helpful: *"I do yes, I think having the experts on-hand to answer people's questions was the most important thing. With a topic as complex as geoengineering you can never answer everyone's questions just by providing good quality input...The folks who attended, the members of the public I think, really wanted to find out more"* (EI-1).

7.16 A further interesting point in relation to the development of the materials was about the importance of discussion around scientific information: *"And I think on the way to getting the materials prepared there was quite a lot of debate and difficulty in terms of how we were framing the questions and the way that information was presented, but I think in the end we cracked it actually so I was quite pleased with what was presented on the day."* (EI-7)

7.17 Although this was not made explicit in the objectives for this dialogue, Sciencewise-ERC says that dialogue run by them "brings together members of the public, policy makers and scientists to discuss and come to conclusions on the social and ethical issues raised by new science and technology, and other policies of national importance". Therefore, contact between the public participants and scientists is an important part of this.

7.18 The scientists who participated in Events 1 (Birmingham) and 2 (Birmingham and Cardiff) that we observed were generally very good but seemed to be thinly spread: they had to move between groups, so not all discussion groups had a scientist participating at all times. Event 2 in Cornwall did not have any scientists present as noted above.

7.19 In Event 3 (Southampton) the mix of participants/experts was well-balanced but the shape of the day could have allowed for more discussion and genuine dialogue: there was considerable contact with the experts as they were in groups with the participants, but as there were so many presentations that discussion time was limited.

7.20 Participants' responses to the questionnaires completed after Events 1 and 2 showed that most people felt that they had been able to discuss issues of concern to them. Only one person who attended one of the Event 1 workshops disagreed with this.

Facilitation and delivery of events

7.21 Under this heading we looked at how the dialogue events were conducted to ensure that all participants were treated respectfully; and the extent to which events were fairly facilitated, non-confrontational and supportive of participants' questioning of experts. There should be enough time for participants to talk to each other and enough structure to enable discussion. Facilitators should encourage everyone to speak and handle sensitive situations in a way that doesn't make anyone feel less able to participate, while at the same time making sure that the event keeps on track.

7.22 Feedback after Event 1 and Event 2 shows that all participants were happy that people had been treated equally and with respect. From the observation by evaluators of Event 1 (Birmingham), Event 2 (Birmingham and Cardiff) and Event 3 (Southampton) a number of issues were noted in relation to each of the events:

i) The facilitators had a lot to do in Event 1 (Birmingham), and had to both present information and facilitate which was perhaps too much for them to do.

ii) The experience of the facilitators was observed as varied in the events, with some very experienced facilitators and some facilitators with little experience. In some of the group discussions this resulted in some participants dominating whilst others made little contribution.

iii) In the Event 3 (Southampton) the groups were large: 13 – 15 when there were four groups; numbers in groups then increased when the event split into just 3 groups. People were encouraged to speak but some said very little, partly due to the size of group and also the time allocated.

7.23 In terms of the delivery and facilitation of the event, the experts interviewed all gave very positive feedback. The contractors were considered to be well organised, professional, "I was really impressed by the facilitation so I would call that an outstanding element from both IPSOS and Dialogue by Design" (EI-2).

> *"they knew what they were doing, they kept the interest of every one going, including the scientists, there was the right amount of time on different topics, the right balance between instruction and debate"* (EI-3)

> *"The facilitators on each table were really good at drawing out, inevitably there were the more quiet people and the more vociferous people and they were really good at drawing those bits out and I thought that was where you really saw they knew what they were doing. They were really very very good."* (EI-8)

7.24 Those expert interviewees that had attended events were also asked what they thought about the quality of the discussions that they had heard together with the extent of interest and enthusiasm of the participants. They thought they were generally very good if variable in some parts:

> *"On average, pretty good. Obviously not uniformly but the best people were completely on top of it and it was generally interesting."* (EI-3)

7.25 There were also some expressions of surprise:

> *"I was surprised, pleasantly surprised actually, firstly by how interested they were and secondly...some of the people had really intelligent comments to make. And it was nice to be able to see their perspective on things and to really understand where some of these people were coming from on this sort of issue."* (EI-7)

7.26 Overall, the experts felt that the public participants were very interested, engaged and enthusiastic in the topic and at the events.

Recording of the events

7.27 Mechanisms should be in place to ensure that participants' views are taken into account: this covers how their views are recorded, how they are reported and how they are linked into wider processes. Recording and reporting mechanisms should be clear and transparent and be understood by all participants.

7.28 In all the events, notes were taken by members of the dialogue team on laptops throughout. In addition, in some cases flip chart notes were also taken. However, different members of the dialogue team had different approaches to recording the information in the events.

7.29 In terms of what participants were told about the recording of the events, no explanations were given at the events observed by evaluators. From our perspective as evaluators it seemed that there were two styles of reporting being carried out. Firstly, recording carried out on laptops was essentially for the report and the contractors rather than for the participants, although it did function as a signal that the participants were being taken seriously. Secondly, recording on flipcharts was done so that participants can see that their views have been noted down correctly. At times both these methods were being used, but it did not appear to be linked to activities, rather it was linked to the style of the facilitator.

7.30 In Event 3 (Southampton), the findings so far were fed back but the audience didn't quite agree with them. At that point participants were told they would get a summary of the report to see how their comments had been dealt with, but no dates were given as to when that would be[11].

7.31 In their interviews, participants highlighted that a number of methods were used to record the events and took that to mean that it was being done professionally. In addition, feedback from small groups was felt to be accurate and reflected discussions well.

Accessibility of reports

7.32 In looking at the accessibility of the reports produced at the end of the geoengineering dialogue, we considered how these reports had been made available to different participants and whether they were perceived as understandable by all participants. Reports should be made available to all those who participated, in a format that is easy for them to use, e.g. web, paper, large print, summaries. Participants should recognise the event they attended in the report.

7.33 NERC published a report of the dialogue process and a two-sided flyer with the main findings. These are both available on NERC's website. Although participants were sent the link to the page where these reports were available and despite the high degree of interest in the topic and the process, we found that the majority of participants had not looked at the results. Simply not getting round to having a look at the website seemed to be the main reason:

> *"I haven't actually been on the site. I'm not gonna lie about it; I haven't really done the site. I was actually thinking about doing it tomorrow, as one of my things to do."* (PP-6)

7.34 Participants appreciated why NERC had not sent out paper copies, with some even saying that they might have thrown a paper copy away. But there is clearly a need to make sure that people see the results of their participation and this could be addressed in future by sending the link to the report electronically and offering to send paper copies (or .pdf files for those less used to weblinks) of the summary to people who expressly request it.

7.35 The participants who had looked at the summary or the full report were satisfied that it represented what had happened at the workshops they attended:

> *"...it seemed to me as though they'd listened and got it right as far as the opinions expressed. They'd drawn the right conclusions from what they'd heard."* (PP-3)

7.36 On the other hand, one participant did comment that the tone wasn't exactly right:

> *"It was fairly close, you know, it wasn't too bad. There was nothing that you could really disagree with even though it might not have been exactly... there's nothing really specific, how can I put it, it's like the tone of the report .... Because whoever wrote the report must have been, I would have thought, on the more scientific side."* (PP-2)

General points about the public dialogue events

7.37 A number of general points about the venue were also noted including comfort (e.g. temperature, space available, noise), layout of the room, registration/welcome, and timekeeping. Appendix 4 provides a summary of observations from the events. In general, the venues served their purposes well with only a few minor aspects that could have been improved. It was to the contractors' credit that they were able to find venues at relatively short notice given the timeframe of the project.

[11] All participants were all sent a weblink to the summary and report when these were published on NERC's website.

Online Dialogue

7.38 The online dialogue was a method which allowed members of the public to let NERC know their views on geoengineering research using a web-based tool. The purpose of the tool was "to give as many people as possible the chance to tell NERC their views on geoengineering"[12]. The online dialogue was designed and managed by Dialogue by Design.

Context

7.39 The objectives of the dialogue were presented clearly on the Online Dialogue home page; the page listed four objectives for the wider public dialogue[13] and set out the specific purpose of the online dialogue (as above). An explanation was provided of when the results were expected and how these would inform NERC's work and other research on geoengineering such as the LWEC programme.

Scope

7.40 Recognising that respondents were likely to be 'interested' people, the contractors targeted communications at scientists, environmental groups and networks, international development networks and relevant community groups. Of the people who saw the information about the dialogue, those who chose to participate were self-selecting, as no incentives were offered. This needs to be taken into account in drawing any conclusions from the results, as Dialogue by Design pointed out in their report[14].

7.41 Participants in the online dialogue were invited to give short answers (up to 600 words) to 2 questions each about nine geoengineering technologies (these were the same technologies that were covered in the public dialogue events):

a) What do you like about this technology?

b) What do you dislike about this technology?

7.42 There was also one more general question: 'Do you think government research funds should be invested in exploring these technologies? Yes/No and why?' This gave participants scope to talk about wider aspects of geoengineering. In response a few of the participants questioned the scope of the online dialogue, adding comments like 'What about renewable energy?' and 'You should open the debate to all areas of environmental and engineering science'. There was no provision for replies to queries raised through this route.

7.43 The dialogue was bounded by a structure which focused almost entirely on two questions about a set of geoengineering technologies, and by the time available. Few questions about scope and aspirations were raised; those that were could not be discussed within the constraints of the process.

Delivery

7.44 Information and the questions about each of the technologies could be accessed through a separate link and participants were invited just to choose the technologies that interested them. Short

[12] From NERC's dialogue page

[13] Our objectives for this public dialogue are to:

- better understand the public's perceptions and opinions of geoengineering research
- identify areas of particular public concern about geoengineering, and ensure new research takes account of the needs and concerns of society on this topic
- increase public awareness of geoengineering and its potential implications
- inform the development of geoengineering research in NERC's strategy, based on the widest range of views and opinions.

[14] Dialogue by Design (2010) *Geoengineering online survey from 5th March to 12th April 2010. Summary Report.*

summaries were provided of each of the technologies – these included pros and cons. It was easy to access the information and answer the questions.

7.45 The general question was accessed through a link to 'Research' at the bottom of the list of technologies. This did not seem to be an intuitive link.

7.46 140 people registered on the website; of these, 65 people provided a total of 953 responses (not everyone answered all the questions). Some basic information was collected about the participants[15].

7.47 The paragraphs introducing these questions said that these would help NERC to consider moral and ethical issues, but this was not reflected in the questions. Answers shown in the report suggested that respondents tended to focus on what is feasible more than on moral or ethical issues.

Impact

7.48 Dialogue by Design produced a report on the responses to the online dialogue. The responses were analysed and grouped in terms of their relevance to the eight criteria for evaluating geoengineering methods identified by the Royal Society[16]:

- Legality
- Effectiveness
- Timeliness
- Impacts
- Costs
- Funding support
- Public acceptability
- Reversibility

7.49 The online dialogue seems to have had little impact: very few of the experts interviewed had looked at the report. On its own it didn't present many conclusions, or make recommendations and as such NERC did not use the online survey report alone, but the results were considered and reported alongside findings from the public events and open access events in the final report, which was used.

Open Access Events

7.50 Three Open Access events were held at science centres in Birmingham, Cardiff and Oxford. The events in Birmingham and Cardiff were aimed at children and involved demonstrations, activities and discussions with scientists. The event in Oxford was an evening meeting with adults. As part of the evaluation, the team observed the meeting in Oxford. The findings of that observation are given below. It is impossible to make an overall evaluation of the open access events as they were so different in scope and delivery. This also meant that no general findings could be obtained from this strand of the project and its value in informing decisions on geoengineering research is questionable.

[15] This covered: the sector they were from (public, private, third sector, individual), age group and attitude towards climate change ('How convinced are you that climate change is currently affecting the planet?'; 'How concerned if at all are you about Climate Change?')

[16] Royal Society (2009) *Geoengineering the Climate*

Context

7.51 The aim of the Oxford event was to hear the views of members of the public on geoengineering and to understand how people come to those views, in order to inform policy and decisions about research. The objectives were explained about halfway through the meeting. From talking to participants before and after the discussion, it seemed that they were there to learn rather than to give their views. They saw the event as part of the series of events that Science Oxford runs.

Scope

7.52 The meeting was organised as an opportunity to talk to a scientist so the whole 90 minutes was spent on questions and answers. The scientist had a good knowledge of the range of geoengineering technologies and explained the general principles and the individual technologies very clearly and accessibly. He mainly used everyday language, with just a little jargon, and made links/used analogies from everyday experience. When scientific concepts and jargon were not explained, the facilitator asked a question e.g. *"I'm totally unclear – CO2 – where are we going to put it?", "What's a saline aquifer?"*. This encouraged members of the public to ask questions. The scientist gave a very balanced view, mentioning both pros and cons e.g. *"There are lots of ways of doing this, some a bit bonkers, some more sane"*.

7.53 Participants were encouraged to ask the scientist questions. At the beginning of the event the facilitator explained that it was different from the events usually held at the centre, because it was intended to be: *"open, discursive and conversational… everyone is welcome to interrupt"*. He got the ball rolling by asking questions of his own. Everyone had a chance to ask questions and all the questions were answered even a few that were slightly off-topic.

Delivery

7.54 The event covered a wide range of technologies, their pros and cons. However, it did not give sufficient attention to hearing the views of participants about geoengineering. At the end of the event, participants were asked to fill in a form with one question, "What should geoengineers be doing to save the environment?" They were not told what the forms would be used for. Information from the open access events was woven into the final report on the dialogue, but the report doesn't refer specifically to the comments recorded on these 'Have your say' cards.

7.55 The meeting was not structured to allow participants time to think about the information they had heard or to talk to each other. Almost all the questions, comments etc from participants were directed to the facilitator or the scientist. There were just a few attempts to actively encourage participants to express their views. The facilitator asked three questions of participants and his role seemed to be making sure that the scientist provided information rather than that the participants expressed their views about it.

Impact

7.56 After the event the participants said that they had enjoyed it and learnt something new. The facilitator and scientist said that it had been an enjoyable experience and different from the usual sit-and-learn science meeting.

7.57 There was no explanation at the event of how information from the meeting would be used and it was hard to see what evidence could have been obtained, given the way that the meeting was structured and run.

8. Impact of the Dialogue

8.1 This section covers Impact, the fourth of the Sciencewise-ERC guiding principles for public dialogue, and the extent to which the public dialogue followed those principles. The principles suggest that, on issues of Impact, as far as practicable, public dialogue on science and technology should aim to:

i) Ensure that participants, the scientific community and policy makers and the wider public can easily understand the outputs across the full range of issues considered

ii) Ensure that participants' views are taken into account, with clear and transparent mechanisms to show how these views have been taken into account in policy and decision-making

iii) Influence the knowledge and attitudes of the public, policy makers and the scientific community towards the issue at hand

iv) Influence the knowledge and attitudes of the public, policy makers and the scientific community towards the use of public dialogue in informing policy and decision-making

v) Encourage collaboration, networking, broader participation and co-operation in relation to public engagement in science and technology

vi) Be directed towards those best placed to act upon

vii) To represent the rationale and implications of divergent views.

8.2 This refers to the impact of the dialogue process in a number of areas:

i) Firstly, in relation to the objectives, in what ways and how far has the dialogue influenced the discussions on research in geoengineering?

ii) Secondly, have the participants' understandings and awareness of geoengineering improved or changed and in what ways?

iii) Thirdly, have the participants' views and understandings of dialogue processes changed?

iv) Finally, what were the participants' perceptions of the impact of the dialogue process?

Influence on discussions about geoengineering research

8.3 Firstly, in relation to the objectives, the question is: in what ways and how far has or will the dialogue influence the discussions on research in geoengineering? In the interviews with the experts a variety of views were expressed. It was felt that the dialogue process would have little influence on decisions made about geoengineering research *"I'm not sure it will affect it very much. ... when one is thinking about how to promulgate the research, or to explain decisions about what to go for, then it will be useful but I think that amongst all the factors that affect decisions that are made this is not going to be a very major one"* (EI-3).

8.4 However, it was felt that whilst there might be little influence on policy directly the findings would help policy makers get an idea of public opinion, and it was considered that it would affect scientists and those involved in terms of the way they communicate: *"I think that this was valuable in showing scientists the sort of issues that the public need to be aware of and actually how difficult it is to engage the public in some of these things. And the importance of taking public views into account, as scientists and politicians go about their work."* (EI-4)

8.5 Following from this, one interviewee remarked: *"Yes, as I said earlier it's extremely valuable because it is and increasingly would be a very controversial area. So I think going ahead in spite of public opinion or without knowing what it is would actually be a slow way to get from A to B"* (EI-1).

8.6 On the other hand another interviewee felt that it clearly gave NERC the go ahead to pursue research in the area *"In the very short term, it allows research to go ahead. I think Council would be pretty comfortable with it from that point of view, with some specific guidance on governance and issues like that"* (EI-8).

8.7 Members of the public thought that their views should not outweigh or be used instead of those of scientists. Public participants argued that members of the public don't have the knowledge to be able to take decisions on geoengineering *("at the end of the day, we're not the experts"* – PP-5), but they felt that the views of the public should be taken into account when decisions are made. So the dialogue process was considered to have a value in helping NERC to understand what lay people think about geoengineering. For some this is a moral imperative: *"It's everyone's planet."* (PP-11).

Influence on participants' understandings and awareness of geoengineering

8.8 While the dialogue did not set out to change people's views or attitudes towards geoengineering, but to find out what their views were and why, one does expect dialogue to increase knowledge and awareness; this in turn may lead to changed attitudes. Feedback at the end of the workshop Events 1 and 2 shows that all except one person in each set of workshops agreed that they learnt something new at the events.

8.9 Although there was initially a preference for afforestation because it didn't have 'side effects' and was seen as more natural, some participants indicated that as they got more information, they could see that 'natural' solutions might not be practical or do enough.

8.10 From informal conversations at Event 3 (Southampton), it seems evident that process had quite an impact on participants. Some were wondering what to do with all the information that they had gathered and one had surprised himself by finding it all really interesting.

8.11 The dialogue was very successful in increasing participants' knowledge and understanding of geoengineering. At the start of the process 54 (out of 90) participants said that they either knew nothing or had never heard of geoengineering; 7 believed they knew a great or a fair amount. By the end of all the Event 2s, 64 people considered that they knew a great or a fair amount about the subject and only one still felt they knew almost nothing

> *"Oh I think I'm a little bit better informed. There's a lot of people that I know from my circle of people who don't know what geoengineering is at all - so I can educate people in that respect, I still know some of the different options and so forth. So I feel I'm in quite a fortunate position really."* (PP-7)

8.12 Because of the low level of knowledge from which many people started, few felt that the process had changed their views; instead, the change was in their degree of awareness. There was an appreciation of the number of geoengineering technologies available (although one participant said he was disappointed to find that there was such a limited range of technological options) and the difficulties involved in assessing their costs and benefits. Several people mentioned the international dimension as an aspect that had caught their attention.

8.13 In the interviews a few people did say that their participation had changed their views on geoengineering. Interestingly, some said that they had moved from a position of favouring technological solutions to a preference for more natural approaches, while others had moved in the opposite direction:

> *"I'm not one of those people that says 'Oh no, we mustn't meddle in nature'. But funnily enough, after spending the two weekends, I was more of the opinion that we shouldn't be messing about....I ended up thinking that planting trees was the best thing."* (PP-15)

> *"We all started off thinking that afforestation was the way to go until we realised how much land was needed. So I went from natural ways of doing it to things like air capture. I had a strong change of opinion."* (PP-17)

8.14 Participants were also positive about the way that the process had contributed to their understanding of scientific research, particularly in giving them a better sense of how much research goes on, the different angles that research has to cover and the way that funding decisions are made. While many said that this had increased their admiration for scientists who were seen as well-intentioned and not acting for financial gain, one interviewee took the opposite view. He felt that the dialogue had been managed to promote particular interests and that as a result:

> *"I was disappointed because it wasn't the altruistic experience I expected."* (PP-10)

8.15 One of the Steering Group members also commented on what he had learnt about geoengineering from the process.

Influence on participants' knowledge and attitudes towards public dialogue processes

8.16 As a general point, the members of the public who participated in the dialogue demonstrated that there is a great appetite for discussion of topics like geoengineering which are seen as important to everyone. When asked whether they would participate in a similar process in the future, most of the participants were emphatic in their enthusiasm. People said that they had enjoyed the opportunity to discuss the issue in depth with people with different views.

> *"I think it was a very interesting experience overall and it was interesting getting together with other people and seeing what other people's ideas were; whether they were similar to yours or different or, and also hearing their reasons for it."* (PP-13)

8.17 In terms of the views expressed by the expert interviewees it was clear that it had influenced their attitudes towards public dialogue processes: reinforcing existing enthusiasm for public dialogue, giving confidence in dialogue processes through the professional delivery of this process, and recognising the need to use professionals to carry out the process.

> *"I came away very much more confident that this can be done, and it can be done well. It needs professional help. I think the idea that scientists can blunder round doing it is silly. We've got to get the professionals in to help"* (EI-8).

8.18 In response to being asked if they would be more likely to engage with the public again all the comments from the expert interviewees were varying degrees of positive. These ranged from comments about dialogue being a useful addition to a research project, to comments of a wider transformative nature:

> *"but I would certainly fly the flag for it you know and that very much came out of the dialogue...it wasn't meant to be a one-off thing in terms of geoengineering and for any geoengineering project*

in the future I think we would say you know, make sure there's a public engagement component." (EI-2)

"I think if you are going to be undertaking some research, which may have some you know, controversial aspects to it, then I thought this was a really good way to start a conversation in the public about it." (EI-1)

"But that's it, I didn't have a clue [about geoengineering]. So that in itself is a huge education. It's almost to stop calling it a public dialogue, this is a discourse, and it's a discourse between people. It's scientists, it's policy makers, it's the public, it's about sitting down. I like to think about it almost like the way the old Greeks used to, they used to have an issue, everyone would come together and they would just argue. We've lost that, and I think if we see this whole process as creating space for people to discuss difficult issues, then I think you've got a model for something really exciting." (EI-5)

8.19 The expert interviewees were asked if there was anything that they heard in the dialogue process that surprised them. The only thing that was mentioned was the perception of some public participants that science is neutral, specifically in relation to climate change:

"Again, I think what really surprises me is this belief that scientists still can just do science for science's sake, and it can just stop there. You do your analysis, you find something out, you publish the findings, and that's where your involvement as a scientists stops." (EI-5)

Perceptions of the impact of the dialogue process

8.20 From the expert interviews a number of issues emerged on what people thought the impact of the work would be. Firstly, its importance was seen to be because it had taken place and on a controversial subject:

"Having a report there, having, I mean one of the most important things, one of the research councils have shown an interest in public dialogue in a controversial new area of science. I think just in itself is extremely important, being deemed to have done some public dialogue work and looked about doing some you know, may be a model for doing some more in the future. That's probably the most important thing." (EI-1)

8.21 Secondly, the fact that it linked into the sandpit was considered to be a very positive impact

"I think that fact that we can say it did have an impact straightaway on some things that were funded [as a result of the sandpit] because that's what people will forever ask and you know, there's been a heck of a lot of dialogues in the past, which is quite hard to pinpoint actually tangible things that have come out." (EI-2)

8.22 Thirdly, it was felt that a lot had been learned about how to communicate what might be done around geoengineering:

"So I think for me the lesson is really about how we communicate what we are doing on geoengineering. And providing we do that appropriately then we can avoid the problems which have been seen in other contentious areas of science, you know, like, GM foods and all these sorts of things. And so for me that was quite good. But the other thing I guess which I think is probably quite important is this idea of the moral hazard and the fact that it doesn't look like people would see us doing geoengineering and decide that that means they don't have to worry about mitigation. So I think that's another sort of important finding I think." (EI-7)

8.23 Fourthly, the dialogue was valued because it was felt to show that the government is listening to the public and this was appreciated by public participants:

> *"The main value is that it demonstrates that government is listening to the public. It's taking account of what the public thinks."* (EI-6)

> *"I felt good to be part of something that probably would be quite significant, when you think about the scheme of things, especially if it's gonna help to, sort of, advise government policy."* (PP-7)

8.24 Comments were also made by the experts about the nature of the dialogue findings. It seemed that whilst there was an appreciation of the methods used, there was a desire to package the process as market research[17] rather than as a mix of a dialogue and learning process which provided participants with information and provoked a discussion in order to understand their perspectives and qualitative social research:

> *"Yes, I thought that it was useful, in some ways it would confirm what one would surmise anyway but ... that kind of market research is very useful... Because potentially this is a piece of market research you know, what do the public think of X, Y, Z and what's their reaction to such and such."* (EI-4)

8.25 The apparent ambivalence towards the findings was drawn out in the following comment:

> *"There is still this belief that science can occur in some sort of vacuum and that scientists have no responsibility to look at the impact of science, or how it affects behavioural change, or not. So I think they're really trying, by doing these public dialogues, to show that they are interested in that side of things, but how they actually take this forward, I think they struggle with hugely."* (EI-5)

8.26 One key aspect of the project was the report, and the extent to which it was in a form that was considered to be useable by NERC and others in terms of inputting into decisions around research on geoengineering. The expert interviewees were asked a number of questions about the report, its format and the impact it made. To begin with there were some comments made about the quality of the report and that it needed to go through

> *"a couple of iterations to get it into a form that was, that NERC were ready for, and I think that was a cultural difference between an organisation that was used to sort of factual, scientific information, and a polling organisation that's used to something a bit more nebulous, inevitably because people's opinions aren't factual bits of information*" (EI-8).

> *"I have read some of the report. I won't say I have read all of it but I thought it was quite a good…, quite a useful report. The difficulty is how do we use it? Or that is the real big question. My own personal opinion is that it doesn't necessarily impact the direction of the research but it does impact how we approach that research."* (EI-7)

> *"Yes, I do, I think the results were helpful to NERC in its decision making on geoengineering, I mean I don't know exactly how NERC operate but I think there's enough in there to say, look the things that people are really worried about are this, this and this so if you're going to go ahead and develop these things or you are going to sort of move them politically then here's what you need to worry about and here are some recommendations about how that's communicated."* (EI-4)

[17] Market research is the study of influences upon customer and consumer behaviour and the analysis of market characteristics and trends (Collins English Dictionary (2003) HarperCollins Publishers). It tends to focus on responses and preferences.

8.27 In terms of discussion about how the work would be used there were no discussions in either of the observed Event 2 (Birmingham and Cardiff) about what NERC was doing to with the findings or how the participants' views would be fed into the research decision-making process. In Cardiff participants began to realise that their views could have an influence and to talk about their responsibilities, particularly in the context of an exercise at the end when they were asked to give advice to NERC. Finally, in Event 3 (Southampton) it was stated that there had been an influence of the dialogue on the EPSRC sandpit in that the first day of the sandpit had been spent discussing moral and ethical issues. Further, the two projects that were recommended for funding through the sandpit were both to have public dialogue components as a result of this dialogue process and one of the projects was to use the outputs from this dialogue project specifically. This suggests that the dialogue process had shown the importance of having public dialogue around geoengineering issues. However, one of the experts reflected on the difficulty of using dialogue might inform the specific direction of research:

> *"One of the difficulties I have with public dialogue is how do you use it to inform your direction. Because I couldn't say that because the public have told us x, y and z, that means we are not going to fund something that they have been talking about."* (EI-8)

9. Project Governance

Assessing the success of the governance of the project

9.1 The governance of the project, including the way decisions are made, the institutions involved and the allocation of resources, may not be apparent to many of those who participate in dialogue events but it can have a major impact on outcomes. Questions about governance were included in the evaluation, using Steering Group meetings, interviews and other opportunities to gather information on this aspect.

9.2 Governance refers to how the project was managed, what the structures were and where decisions were made. In terms of the structures, Figure 1 shows the management relationships between the four groups involved in the project.[18] NERC and Sciencewise-ERC were the funders of the process (highlighted in bold), the Royal Society led on the NGO meeting and their input to the materials development and the EPSRC were the key link with the sandpit event on geoengineering.

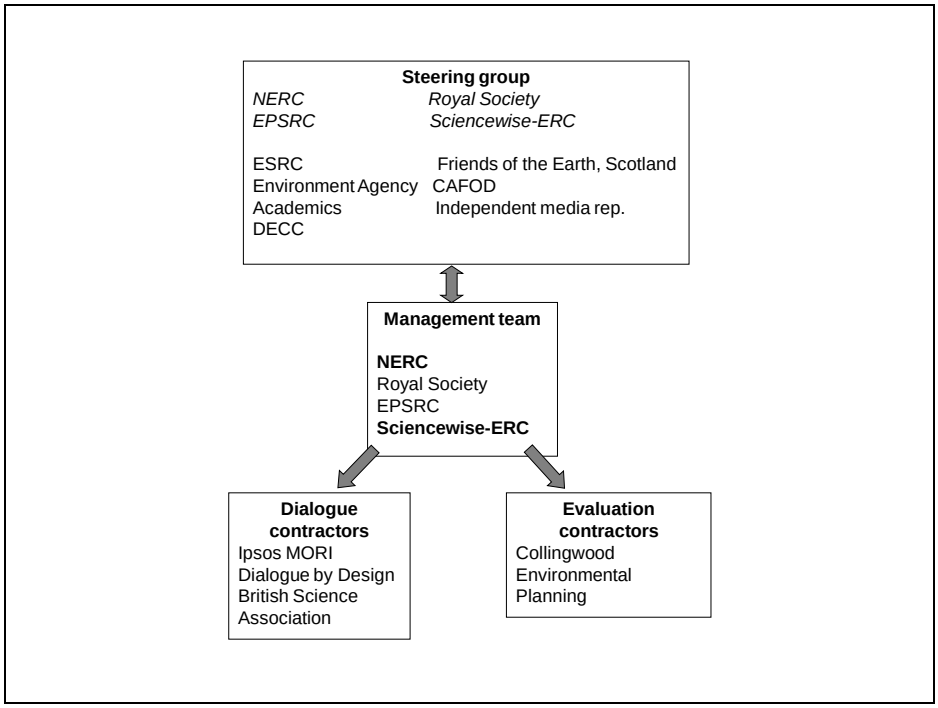

Figure 1: Management relationships in the project

9.3 There were terms of reference for both the Management Team and the Steering Group clearly distinguishing between the two groups, with the Management Team responsible for the running of the project, managing the dialogue and evaluation contractors and signing off the outputs and the Steering Group responsible for representing views of a wider stakeholder community, providing advice, helping to raise the profile of the project, and to facilitate embedding of the findings in policy and practice.

9.4 Members of the Management Team were not members of the Steering Group and only attended meetings in an ex officio or observer status. This structure was clear and made effective use of the roles of the different groups. The Steering Group met only twice, but at the first meeting they were

[18] There was contact between the different groups, formally through the interviews for this evaluation, but also informally. However, this diagram is intended to illustrate the formalised management arrangements on the project.

involved in a facilitated event around the development of the materials for the dialogue process. Members were encouraged to attend the dialogue events which a number did, and they were involved in commenting on the report. The links between the dialogue process and EPSRC/NERC sandpit and the Royal Society NGO meeting were perhaps less clear.

9.5 The expert interviewees were asked about how they felt the various governance structures worked. With respect to the clarity of the roles and responsibilities of the Steering Group and Management Team a range of views were expressed:

> *"R: No not [clear] in comparison to the Management Group, I didn't think that was sufficiently clear.*
>
> *I: So how do you think it could have been improved?*
>
> *R: Basically by having more time, it was an unfortunate side effect of there being very little time. But what would have been ideal is for the Steering Group to take the overall view, they decide what they want to be done, what they are trying to achieve and then they instruct the Management Group to go out and do that. That would have worked better."* (EI-1)
>
> *"R: I think at times there was confusion between what the management group was about and what the Steering Group was about but yeah, I think it was clear in as much as I felt that the management group were the group that were making the decisions, as it were, based on the advice from the Steering Group."* (EI-7)
>
> *"R: Reasonably clear. I think we met twice. I think in the first meeting we were finding our way a bit. The Steering Group was actually really good and I think after half an hour or so had really understood where they could add value to the process.*
>
> *I: And so it was clear in both meetings and throughout?*
>
> *R: By the second one it was clear. The first one, it took us a bit of time to work out exactly what our role was."* (EI-3)

9.6 In terms of the membership of the Steering Group, it did consist of a wide range of people and this was appreciated and remarked upon by the experts that were interviewed.

> *"But no, I thought the types of people and the skill sets of the people who were there and also the breadth of the people there, I thought was really good, so we had people from organisations such as CAFOD right through to organisations like the Environment Agency."* (EI-7)

9.7 In terms of additions or omissions to the Steering Group one expert interviewee suggested it was quite weighted toward science as opposed to communication and another suggested that perhaps there could have been members of the public on the Steering Group as well.

> *"but given that this was about science communication and about you know, getting people's views and so on, I thought that perhaps the balance was slightly towards the science rather than the mediation, the communication you know, those sorts of things."* (EI-4)
>
> *"Yes, probably even at the steering committee stage, it may have been worthwhile having a few members of the public there, as that was what it was about. Informed members of the public would have been, probably, quite useful because they could have immediately said, "Well this is ridiculous, we don't understand this, we want this."* (EI-5)

9.8 The expert interviewees were asked about the roles and relationships between all of the groups. Overall, it was felt to have gone well but it was acknowledged that it was quite a complex task to do especially over such a short time period:

"Overall quite well, I mean co-ordinating all these different groups it still collectively managed to get a report done over a short time period that was useful. So yes, overall it worked quite well. I think that the folks from NERC were far more responsible for actually making this happen [and] experienced more trouble balancing all these relationships, particularly with the contractors responsible for the delivery of the Project." (EI-1)

"They [the Steering Group] had all the information if they wanted it, they have been sent it all and they, yes, had enough I think, I think it worked all right. ... because it was the first one we've done of these with Sciencewise you know, the relationship with us, Sciencewise and the contractors, apart from the Steering Group, was complex enough in terms of working out who was responsible for what, but yes I think we sorted that out all right." (EI-2)

9.9 A further comment was made about the contractors in terms of their familiarity with the scientific information for the project:

"And I thought they were asked to deal with some very scientific information which I didn't think they were that comfortable with. It was clear that what they were, they were obviously very very good with this kind of dialogue arrangement with the public. I thought they did that really well. ... in retrospect it was kind of obvious that they would lack the scientific information and then they were rushing around trying to acquire it and use the Steering Group in particular as a resource to check the material. I don't think the Steering Group were ready for that and the timetable for the whole project was pretty short. There was probably a month from appointing the contractors to the first engagement meeting with the public." (EI-8)

Lessons for governance of future dialogue processes

9.10 In terms of what could be improved for future dialogues a number of issues were expressed:

1. Increased clarity around objectives, rather than doing dialogue for its own sake
2. More time in general and specifically for development of materials and for the Steering Group to understand their role.

9.11 In addition, there were generally positive expressions about the governance:

"I was very happy. It's very rare that I come out of meetings feeling quite buoyed up and happy. Normally you just come out feeling totally depleted, and I think the very fact that I thought I had partaken in really interesting discussions, my views had been listened to, I had heard other people and listened to them, and seen their views taken into account. I think it was actually democracy working, for once." (EI-5)

10. Dialogue Costs and Benefits

10.1 Public consultation has costs as well as benefits. In examining the value of the public dialogue on geoengineering, how costs and benefits were perceived by different participants and what factors are taken into account in attributing costs and benefits were explored.

Overall balance of the costs and benefits of the dialogue

10.2 The public dialogue on geoengineering produced a range of benefits beyond the outcomes it was explicitly intended to achieve. These are seen differently by different participants and this range of views is explored below. But while it is relatively easy to identify and examine benefits, people seem to be more wary of talking about costs. When asked about the costs of the process, most people's response was that they didn't know how much it cost and therefore couldn't comment. This may reflect a tendency to think of costs in monetary terms and for people and institutions to shy away from public discussion of the resources allocated. Given the current emphasis on disclosure and accountability, there might be a case for making the costs of public dialogue exercises more readily available, particularly to those, like Steering Group members, who are also contributing resources of their own.

10.3 The problem with making available the monetary costs of dialogue processes is that it may encourage people to focus on this aspect of the cost-benefit equation to the detriment of other less tangible aspects. While the rationale for carrying out evaluations like this is to move away from a balance sheet approach to costs and benefits, there is a case for being more explicit about costs, to allow comparison with other similar dialogue processes, other kinds of public engagement and, ultimately, with other potential uses of public resources. This would also be a way of ensuring that costs of different kinds were explicitly in the frame: An outline framework for looking at costs is provided in Involve (2005)[19] which divides costs into monetary and non-monetary:

- Monetary costs include: staff time (paid), staff expenses, external staff / consultants, fees to participants, expenses to participants, training (staff), training (participants) and administration
- Non-monetary costs covers: time contributed by participants, staff time (unpaid) and skills needed for the new approach together with risks to reputation, stress and conflict.

10.4 Being more open about potential costs would also encourage those involved in dialogue processes to make explicit the broader benefits, for example in terms of networking, the opening up of new opportunities for institutional collaboration and the ability to reach out to wider audiences.

10.5 For this evaluation, the expert interviewees and the public participants were asked about the overall costs and benefits of the dialogue process. The expert interviewees were asked about the benefits to them individually or to their institutions, the financial costs, the value for money and whether they considered it to be money well spent. The members of the public were asked about the benefits to them individually or professionally, the value of the dialogue in determining future geoengineering research and whether the benefits justified the cost of the process. Participants' views on costs and benefits are explored in the subsequent two sections. In this section we present some general views on assessing the costs and benefits that were put forward by the expert interviewees.

[19] Involve (2005) The True Costs of Public Participation http://www.involve.org.uk/assets/Uploads/True-Costs-Full-Report2.pdf

10.6 One expert interviewee suggested that there might be more cost-effective ways of engaging with public opinion, depending on the objectives of the engagement:

> *"it depends what you want from the dialogue you know, do you want to do dialogue because you want to be seen to be doing dialogue? you know, you don't actually want to know what people think but you have to consult them, right?... or are you doing it because you actually genuinely want to find out people's views or are you doing it because you want to persuade people by engaging them in an argument and then persuade them with something?... there may be much much cheaper ways of doing some of these things like leveraging the BBC or someone else to do this for you."* (EI-4)

10.7 Some people felt that it was problematic to assess the value of the process as they did not have information about how much it cost. Being able to assess the value was felt to need more time, that is, the real value would only be known in a few years.

> *"The money is the easy bit and the value is the hard bit. So what really needs to be done is in a couple of years' time to look at other public consultations to then look back and see how it's influenced decision making. One might want to look for something like the GM debate where there have been a lot of public consultations. Now, has that actually made a difference?"* (EI-3)

10.8 Another expert interviewee suggested that timing and degree of contentiousness were additional factors that should be taken into account in assessing value: against this measure, this person felt, the geoengineering dialogue would score well. Another endorsement of the value of the process was based on the its value in creating awareness:

> *"It is an awareness raising process, so yeah, 100% I think it's money well spent. In fact, with the slashing of research budgets and things, I fear that this sort of initiative will be the sort of thing that is seen as, "No, it's not that important." And the budgets will be cut for this, which I think would be a tragedy."* (EI-5)

10.9 In terms of whether or not the expert interviewees felt that money could have been saved without compromising the quality of the outputs a number of views were expressed. Overall, it was suggested that that would have been difficult for the main dialogue events. The Open Access events were thought perhaps to have added least to the final output, and it was suggested that with a bit more organisation it might have been possible to have only one Steering Group meeting. There was some curiosity over what would have been achieved for the same amount of money but using a market research approach *"I don't know what you'd get by sort of bounding up to people in the street and asking them."* (EI-4). The evaluation was considered to be quite detailed and so perhaps savings could be made there.

10.10 The public participants found it even harder to assess the cost of the dialogue process than the experts, perhaps because the latter would have had some idea of the range of activities carried out and therefore the potential costs involved. One member of the public suggested that an assessment of the cost of the dialogue would need to take account of other spending priorities.

10.11 Given that many of the interviewees – both experts and members of the public - found it difficult to comment on the cost effectiveness of the dialogue, it is important to emphasise that no-one suggested that the process had been a waste of money or time.

Benefits of the dialogue process

10.12 In looking at the benefits of the dialogue, we focus on those benefits that are additional to the outputs that the project was intended to achieve (the extent to which the project achieved its

objectives is covered in section 8). This reflects the value added by the design and delivery of the dialogue process and any unexpected benefits. Participants – both experts and members of the public – who are new to dialogue often find some of the positive outcomes surprising, even though these are not unexpected to those charged with running the process, and are usually achieved by design.

10.13 Some of the significant benefits or value added to the overall process of decision-making on geoengineering research were:

i) Making the link between research being carried out by different institutions (NERC, EPSRC, Royal Society) and getting the views of the public on the field as a whole rather than on specific programmes. A clear benefit of the dialogue process was to inform the EPSRC sandpit held in mid-March to explore geoengineering research ideas.

ii) Facilitating the direct exchange of views between members of the public and scientists, so that each group encountered the views, priorities and concerns of the other in an unmediated way and could respond to those. The powerful impact of this direct contact was commented on by both the experts and the members of the public. Other methods of exploring the views of members of the public, such as opinion polls and focus groups, do not produce this contact.

iii) Suggesting better ways of communicating with wider audiences about geoengineering research. Experts saw this as valuable:

"From what I can tell of the way these were run, the members of the public involved had a real opportunity to question, to get their views across. And I think there was a real understanding of what the pressure points are and how to communicate these things in the future. So I think that that was pretty good, very meaningful." (EI-4)

10.14 Members of the public also felt that the process would lead to more effective communication and that this was very important:

"And it's actually deciding which of the methods of geo-engineering is least harmful to the planet ... And it should be very important to everybody. But then they can only give their views if they know what the possible methods of dealing with climate change are. I think one of the big dangers we have these days is people give their view from ignorance. [Q: So it's worthwhile to go through a process where people can get this information?]. I think it does, yeah absolutely, effective communication." (Z-3)

Costs of the dialogue process

10.15 As discussed above, those involved in the dialogue process found it difficult to talk about costs, mainly because of the tendency to focus on the financial costs of organising and running the dialogue events (which they had no information about) and not looking more widely at the costs of holding a dialogue process of this kind, and how these might compare with other methods. In this section, therefore, we focus on a few of the specific additional costs associated with the way that the dialogue process was developed.

10.16 One expert suggested that the costs of this kind of process could be reduced if the input from the Steering Group could be organised more efficiently, so that views were gathered once rather than over several iterations. We would suggest that the tight timescales in which the dialogue was organised and run meant that the objectives of the lead organisations, particularly in relation to the kinds of materials needed, had not been fully bottomed out before the first Steering Group meeting and that this had costs in terms of time spent subsequently on coordinating expert input. It was felt

that the process had been squeezed to fit a short time frame, because of external factors like the date of the EPSRC sandpit event. This is not to suggest that these costs outweighed the clear benefits of making the link; simply that it is not clear that the Management Team explicitly considered the balance between costs and benefits.

10.17 The inclusion of a range of different types of activity within the dialogue process, and particularly the Open Access events, was considered by some of the experts not to have significantly improved the results of the dialogue, while clearly adding to its overall cost.

10.18 Full details of the monetary costs of the dialogue have not been collected, and no data has been collected on non-monetary costs. However, the total budget for the project was £155,000, of which Sciencewise-ERC contributed £85,000. To put this into context, it was expected that up to £3.5 million of funding would be made available for research projects arising from EPSRC-NERC sandpit alone[20]. The costs of the dialogue were therefore a relatively small proportion of the costs of the activities potentially influenced by the dialogue findings.

[20] *Climate Geoengineering Sandpit. Call for participants*. EPSRC website, consulted 16 March 2011. http://www.epsrc.ac.uk/funding/calls/2010/Pages/climategeoengsandpit.aspx

11. Learning from the Dialogue

11.1 The evaluation of NERC's public dialogue on geoengineering provides valuable learning about processes for involving members of the public in discussions on scientific research and its development. Some of this learning is based on the good practice observed; in other cases it comes from a reflection on the challenges faced. This is an area whose importance is increasingly recognised but whose practical application is relatively recent. Below we outline six learning points from the geoengineering process which we hope will inform future work on the part of NERC, Sciencewise-ERC and other institutions interested in taking the views of members of the public into account in scientific research.

Learning point 1: Value and cultivate the multiple benefits of bringing the public and scientists together in scientific discussions

11.2 All of those involved in the public dialogue on geoengineering who were contacted for this evaluation (NERC, the members of the Management Team and Steering Group, other experts and members of the public) indicated that they found the process valuable. Some found value in aspects they had not initially considered; members of the public who went along to Event 1 thinking that they would find out about practical ways of preventing climate change, for example, felt privileged to have been able to discuss geoengineering with scientists even though this was not related to them making practical changes in their behaviour. Many of the scientists commented on the useful messages coming out of the dialogue on how best to communicate geoengineering science.

11.3 People said that they had enjoyed the events and many said they would like to be involved in similar activities in the future. They gave many different reasons for this: the scientists enjoyed hearing the views of members of the public; members of the public enjoyed listening to the scientists; everyone felt that their views were being listened to and appreciated. This experience has a tremendous value in a society where people are losing the experience of engaging in conversations about important subjects with people unfamiliar to or unlike themselves.

11.4 The overall delivery of the dialogue events by the contractors' team was highly professional, ensuring that participants could focus on exploring issues. Both the contractors and the Management Team, working with the Steering Group, put in a good deal of effort to clarify the process and resolve differences about the materials and the resulting process was generally extremely effective. Where participants were less clear about their role (as in the case of some of the people who were called upon to act as 'experts' at public events) or the purpose of their input (for example, some members of the public did not think it was appropriate that they were asked to say which geoengineering technologies they preferred) they were more likely to question how useful the findings would be.

Learning point 2: Ask members of the public to use their own expertise and don't expect them to become scientists

11.5 It is important that members of the public who participate in dialogue events feel that their involvement is worthwhile, so that they and others are willing to take part in similar events in the future. Although the members of the public involved in the geoengineering dialogue gave a strong endorsement of the process and said they would like to participate in similar events, a number

expressed concern about how their views might be used, emphasising that they were not 'experts' and that they did not have the necessary information to be able to give opinions.

11.6 It is clearly unrealistic to expect members of the public to achieve a degree of scientific knowledge on a topic like geoengineering that in any way compares to that of experts working in the field. Given this difference in expertise, many members of the public were at a loss as to why they were being asked for their opinion. Rather than feeling concerned that their input might not be taken into consideration, several people said it would be wrong for their views to have a significant bearing on the subject, *"because we just don't know"*. Public participants even felt unqualified to assess elements of the dialogue process like the quality of the materials provided, because they didn't know enough about it.

11.7 One member of the public argued that as lay people coming to an unfamiliar subject, participants had little capacity to provide a viewpoint that was different from or challenged that of NERC and its partners:

> *"I could say, all right we could make a decision now on whatever, but we don't have enough information to be able to make that decision.... Us lay people could only go by what the scientists tell us. [Our views] would have some bearing on the way things happen probably, all right? But I wouldn't say they would take a lot of notice because we just don't know."* (PP-2)

11.8 A very similar concern was voiced by a member of the Management Team:

> *"One of the things that I did wonder was whether we just heard back what we put in?"* (EI-7)

11.9 This problem can be solved by ensuring that members of the public are asked questions that they can answer. For example, rather than asking participants to give their preferences for different geoengineering technologies, a more useful question might have been, 'What would you need to know in order to say whether one geoengineering technology was better than another?' or 'What are the factors that scientists need to consider when choosing one geoengineering technology over another?'

Learning point 3: Be clear about what the public can influence and make sure they are clear throughout

11.10 In the long term, the effectiveness of dialogue processes will generally be assessed in terms of the way they influence people, decisions or actions, and this is why influence is emphasised within good practice guidance on all dialogue processes. It is therefore important to be very clear about the people, decisions or actions that could be influenced, otherwise public participants may feel that their input has not been used and expert participants may not see the relevance of the information generated. When asked, public participants felt that they knew how the results of the geoengineering dialogue would be used. However most were hazy about exactly who would take decisions (the UK Government? NERC? Others?). In part this reflects a lack of precision on the part of NERC and its partners about what exactly would be done with the results. Lack of clarity led some participants to conclude that NERC would use the results to support efforts to secure funding for geoengineering research.

11.11 This was also reflected in the views from the experts interviewed, that while there were a number of actions that had been influenced by the process there was not an obvious strategy for taking the report and its findings and feeding that through into the geoengineering research development process.

Learning point 4: Engaging with the public involves practical responses

11.12 As observers, we were impressed by the impact that the process had on the majority of the experts who became involved in it. Many indicated during the dialogue events or later in the interviews that they had realised the value of discussing science with members of the public and were ready to promote this within their own and other organisations.

11.13 However, this change was not clear to members of the public. Despite the very strong endorsement of the results of the process expressed by the Chief Executive of NERC and other experts at Event 3 in Southampton, one of the members of the public commented that, following this event, the public participants had been discussing what was going to happen next:

> *"We wondered whether anyone would take any notice of it or if it's just a PR exercise."* (PP-14)

11.14 This suggests that participants may need to see clearer evidence of how their input has been used if they are to be convinced that this has really had an impact. It may also be the case that if the impact on the experts and sponsors who attended the events is not translated into changes in structures or processes, the influence of the dialogue will remain informal and will depend on the initiative of key individuals.

11.15 The end of the events that have made up a public dialogue process is a critical moment at which those involved may feel that the discussion has been closed down or alternatively see that their input is taken forward and has the potential for having a real influence.

Learning point 5: It's worth investing in making partnerships work

11.16 The public dialogue on geoengineering involved a complex set of institutional relationships and shared working, both between research councils and related institutions (NERC, EPSRC, Sciencewise-ERC) and with others (Royal Society). This breadth of institutional support, combined with the range of different types of activity that fed into the process, gave the dialogue a strong foundation and credibility within the academic community and beyond. This aspect was appreciated by the experts involved and has led to further partnership working between one Steering Group member and NERC.

11.17 It is important not to underestimate the investment of time and effort that goes into making this kind of complex institutional relationship work effectively. It is likely that NERC found itself required to take on a much more hands-on and energetic project management role: it would be useful if this experience could be documented for other situations in which research councils may find themselves leading similarly broad partnerships.

11.18 It is also important that teams or organisations with less experience of dialogue do not feel that they have to start from scratch when they undertake dialogue processes. While this is a relatively new area, there is a rich body of learning both from earlier science dialogues (e.g. the nano-dialogues) and from outside the field of science. Effective sign-posting and sharing of lessons on the part of Sciencewise-ERC will ensure that the learning from each new process can be disseminated more widely.

Learning point 6: Dialogue and market research have different purposes

11.19 Like other earlier dialogues between scientists and members of the public, the public dialogue on geoengineering has highlighted the many valuable outcomes of this method of engagement. Engagement between members of the public and decision-makers can take different forms: from simply informing and consulting or getting information from members of the public through to the deeper engagement of partnership working, co-production of outcomes and citizen control. Dialogue is towards the 'deeper engagement' end of the spectrum, encouraging the co-production of outcomes, deliberation and social learning.

11.20 Market research is another form of engagement, which is closer to the other end of the spectrum. It asks people for information, to gain better understanding of their actions, attitudes or concerns.

11.21 Some participants, both experts and members of the public, made comparisons between market research and the dialogue process they were involved with. In some cases it was suggested that one or other method was 'better' and therefore should be used. This is misleading, as each of the methods serves a different purpose and the choice of method should be taken in relation to the objective of engagement. This is seldom a simple decision as most engagement processes have multiple objectives.

Appendix 1: Public Dialogue Evaluation Data Sources

The following types of data were collected for the evaluation during the course of this dialogue, and its complementary streams.

Types of events / sources	Types of data collected
Project Management meetings	Notes from the observation of 3 Project Management Team meetings.
Stakeholder engagement	Notes from observation of 3 stakeholder events, based on a common template. These events were: • 2 Steering Group meetings • 1 NGO meeting
Events 1 and 2 and Reconvened Event (Event 3)	Notes from observation of 4 Public Dialogue events, based on a common template. These events were: • Birmingham: Events 1 and 2 • Cardiff: Event 2 • Southampton Reconvened Event (Event 3) • Pre- and post-event questionnaires
Open Access Events	Notes from observation of 1 Open Access Event events, based on a common template. This event was a meeting held in Oxford.
Interviews	Structured interviews with 16 participants in the Public Dialogue Events. Semi-structured interviews with 8 Experts.

Appendix 2: Summary Event Observation Table, Excerpt and Outline

(i) Outline Summary Event Observation Table

Date: Location:

Event: Time:

Facilitated by: Observer:

		Questions	Comments
Context	In what ways are the objectives of the process made clear to the participants?	How are the objectives of the dialogue explained? (clear, succinct, accessible, look at method and manner of delivery)	
	Are the objectives perceived as clear by different participants?	How are they understood? (asking questions that show understanding/ looking for clarification etc)	
	Are participants able comfortably to explain the purpose of the dialogue?	Ability to explain the purposes of the dialogue in informal conversation	
	What decision making processes are the geoengineering dialogue process linked into?	Are these explored? Questioned?	
	How are those links going to be maintained and developed?	Is this discussed?	
	What commitment is there to ensuring the dialogue process is taken into account?	How clearly did NERC explain how the results would be used? How is this discussed in Steering Group meetings?	
Scope	How are the concerns and aspirations of the different participants explored? How are differences in perceptions of scope of the process addressed?	How questions about the scope of the dialogue are answered (openly, closed, relevance etc.) by the dialogue team and clients?	
		Is there time for discussion of the scope of the dialogue process? Are questions about aspirations for the process discussed?	
	How is the scope expressed? Is the topic clearly articulated and accessible?	How are the materials presented? Are they accessible/understandable How much information is given? How balanced are the arguments - look for pros/cons? Are participants encouraged to ask questions? Did they give enough time for questions?	
	To what extent is the selection of the	How have people been selected?	

		Questions	Comments
	participants appropriate for the topic under consideration?		
	What kind and extent of influence do the participants have in the process over key issues such as what areas are taken further in research?	How is the influence of participants explained? How is the influence of participants understood/discussed by participants?	
Delivery	Fit for purpose:	In what ways is the process designed to reflect the objectives of the dialogue process, its context and scope?	
		Is there flexibility in the process to allow for changes in direction through the dialogue process?	
	Inclusive: How is dialogue between members of the public, and experts maximized?	How is the event organized? How much contact do the participants have with the experts (informal/formal), presentations only, small group work etc	
	Deliberative: Is there time for participants to become informed in the area of geoengineering? What types and quality of information are participants given on the topic? How are those materials perceived and used by participants?	How much information is presented? How much time are participants given to consider and reflect on the information? PLUS questions in Scope section	
	How are the dialogue events conducted so that all participants are treated respectfully? To what extent are events non-confrontational, fairly facilitated, and supportive of participants' questioning of experts?	Was there enough time for participants to talk to each other? Was there enough structure to enable discussion? How was the group facilitated? Was everyone encouraged to speak? How were the discussions recorded? How were sensitive situations handled? How well was the discussion kept on track?	
	In what ways are reports accessible to different participants? Are they perceived as understandable by all participants	How are the reports made available? (e.g. web, paper, large print, summaries etc)? What do participants think of the reports?	
Impact	What mechanisms are in place to ensure that participants' views are taking into account? Are they clear and transparent and perceived to be so by all participants	Is it made clear to participants how their views will be taken into account? i.e. how recorded, reported etc. linked into wider processes?	
	In what ways, if any, have participants' knowledge and attitudes towards geoengineering been influenced by the dialogue	How do participants feel they have been influenced in terms of geoengineering by the dialogue process?	

		Questions	Comments
	process?		
	In what ways, if any have participants' knowledge and attitudes towards public dialogue processes been influenced?	How do participants feel they have been influenced in terms of dialogue processes?	
General considerations	Comfort	Was the temperature of the room comfortable?	
		Were the presentations audible?	
		Were the noise levels acceptable?	
		Were there sufficient breaks?	
	Welcome	Was there a clear welcome/registration?	
		How were participants identified?	
	Layout of room	What was the layout?	

(ii) Excerpt from Summary Event Observation Table

	Questions	Comments
In what ways are the objectives of the process made clear to the participants?	How are the objectives of the dialogue explained? (clear, succinct, accessible, look at method and manner of delivery)	• Across the events the specific objective of finding out people's preferences was not made v. clear. ○ The information was on the slides used in Event 1 • The slides for Event 2 referred to the objective of exploring the moral, ethical and societal implications of funding decisions. • In the events observed (B'ham and Cardiff) the slides explaining the objectives and process were gone through very quickly and minimal explanation given regarding context and process. • In event 3 there were links back to how the participants' views had fed into the research.
Are the objectives perceived as clear by different participants?	How are they understood? (asking questions that show understanding/looking for clarification etc)	Event1 (B'ham): mistrust of motives behind process expressed by some participants (e.g. is the govt going to do this anyway, are they going to put up our taxes and justify it through this research). Events 2 & 3 Guided tasks (B'ham, Cardiff & Soton)) meant that people got on with what they were doing rather than asking questions.
Are participants able comfortably to explain the purpose of the dialogue?	Ability to explain the purposes of the dialogue in informal conversation	People's reasons for participating in a dialogue may be different from those of the organisers. Event 1 (B'ham) – some people there to find out about climate change and what can be done about it. Others glad to be consulted. Event 2 (B'ham) people were clear about the purpose of tasks.

	Questions	Comments
		Event 2 (Cardiff) most people seemed clear about what they were being asked to do. Some began to feel during the day that they were being asked very big questions and that they had been given a big responsibility. Event 3 – Some clear about objectives, others we spoke to still weren't quite sure, but also some there were impressed that they had been consulted.
What decision making processes is the geoengineering dialogue process linked into?	Are these explored? Questioned?	Event 1 (B'ham) – explained too quickly at the beginning of event, and although 2 people from NERC were there they were not integral to the explanation. Event 2 (B'ham) – explained a bit more at end of event. Scientist mentioned that they (research council) don't want to make the same mistake as in the case of GM. No specific discussion of decision-making processes in NERC. Event 2 (Cardiff) – very little discussion about the way that decisions on research and development of technologies happens. The futures scenarios format didn't lend itself to discussion of this (the stories were about the technologies already in place). More discussion of the research process in the afternoon: this was quite new to most people. Event 3 – lots on how this fits in with decision-making processes that NERC go through in terms of deciding on research themes– presented but not explored in discussion events
How are those links going to be maintained and developed?	Is this discussed?	Event 2 (B'ham) - facilitators mentioned that film being made would be on NERC's website. Facilitator explained about the reconvened event – everyone said they wanted to go. Event 2 (Cardiff) - In discussion with other observers and the facilitators, the Sciencewise-ERC representative raised the question of continued involvement of these convened groups in discussion of geoengineering research but this was not discussed with participants and it's not clear whether anything further is being done on this. Event 3 – via new project from sandpit – Nick Pidgeon.
What commitment is there to ensuring the dialogue process is taken into account?	How clearly did NERC explain how the results would be used? How is this discussed in Steering Group meetings?	While there was a clear commitment on the part of NERC that we can trace through other statements, this was not clearly brought out in Events 1 & 2. In Event 3 NERC came out clearly on their support for dialogue.

Appendix 3: General Considerations from Observations

	Questions	Comments
Comfort	Was the temperature of the room comfortable?	Event 1 (Birmingham) – yes but no natural light or fresh air. Problematic by the end of the day. Event 2 (Birmingham) – much nicer room than first one. Room bit hot but had natural light. Event 2 (Cardiff) – big ballroom lots of light and temperature OK. Event 3 (Southampton) –nice and light if rather cold
	Were the presentations audible?	Yes.
	Were the noise levels acceptable?	Yes on the whole though some difficulty in small groups.
	Were there sufficient breaks?	Yes except for Birmingham event 1. The break in the morning needed to be sooner and there should have had lots of mini-breaks in between stations as some people were really struggling to stay with the process towards the end.
Welcome	Was there a clear welcome/registration?	Event 1 (Birmingham) – registration yes. But once they were in the room nobody greeted them. They just somehow ended up at a table and sat in silence until facilitators started talking at 10. Event 2 (Birmingham) -Yes. Event 2 (Cardiff) – Yes. Event 3 (Southampton) - No. This was disorganized but seemed to be due to the venue.
	How were participants identified?	Event 1 (Birmingham) – name badges. Event 2 (Birmingham) – had name tags but by mid-morning were referring to each other by name. Event 2 (Cardiff) – name tags. Event 3 (Southampton) name tags.
Layout of room	What was the layout?	Event 1 (Birmingham) – Large room with 3 cabaret style tables seating 10. Rows of chairs at back of room with 2 stations introducing technologies. Event 2 (Birmingham) – long thin room with screen at one end but it was fine. Event 2 (Cardiff) - Large rectangular ballroom with three big tables. The video clips were shown at one end of the room, so participants stood round the screen to watch. This worked fine as the clips were quite short. Event 3 (Southampton) – layout was good. One large room with four areas. One breakout space was a lecture theatre so not as helpful for dialogue but rest of the space worked well.

Appendix 4: Sample Dialogue Event Participant Questionnaire

NERC Public Dialogue on Geoengineering - Event 1

End of meeting questionnaire

We would very much like to hear how you found the meeting. Please could you answer the questions below then **hand to a member of Ipsos MORI staff**.

Please remember your **answers will be completely confidential**. Both Ipsos MORI and Collingwood Environmental Planning will only report your responses as summaries in which no names will be mentioned.

Thank you!

Your name (Please print)

Q1. How far do you agree or disagree with the following statements about the meeting?

PLEASE TICK ONE BOX ON EACH LINE	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
a. There was enough time to fully discuss the issues	❒	❒	❒	❒	❒
b. The information provided was fair and balanced	❒	❒	❒	❒	❒
c. I understood the information provided	❒	❒	❒	❒	❒
d. I understood the purpose of the meeting	❒	❒	❒	❒	❒
e. I understood how the results of the meeting will be used	❒	❒	❒	❒	❒
f. Attending this meeting has changed my views	❒	❒	❒	❒	❒
g. I learnt something I did not know before	❒	❒	❒	❒	❒
h. I enjoyed taking part	❒	❒	❒	❒	❒
i. I was able to discuss the issues that concern me	❒	❒	❒	❒	❒
j. All participants were treated equally and respectfully	❒	❒	❒	❒	❒

Q2. After today's meeting, how much, if at all, would you say you know about geoengineering?

	TICK ONE BOX
I know a great amount about geoengineering	❒
I know a fair amount about geoengineering	❒
I know just a little about geoengineering	❒
I know almost nothing about it	❒

Q3. Overall, to what extent would you support geoengineering approaches to tackling climate change?

	TICK ONE BOX
Strongly support	❒
Tend to support	❒
Neither support nor oppose	❒
Tend to oppose	❒
Strongly oppose	❒
Don't know	❒

Q4. To what extent would you support or oppose the following?

PLEASE TICK ONE BOX ON EACH LINE	Strongly support	Tend to support	Neither support nor oppose	Tend to oppose	Strongly oppose	Don't know
Developing technology to reduce global temperatures by reflecting sunlight back into space	❒	❒	❒	❒	❒	❒
Developing technology to extract the gases that cause climate change from the air and store them.	❒	❒	❒	❒	❒	❒

Q5. To what extent do you support or oppose funding research into each of the following forms of geoengineering?

PLEASE TICK ONE BOX ON EACH LINE	Strongly support	Tend to support	Neither support nor oppose	Tend to oppose	Strongly oppose	Don't know
Air capture – Using 'artificial trees' to remove CO2 from the air.	❒	❒	❒	❒	❒	❒
Iron fertilisation - algae grows by adding iron to the ocean. The algae absorbs CO2 from the atmosphere and sink from the upper ocean	❒	❒	❒	❒	❒	❒
Liming the ocean - Adding lime reduces the acidity of the oceans, making them absorb more CO2	❒	❒	❒	❒	❒	❒
Biochar - By turning dead vegetation into a fine charcoal and burying it, the CO2 in the plants will remain locked away rather than released into the atmosphere.	❒	❒	❒	❒	❒	❒
Afforestation - Planting more trees to absorb more CO2	❒	❒	❒	❒	❒	❒
White roofs - Painting surfaces of man-made structures to be more reflective would reflect heat and could lower temperatures.	❒	❒	❒	❒	❒	❒
Mirrors in space - Giant mirrors would act as a sunshade to reflect sunlight away from the earth and prevent warming.	❒	❒	❒	❒	❒	❒
Cloud whitening - Spraying seawater droplets into the air would increase cloud cover, increasing reflectivity.	❒	❒	❒	❒	❒	❒
Sulphate particles - Sulphur sent into the atmosphere would reflect the suns rays back into space	❒	❒	❒	❒	❒	❒

Q6. How satisfied or dissatisfied were you with the following aspects of today's meeting?

PLEASE TICK ONE BOX ON EACH LINE	Very satisfied	Fairly satisfied	Neither satisfied nor dissatisfied	Fairly dissatisfied	Very dissatisfied
The venue itself	❒	❒	❒	❒	❒
The helpfulness of the staff at the workshop.	❒	❒	❒	❒	❒

Q7. What were the best/most successful aspects of the meeting?

Q8. What were the worst/least successful aspects of the meeting?

Q9. How do you think the meeting could have been improved?

Q10. Is there anything else you would like to add?

Thank you very much for your help and attending today's meeting.

Appendix 5: Analysis of Participants' Questionnaires

Pre-event questionnaire – analysis of responses

Question	Number of respondents and % of total												
	To learn more about climate change	(%)	Interest in environmental issues	(%)	To express my views	(%)	To influence decisions about climate change research	(%)	Because of the financial incentive	(%)	To meet people	(%)	Total respondents
1. Main reasons for taking part	58	30	48	25	32	16	19	10	38	19	13	7	**81**

	Great	(%)	Fair amount	(%)	Just a little	(%)	Heard of but know nothing	(%)	Never heard of	(%)			
2. Knowledge of geoengineering	1	1	6	7	20	25	30	37	24	30			**81**

	Strongly support	(%)	Tend to support	(%)	Neither agree not disagree	(%)	Tend to oppose	(%)	Strongly oppose	(%)	Don't know	(%)	
3. Supports geoengineering approaches to tackling climate change	10	16	33	54	16	26	1	2	1	2	20	33	**61**
4a. Supports developing SRM technology	7	11	18	28	27	42	11	17	1	2	16	25	**64**
4b. Supports developing CDR technology	9	13	31	46	18	27	7	10	2	3	14	21	**67**

	Strongly agree	(%)	Agree	(%)	Neither agree not disagree	(%)	Disagree	(%)	Strongly disagree	(%)			
5a. NERC will take into account the public's views about these issues	15	19	31	39	26	33	7	9	1	1			**80**
5b. NERC will make sound decisions about these issues	11	14	23	29	38	49	4	5	2	3			**78**
5c. It is important to consult the public on these issues	34	43	29	37	11	14	3	4	2	3			**79**

Questionnaire Events 1 & 2

Analysis Tables

Event 1 – Analysis of responses to questionnaire

Question	Number of respondents and % of total												
	Strongly agree	(%)	Agree	(%)	Neither agree not disagree	(%)	Disagree	(%)	Strongly disagree	(%)			Total respondents
1a. There was enough time to fully discuss the issues	17	21	44	54	7	9	12	15	2	2			82
1b. The information provided was fair and balanced	17	21	48	59	16	20	0	0	1	1			82
1c. I understood the information provided	22	27	55	67	5	6	0	0	0	0			82
1d. I understood the purpose of the meeting	35	43	46	56	1	1	0	0	0	0			82
1e. I understood how the results of the meeting will be used	17	21	49	60	12	15	3	4	0	0			81
1f. Attending this meeting has changed my views	14	17	37	45	19	23	10	12	2	2			82
1g. I learnt something I did not know before	43	60	28	39	1	1	0	0	0	0			72
1h. I enjoyed taking part	50	61	30	37	1	1	1	1	0	0			82
1i. I was able to discuss issues that concern me	25	32	52	67	0	0	0	0	1	1			78
1j. All participants were treated equally and respectfully	48	59	33	40	1	1	0	0	0	0			82

	Great	(%)	Fair amount	(%)	Just a little	(%)	Almost nothing	(%)					Total respondents
2. Knowledge of geoengineering	7	9	54	68	18	23	1	1					80

	Strongly support	(%)	Tend to support	(%)	Neither agree not disagree	(%)	Tend to oppose	(%)	Strongly oppose	(%)	Don't know	(%)	Total respondents
3. Supports geoengineering approaches to tackling climate change	12	15	46	58	14	18	6	8	2	3	1	1	**80**
4a. Supports developing SRM technology	7	9	16	20	16	20	26	33	14	18	0	0	**79**
4b. Supports developing CDR technology	13	16	39	49	16	20	9	11	3	4	0	0	**80**
5a. Air capture	15	19	37	46	13	16	13	16	2	3	0	0	**80**
5b. Iron fertilisation	3	4	23	29	16	20	21	26	17	21	1	1	**80**
5c. Liming the ocean	2	3	18	23	16	21	25	32	17	22	3	4	**78**
5d. Biochar	20	25	36	45	14	18	7	9	3	4	1	1	**80**
5e. Afforestation	60	74	18	22	2	2	0	0	1	1	0	0	**81**
5f. White roofs	2	3	23	29	14	18	20	25	20	25	2	3	**79**
5g. Mirrors in space	3	4	9	12	10	13	18	24	35	47	6	8	**75**
5h. Cloud whitening	7	9	25	33	20	26	15	20	9	12	5	7	**76**
5i. Sulphate particles	5	6	13	17	10	13	26	34	23	30	4	5	**77**

	Very satisfied	(%)	Fairly satisfied	(%)	Neither satisfied nor dissatisfied	(%)	Fairly dissatisfied	(%)	Very dissatisfied	(%)			Total respondents
6a. Satisfaction with the venue itself	58	71	22	27	2	2	0	0	0	0			**82**
6b. Satisfaction with the helpfulness of the staff at the workshop	74	90	7	9	0	0	1	1	0	0			**82**

Event 2 - Analysis of responses to questionnaire

Question	Number of respondents and % of total												
	Strongly agree	(%)	Agree	(%)	Neither agree not disagree	(%)	Disagree	(%)	Strongly disagree	(%)			Total respondents
1a. There was enough time to fully discuss the issues	22	28	42	53	4	5	11	14	1	1			80
1b. The information provided was fair and balanced	21	26	48	60	7	9	3	4	1	1			80
1c. I understood the information provided	19	24	55	71	4	5	0	0	0	0			78
1d. I understood the purpose of the meeting	35	43	40	49	2	2	4	5	0	0			81
1e. I understood how the results of the meeting will be used	21	27	48	61	9	11	1	1	0	0			79
1f. Attending this meeting has changed my views	22	28	35	44	16	20	4	5	3	4			80
1g. I learnt something I did not know before	49	62	29	37	1	1	0	0	0	0			79
1h. I enjoyed taking part	57	71	21	26	2	3	0	0	0	0			80
1i. I was able to discuss issues that concern me	37	46	39	49	4	5	0	0	0	0			80
1j. All participants were treated equally and respectfully	53	66	26	33	1	1	0	0	0	0			80
	Too much information	(%)	Right amount	(%)	Not enough information	(%)							Total respondents
2. How did you find the amount of information given at the meeting?	2	3	61	76	17	21							80
	Great amount	(%)	Fair amount	(%)	Just a little	(%)	Almost nothing	(%)					Total respondents
3. Knowledge of geoengineering	14	18	50	64	13	17	1	1					78

	I don't know anything	(%)	I know just a little	(%)	I know a fair amount	(%)	I know a great amount	(%)					Total respondents
4a. What geoengineering could be used for	2	3	8	10	52	65	18	23					**80**
4b. The possible benefits of using geoengineering	2	3	11	14	52	66	14	18					**79**
4c. The possible problems of using geoengineering	3	4	13	16	50	63	13	16					**79**

	Strongly support	(%)	Tend to support	(%)	Neither support nor oppose	(%)	Tend to oppose	(%)	Strongly oppose	(%)	Don't know	(%)	Total respondents
5. Supports geoengineering approaches to tackling climate change	21	27	37	47	16	20	4	5	1	1	0	0	**79**
6a. Supports developing SRM technology	8	10	16	21	19	24	24	31	11	14	0	0	**78**
6b. Supports developing CDR technology	17	22	42	54	12	15	6	8	1	1	2	3	**78**
7a. Air capture	31	40	32	42	10	13	3	4	1	1	0	0	**77**
7b. Iron fertilisation	4	5	10	13	18	23	24	30	23	29	0	0	**79**
7c. Liming the ocean	3	4	7	9	14	18	30	38	24	31	1	1	**78**
7d. Biochar	20	26	40	52	12	16	2	3	3	4	0	0	**77**
7e. Afforestation	57	73	14	18	4	5	2	3	1	1	0	0	**78**
7f. White roofs	3	4	10	13	30	39	14	18	20	26	0	0	**77**
7g. Mirrors in space	3	4	7	9	16	22	23	31	25	34	4	5	**74**
7h. Cloud whitening	8	11	24	32	20	26	16	21	8	11	2	3	**76**
7i. Sulphate particles	4	5	18	23	12	15	18	23	26	33	0	0	**78**

	Strongly agree	(%)	Agree	(%)	Neither agree not disagree	(%)	Disagree	(%)	Strongly disagree	(%)			Total respondents
8a. NERC will take into account the public's views about these issues	18	23	46	58	14	18	2	3	0	0			**80**
8b. NERC will make sound decisions about these issues	17	21	42	53	20	25	1	1	0	0			**80**
8c. It is important to consult the public on these issues	52	65	22	28	1	1	5	6	0	0			**80**
8d. This meeting has boosted my trust in the way decisions are taken on research about these issues	17	21	46	58	14	18	3	4	0	0			**80**

	Totally convinced	(%)	Fairly convinced	(%)	Not very convinced	(%)	Not at all convinced	(%)	Don't know	(%)			Total respondents
9. How convinced are you that climate change is currently affecting the planet?	37	46	35	44	7	9	1	1	0	0			**80**

	Very concerned	(%)	Fairly concerned	(%)	Not very concerned	(%)	Not at all concerned	(%)	Don't know	(%)			Total respondents
10. How concerned are you about climate change?	42	53	31	39	4	5	3	4	0	0			**80**

	Mainly natural processes	(%)	Partly natural/ partly human activity	(%)	Mainly human activity	(%)	No such thing as climate change	(%)	Don't know	(%)			Total respondents
11. Thinking about the causes of climate change, which of the following best describes your opinion?	4	5	34	43	41	51	0	0	1	1			**80**

	Very satisfied	(%)	Fairly satisfied	(%)	Neither satisfied nor dissatisfied	(%)	Fairly dissatisfied	(%)	Very dissatisfied	(%)			Total respondents
12a. Satisfaction with the venue itself	58	73	16	20	5	6	0	0	0	0			**79**
12b. Satisfaction with the helpfulness of the staff at the workshop	69	88	8	10	1	1	0	0	0	0			**78**