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Healthy Environment

Phase 1: Scoping a public dialogue on healthy environment research

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UK Research and Innovation

Natural Environment Research Council

Ipsos MORI   Ipsos
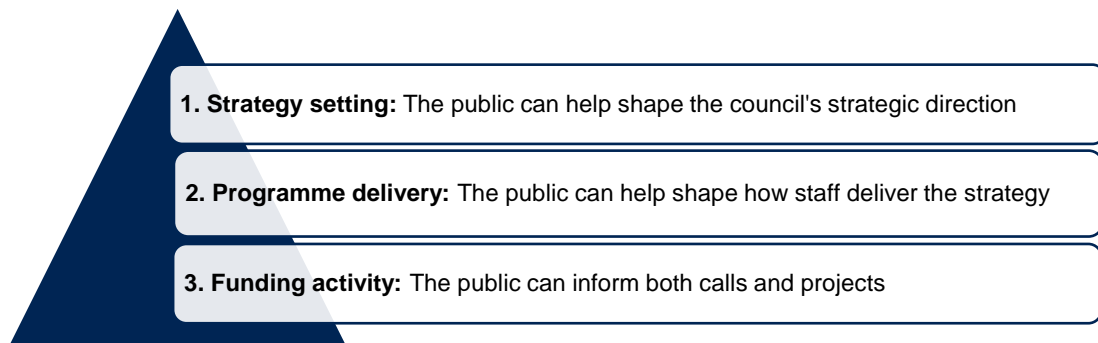
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Executive summary

Ipsos MORI was commissioned by NERC/UKRI to conduct scoping research to inform a public dialogue around the theme of 'healthy environment' research. We conducted a series of interviews with academics, stakeholders and public engagement (including public dialogue) experts, held a virtual roundtable with experts, reviewed relevant literature and carried out a telephone survey among a representative sample of adults aged 18+ across the United Kingdom. This report summarises our findings and outlines ten key insights that NERC/UKRI may wish to consider.

Listening and responding to society's concerns and aspirations is important to maintain public confidence in research and to root research in the public's perspective of key social and ethical issues.[1] The public too believe that their involvement matters. 37 per cent of those asked, in the survey we ran as part of this work, reported that the main reason for engaging the public in research decisions is 'because scientific research affects people's lives'.

Public dialogue is widely recognised as one of the best ways to engage the public on complex research questions.[2] Public dialogues bring together experts and the public on an equal footing to deliberate, reflect and come to conclusions which lead to meaningful change in the commissioning body.[3]

Adding value with the public's voice

Roundtable participants were enthusiastic about the value that the public perspective would bring to the research process, and our research identified three levels where the public might be able to meaningfully input.

1. Strategy setting: The public can help shape the council's strategic direction

2. Programme delivery: The public can help shape how staff deliver the strategy

3. Funding activity: The public can inform both calls and projects

Insight 1: It is necessary for NERC/UKRI to prioritise where the public's voice can meaningfully add value within its decision making before it commissions a public dialogue, and what action will be taken as a result of the exercise. Our interviews with stakeholders suggest enthusiasm for the public having a role in the research funding process, particularly at a strategy setting level.

Insight 2: NERC/UKRI may also want to consider ways to embed the public's voice in ongoing decision making. If a dialogue is used to engage the public on NERC/UKRI's healthy environment strategy, steps could be taken to keep the public's voice engaged in an continued check and challenge process (for example, by setting up a citizens' panel as a means for enabling the public perspective to be considered at all stages of research, from design and conduct to dissemination), and/or in the evaluation of the strategy and for future strategy setting processes.

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[1] https://www.ukri.org/files/legacy/scisoc/120727rcukreview-pdf/

[2] https://www.ukri.org/files/legacy/scisoc/120727rcukreview-pdf/; https://sciencewise.org.uk/about-dialogue/what-is-public-dialogue/

[3] https://nerc.ukri.org/about/whatwedo/engage/public/public-engagement-glossary/

Key research challenges

NERC/UKRI's healthy environment programme, and the work of other research councils working in environment and health, covers a wide range of subject areas, and our research has revealed compelling arguments to conduct a dialogue in almost all of them, for example green and blue spaces and pollution. Within the healthy environment remit, it will be for NERC/UKRI to decide which subject areas it chooses to cover in its future public dialogue, and our research reveals several important considerations which might help inform this.

Through a telephone survey with a nationally representative sample of British adults aged 18+, we explored the key features of public opinion on healthy environment research to establish a baseline of knowledge to inform a future public dialogue. This revealed that pollution is the public's most significant environmental concern. Unprompted, 83 per cent of all open responses to a question about the most important issue to them when they think about the environment and their own health named pollution-related concerns.

Insight 3: Our research indicates that UK adults do not tend to think about healthy environment research in silos, or within established research disciplines. NERC/UKRI already conducts extensive interdisciplinary research and thus may wish to consider taking an interdisciplinary approach with a future public dialogue. For example, in relation to planetary health, encouraging the natural flow of discussion between different but interrelated areas.

Insight 4: NERC/UKRI may want to consider conducting a public dialogue in an area where the public has low awareness, such as soil health or the link between the environment and antimicrobial resistance. Our research shows that the public can contribute to complex areas that they previously know little about, and a public dialogue on one of these issues will help bring the public's voice into areas where it is harder to gauge public opinion.

Insight 5: Our review of previous public dialogues indicates that participants prefer to engage with science through their own frame of reference. NERC/UKRI's future public dialogue should be designed with this in mind. NERC/UKRI should consider involving dialogue participants actively, rather than just in discussion (i.e. asking them to monitor changes in the local landscape or discuss the health benefits realised from engaging with the natural environment).

Insight 6: Research participants suggested that the public should be engaged with subject areas which they saw to have a level of uncertainty surrounding them. The suggested areas included the impacts of climate change, and the associated mental and physical health risks. A public dialogue that discusses the impact of the increasing risk from changes to the environment, such as climate change and human health, would give the public a stake in the solutions that scientists and policy makers develop.

Designing the dialogue

Our research reveals several design challenges which a future NERC/UKRI public dialogue will need to overcome. The respondents to our survey were just as confident engaging in a discussion online (69%) as face-to-face (68%), but there are important demographic differences with those in lower socioeconomic groups and with fewer education qualifications much less likely to say they would be confident online. Steps that could be taken to improve confidence in online methods will be important given that the public dialogue is likely to take place online, due to the current COVID-19 health crisis.

It is important that a dialogue identifies the audiences most appropriate to engage with, paying particular attention to those most likely to be affected by the issue being discussed (e.g. socio-economically disadvantaged). NERC/UKRI should consider involving certain subgroups in any future public dialogues, instead of solely engaging a more 'general' public'. This is particularly important given inequality of access to the health and wellbeing benefits of green/blue spaces, for example.

Our research has found that the public are more likely to engage best with a topic when shown how it relates to their everyday lives, and NERC/UKRI may want to use innovative methods to bring the subject to life for people. This might include asking dialogue participants to spend time monitoring changes in their local environment, as part of the exercise, or using artistic and creative methods to explore topics.

Insight 7: It is highly likely that the public dialogue will be delivered online, but this should be seen as an opportunity to do dialogue differently rather than simply recreating face-to-face methods. Designing the public dialogue around what people are already comfortable doing online might help boost inclusion.

Insight 8: It is important to consider how to make the public dialogue as inclusive as possible. This could include making sure those most affected by the issue being discussed are well represented, as well as considering who is missing from sampling, and questioning why that might be.

Insight 9: Innovative methods should be explored with experts and practitioners as tools for emotionally engaging participants and enabling them to grapple with complex subjects, prioritising the potential of drama, technology, citizen science and futures-thinking.

Insight 10: In addition to meeting all the well-established principles for dialogue, there are three especially important design considerations for a dialogue on environmental science. First, the language used should be consistent and clear to facilitate participant understanding. Second, it is important to frame a dialogue in people's lived experience. Third, the public engagement should be as meaningful as possible, allowing the outcomes of the dialogue to lead to change.

1 Introduction

1.1 Aims and objectives

Ipsos MORI was commissioned by the Natural Environment Research Council (NERC) and UK Research and Innovation (UKRI) in February 2020 to conduct scoping research (phase one) that will inform a separate public dialogue around the theme of 'healthy environment' (phase two). The invitation to tender outlined the primary aim of the research as:

> *"To help [NERC/UKRI] understand 'what is known' about public attitudes to healthy environment research, identifying where the evidence gaps are, what issues have been explored and whose voices have or haven't been included. These insights will help us to identify what are the key questions, methods and techniques that we can use to deliver a useful, inclusive and innovative public dialogue in Phase 2."*

After consultation with NERC/UKRI, and as a consequence of initial research, the research questions for this project were broadened. The research we have conducted has been structured around the following overarching question and three core sub-questions.

> *What can public opinion tell us about opportunities for future research on the theme of healthy environment?*
>
> - *How can the public's voice add value in NERC/UKRI's structures?*
> - *What are the key research challenges where there is an opportunity or need for public dialogue?*
> - *How can NERC/UKRI design a public dialogue that is innovative, inclusive and engaging?*

1.2 Methodology

We conducted a five stage research process in order to answer these questions. The research process lasted three months, commencing in February 2020 and concluding in May 2020.

Figure 1. The research process

Our first stage was conducting detailed **familiarisation interviews** with key staff and council members at NERC/UKRI. The purpose of these interviews was to gain a deeper understanding of the healthy environment research theme and explore opportunities for public engagement in phase two. We spoke to the following six people:

- Dr Caroline Culshaw, Head of Healthy Environment, NERC and Dr Bethany Adams, Senior Programme Manager, Healthy Environment, Strategic Programme Delivery, NERC

- Theo Bass, Programme Manager, Public Engagement Team, UKRI
- Professor Stephen Holgate CBE, Clinical Professor of Immunopharmacology at the University of Southampton and member of NERC's council
- Dr Simon Kerley, Head of Terrestrial, Earth and Water, NERC
- Hannah King, Senior Public Engagement Programme Manager, NERC
- Jo Thompson, Head of Engagement, NERC

These interviews helped refine our research questions. We then conducted **23 stakeholder interviews** with senior academics and public engagement (including public dialogue) experts.

To supplement these interviews, and gather an initial sense of the public's priorities for a public dialogue, we conducted a **telephone survey with a representative sample** of 1,031 adults aged 18+ across the United Kingdom. Research was conducting using Ipsos MORI's telephone Omnibus (CATIBUS) between 17th – 26th April 2020. Data has been weighted to the known offline population proportions for age within gender, government office region, working status, social grade and education.

Towards the end of this scoping research, we held an **virtual stakeholder roundtable** with senior academics and public dialogue experts. The purpose of the roundtable was to receive feedback on initial research findings, and help shape our recommendations. Thirty six people took part in the discussion, and a full list of participating organisations is appended to this report. Roundtable participants are directly quoted throughout this report.

We also conducted a thorough **literature review**, which has taken place alongside all of these research inputs. We reviewed:
- 33 reports on public dialogues and 18 public attitudes surveys that relate to healthy environment research or how the public wants to engage with research funding
- Articles and reports relating to the government's priorities, including DEFRA's 25 year strategy, the Clean Growth Challenge and COP26
- Articles and reports relating to specific subjects under the healthy environment theme

A full bibliography is appended to this report.

1.3   NERC healthy environment research

Healthy environment research is one of the eight research and innovation priorities set out in NERC's 2019 delivery plan. Within this priority, NERC hopes to fund research which reduces and reverses environmental degradation, and which contributes to an understanding of how a healthy environment contributes to human health.

Healthy environment research covers a very broad range of research topics. To focus our research on the most important areas, we agreed search terms with NERC/UKRI staff. These search terms reflect the most significant projects that are currently funded within the healthy environment theme, as well as areas which NERC/UKRI staff would like to see developed in the coming years.

Figure 2. Agreed search terms

Healthy environment	Healthy humans
- Biodiversity - Air and marine pollution - Soil - Antimicrobial resistance - Infectious diseases - Synthetic biology - Planetary health	- Climate change and human health - Mental health - Cognitive development - Green prescribing - Green infrastructure - Nutritious food

2 Adding value with the public's voice

Key insights

One of the defining features of a public dialogue is that it has a clear purpose, and that decision makers are willing to use insights from the discussion to change practice. This chapter explores the possible ways the public's voice might be used to shape NERC/UKRI's activity and provides an overview of the public's views on their engagement in research. It outlines key insights for NERC/UKRI to bear in mind ahead of phase 2:

Insight 1: It is necessary for NERC/UKRI to prioritise where the public's voice can meaningfully add value within its decision making before it commissions a public dialogue, and what action will be taken as a result of the exercise. Our interviews with stakeholders suggest enthusiasm for the public having a role in the research funding process, particularly at a strategy setting level.

Insight 2: NERC/UKRI may also want to consider ways to embed the public's voice in ongoing decision making. If a dialogue is used to engage the public on NERC/UKRI's healthy environment strategy, steps could be taken to keep the public's voice engaged in an continued check and challenge process (for example by setting up a citizens' panel as a means for enabling the public perspective to be considered at all stages of research, from design and conduct to dissemination), and/or in the evaluation of the strategy and for future strategy setting processes.

2.1 The value of public insight

Public engagement with research activity is important to maintain public confidence in research and to root research in the public's perspective of key social and ethical issues.[4] Our research revealed real enthusiasm for a meaningful role for the public in NERC/UKRI's research funding process. Interviewees and roundtable participants emphasised the value that the public perspective would bring to the research process, with several academics commenting that the public might be able to shine a different light on scientific questions and help scientists root their work in everyday experience. As one climate expert commented at the stakeholder roundtable:

> *"We have to remember that [scientists and researchers] live in a bubble… it is important to test the ethics and acceptability of science and test how it would work in the real world."*

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[4] https://www.ukri.org/files/legacy/scisoc/120727rcukreview-pdf/

Box 1. What is public dialogue?

Public dialogues allow the public and experts to come together and contemplate and discuss complex issues. The Sciencewise guiding principles, seen as the industry standard across the science and technology sector, describe dialogue as a process during which members of the public "interact with scientists, stakeholders and policy makers to deliberate on issues relevant to future policy decisions." Research Councils UK (RCUK), the umbrella body for research councils which has now been merged into UKRI, highlighted public dialogue in 2012 as particularly appropriate for research strategy decisions, arguing that "public dialogue has a particularly important role to play in providing 'social intelligence' about the wider public, social and ethical dimensions of research strategy and governance."[5]

Public dialogues have several distinguishing features, including:

- Consensus building: Dialogues seek to find consensus among participants, and to explore where the public is willing to compromise. This means they can be particularly useful for highly contested issues where public opinion seems to be polarised.
- Meaningful change: Dialogues should only be held when there is a commitment from decision makers to use public insights to inform a decision or strategy.
- Time to reflect: Dialogues are usually longer sessions with the public and are often reconvened. This is to ensure people have the time to fully engage with the detail of the issue under discussion, as well as ensuring trust can build amongst participants.

Others commented that the public could also have a role in the funding process, which would further add objectivity to the process. One academic, for example, pointed out that scientific funding should be less risk-adverse and involving the public may be one way of achieving this. It is also important to be clear when public engagement should not be undertaken. Involve, a public participation charity, set out several occasions when it isn't appropriate, including when a decision has already been made and there is no room for the public to influence the outcome. Involve also point out that public engagement shouldn't be used as a delaying tactic to avoid difficult decisions, or simply as a tick-box exercise.[6]

Research participants raised the importance of ensuring any public engagement in the research process is embedded beyond any one-off public dialogues. A research council member remarked at the roundtable that there are limitations of ad-hoc engagement, arguing the process needs to be much more embedded to allow multiple public dialogues to continue. This sentiment was echoed by another stakeholder interviewee, an expert in public engagement, who pointed out:

"You can't just bodge it and add public voice on side… it needs to be embedded."

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[5] *Public Dialogue Review - Lessons from public dialogues commissioned by the RCUK* , Centre for Science and Policy, University of Cambridge for Research Councils UK (RCUK), 2012 https://bit.ly/39vNrG5

[6] https://www.involve.org.uk/resources/knowledge-base/what/public-engagement-public-policy-making
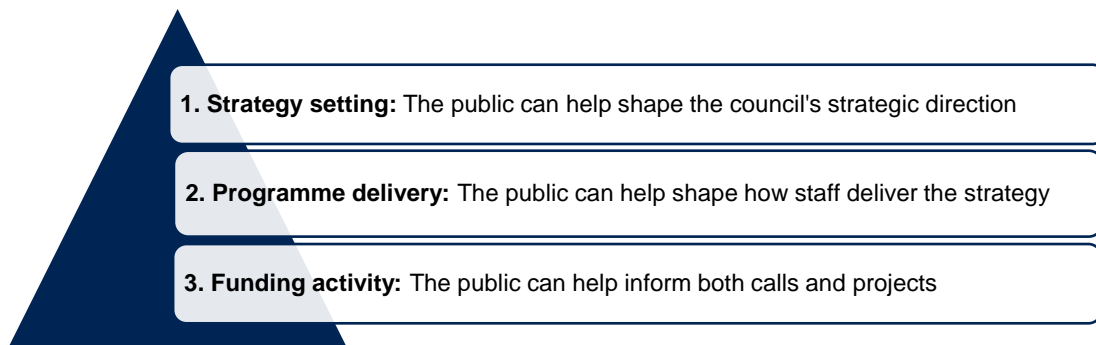
Box 2. The Dutch National Research Agenda

Several interviewees directed us to explore the Dutch National Research Agenda which was a programme to engage the public in the development of a national research agenda. The purpose was to engage the public in the framing and phrasing of research questions to ensure they were relevant to their lives. The aim of the agenda is described on the website of Dutch funder NWO as: *"to provide a positive and structural contribution to the global knowledge society of tomorrow, in which new knowledge flows freely from researcher to user and where new questions from practice and society quickly and automatically find their way into new research."* [7]

2.2   Ways the public can shape research funding

In order to understand how a public dialogue might be able to guide how NERC/UKRI funds research, we explored the different stages of the research funding process. Our research has identified three levels where the public might be able to meaningfully input into the process.

Figure 3. The three stages where the public's voice can add value within individual research councils

1. Strategy setting: The public can help shape the council's strategic direction

2. Programme delivery: The public can help shape how staff deliver the strategy

3. Funding activity: The public can help inform both calls and projects

2.2.1 Strategy setting

The first point at which the public's voice could be used is when a research council is setting its strategic priorities, either across UKRI or at the level of an individual council. Each council's areas of focus and key activities are currently outlined in their 2019 Delivery Plans, which feed into UKRI's Strategic Prospectus. The NERC Delivery Plan was developed by senior staff at NERC along with the NERC council and the Science Council, with no formal public involvement. While the overarching strategy has been set, NERC staff were clear in interviews that there are several strategic questions that are still to be addressed to help flesh out the detail of NERC's programme over the coming years.

There was a widespread view among research participants that it is useful to engage the public - a key stakeholder - in the setting of a strategy. This could take the form of a statement of need from the public, for example, and/or involving the public to help a research council define the remit and framing within its strategy. One senior member of NERC staff expressed during the roundtable that they saw the most value in engaging the public at the discovery stage rather than the implementation stage. This was echoed by a senior civil servant who argued councils should listen to *"fresh views"* from the public, rather than adding them *"too far upstream"* in the research process.

Others commented that the public's engagement in the strategy setting process should be embedded and not just taken from a one-off public dialogue. A public engagement expert argued that there should be early involvement from the public when thinking about developing plans, and that the public should be embedded into institutional decisions. It was also suggested that participants should be asked to evaluate the finished strategy to see if they are happy with it.

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[7] https://www.nwo.nl/en/common/policies/dutch-research-agenda/index

NERC's current strategic plans on healthy environment research is reflected in the 2019 Delivery Plan, which will be in place for the next five years. NERC staff are clear that there are short term strategic questions that the public could engage on. This includes short-term research ambitions within healthy environment research which are updated annually. Staff also suggested there is the potential to redirect funds from elsewhere in the organisation to create a bespoke process for the public to add to or amend the current overarching strategy.

2.2.2 Programme delivery

It is also possible to engage the public as council staff work to implement the ideas set out in the delivery plan. NERC/UKRI currently does some engagement work at this stage, particularly in scoping individual calls, with some programme managers seeking to include public voices. The scoping process used by NERC/UKRI includes the use of workshops, the appointment of a steering committee and the inclusion of the public in stakeholder consultation.

Our research revealed some enthusiasm for an increased role for the public at the delivery level, especially if part of a wider attempt to embed the public's voice at every stage of the funding process. Interviewees suggested that the public's voice could be used where one aspect of the strategy would benefit from being refined or shaped by public input. This might be particularly useful where the subject in question has a big day to day impact on the public, such as pollution, or where participants' own experience might shed new light on a scientific challenge.

An illustrative example of this approach was shared with us by the James Lind Alliance, who use 'Priority Setting Partnerships' to bring patients, carers and clinicians together to identify questions which have not been answered by existing research. This approach was used on a recent project relating to asthma, where patients were consulted about their daily concerns regarding their health. This surfaced concerns about breathing exercises and whether these exercises can be taught for patients to do independently, leading to the funding of research on this issue. There is now new best practice on the best way to administer these exercises through physiotherapy. As one of our stakeholders, a senior consultant on health research, pointed out- "you have to be willing to hear data that doesn't look like research questions".[8]

Box 3. Addressing strategic questions in a dialogue

There are several approaches, which could arguably be combined, that could be taken in a dialogue to engage the public in strategic questions. These include:

Resource prioritisation: Dialogue participants could be asked to make decisions about the strategy from the perspective of value for money. One public engagement expert told the roundtable that it was important to be "pragmatic", and that the public could consider "where to put money to maximise benefit".

Ideas generation: Dialogue participants could be invited to an open-ended discussion about a subject area, several subject areas or even across the whole healthy environment research space. The findings from the discussion could then be used to formulate strategy or set research questions for scientists and researchers to answer. Ipsos MORI's recent dialogue for Wellcome took this approach on the issue of neuroscience, and participants devised a set of high-level operating principles which they thought should guide research funding.

Basic versus applied research: Dialogue participants could be asked to discuss the type of research that NERC prioritises for funding, and to provide their ideas on whether the balance is appropriate. Interviewees suggested that applied research is harder to secure funding for across UKRI, despite being closer to practical changes in people's lives.

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[8] http://www.jla.nihr.ac.uk/news/breathing-exercises-help-asthma-patients-with-quality-of-life-first-psp-research-study-funded-by-the-nihr-hta-programme-announces-its-results/7634

2.2.3 Funding activity

The third stage where the public's voice could be embedded is in the research being conducted by NERC/UKRI funded scientists and researchers. Some of this is directed by researchers themselves, as they build the public into their research programmes of their own accord. But much of it can be driven by the centre, with a focus on the importance of public engagement in the assessment of funding applications.

Several interviewees raised the recently removed UKRI wide 'Pathways to Impact' requirement in funding applications, which asked applicants to consider how they will or might achieve impact outside the scientific community and included public engagement as a pathway to achieving impact. While its removal was designed to streamline the process and make it simpler,[9] rather than deprioritise public engagement, there is significant concern that this may be a long-term consequence of the change. Some suggested that individual councils should consider ways to require public engagement in funding calls. One stakeholder interviewee, an expert in public engagement in science, suggested that NERC/UKRI could do more *to "insist on public dialogue and consultation"* and *"incentivise individual researchers to do it."* This could be through formal requests in funding calls, or through softer encouragement or incentivisation. NERC/UKRI could also consider continuing to support efforts which encourage research that seeks to remove barriers to public engagement in universities, such as the RCUK and NCCPE funding call for Strategic Support to Expedite Embedding Public Engagement with Research (SEE-PER).[10]
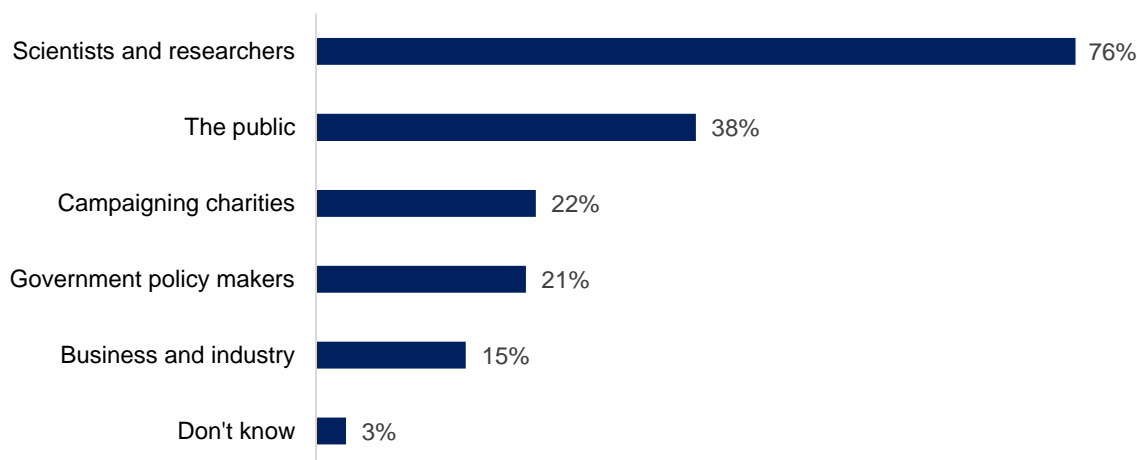
2.3   The public's view

We also explored what the public think about having a role in shaping the research funding process. Our survey of the public, review of other published surveys and review of relevant public dialogues revealed that the public do see a role for themselves, initially driven by the desire to have a say on issues which affect their lives.

Our survey of UK adults explored, from five options, who the public thinks it is most important for NERC/UKRI to listen to when deciding what research to fund. 76 per cent of the public said it is most important for NERC/UKRI to listen to scientists and researchers. The second most popular option, with 38 per cent selecting it, was the public. Young people aged between 18 and 24 were slightly more likely (45 per cent) to state this view.

Figure 4. Public views on who NERC/UKRI should listen to when deciding which research to fund

Q1. The Natural Environment Research Council is responsible for distributing public money to scientists. Who do you think it is most important the Natural Environment Research Council listens to when deciding what research to fund?

Scientists and researchers	76%
The public	38%
Campaigning charities	22%
Government policy makers	21%
Business and industry	15%
Don't know	3%

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

[9] https://www.ukri.org/news/pathways-to-impact-impact-core-to-the-uk-research-and-innovation-application-process/

[10] https://www.publicengagement.ac.uk/whats-new/news/further-funding-embedding-public-engagement
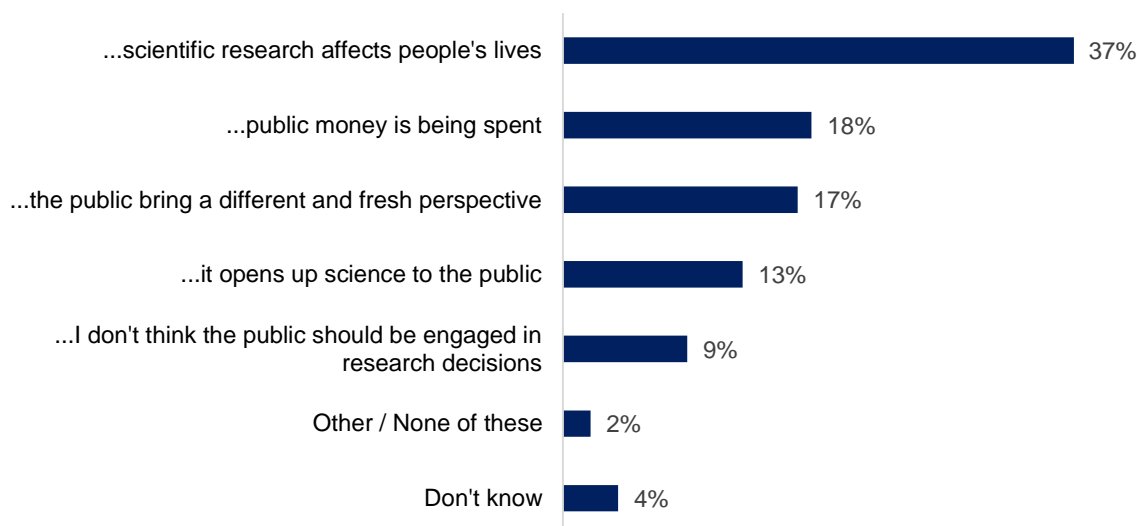
Ipsos MORI's Dialogue to Inform Science Strategy for the John Innes Centre explored the public's views on research participation in more detail. While the public dialogue found that participants were quite reluctant to engage in questions related to strategy setting, their enthusiasm shifted as their confidence discussing the scientific concepts grew. Ipsos MORI's Public Dialogue on Future Strategy for the Babraham Institute drew similar conclusions. Participants worried that there was limit to their knowledge on scientific questions, but there was still a strong desire for a two-way conversation between scientists and the public. These findings underline the need to ask the public questions that they are able to engage with in a meaningful way, which will build their confidence about participating in the setting of strategy.

We also asked survey participants what they thought the main reason is for engaging the public in research decisions. The most popular response, with 37 per cent choosing it, was 'because scientific research affects people's lives'.

Figure 5. Public views on why they should be engaged in research decisions

Q2. The Natural Environment Research Council uses a range of methods to try and involve the public in decisions about science funding. There are lots of reasons why they do this. Which, if any, of the following do you think is the main reason that the public should be engaged in research decisions:

The public should be engaged in research decisions because...

...scientific research affects people's lives	37%
...public money is being spent	18%
...the public bring a different and fresh perspective	17%
...it opens up science to the public	13%
...I don't think the public should be engaged in research decisions	9%
Other / None of these	2%
Don't know	4%

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

Dialogues with the public have explored this sentiment in more detail. While it is true that the public do connect the work of scientists and researchers to their lived experience, it is also true that the public tend to feel most comfortable discussing issues to which they relate. In the 2016 'Our Food Future' public dialogue, for example, participants generally found thinking globally about food production very challenging. Instead, they talked from a consumer level and spoke about the impact food challenges would have on them and people they know. [11]

This principle also applied in previous public dialogues to discuss research funding priorities. In Ipsos MORI's recent public dialogue for Wellcome on neuroscience and mental health[12], participants were initially drawn to issues which they had direct or indirect experiences with. As the public dialogue progressed and they absorbed knowledge and increased their understanding, however, their interest widened, and they became keen to discuss bigger, more fundamental questions about the research.

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[11] *Our Food Future*, 2016, TNS BMRB for Food Standards Agency.https://bit.ly/2Z72EKI

[12] https://www.ipsos.com/sites/default/files/ct/publication/documents/2020-05/what-matters-to-public-neuroscience-mental-health-research_0.pdf

3 Key research challenges

Key insights

This chapter explores the key research challenges where there is an opportunity or need for public dialogue. It highlights the key features of both public and expert opinion on how a public dialogue might advance healthy environment research and draws out four guiding considerations which can be used by NERC when deciding which subject to address in the dialogue.

Insight 3: Our research indicates that UK adults do not tend to think about healthy environment research in silos, or within established research disciplines. NERC/UKRI already conducts extensive interdisciplinary research thus may wish to consider taking an interdisciplinary approach with a future public dialogue. For example, in relation to planetary health, encouraging the natural flow of discussion between different but interrelated areas.

Insight 4: NERC/UKRI may want to consider conducting a public dialogue in an area where the public has low awareness, such as soil health or the link between the environment and antimicrobial resistance. Our research shows that the public can contribute to complex areas that they previously know little about, and a public dialogue on one of these issues will help bring the public's voice into areas where it is harder to gauge public opinion.

Insight 5: Our review of previous public dialogues indicates that participants prefer to engage with science through their own frame of reference. NERC/UKRI's future public dialogue should be designed with this in mind. NERC/UKRI should consider involving dialogue participants actively, rather than just in discussion (i.e. asking them to monitor changes in the local landscape or discuss the health benefits realised from engaging with the natural environment).

Insight 6: Research participants suggested that the public should be engaged with subject areas which they saw to have a level of uncertainty surrounding them. The suggested areas included the impacts of climate change, and the associated mental and physical health risks. A public dialogue that discusses the impact of the increasing risk from changes to the environment, such as climate change and human health, would give the public a stake in the solutions that scientists and policy makers develop.

NERC's healthy environment programme covers a wide range of subject areas, ranging from chemical pollutants through to the impact the environment has on human health. NERC's current funding programme is weighted in favour of environmental harms and their impact on humans – there have been large awards to projects on clean air, chemicals in the environment and antimicrobial resistance. But despite this, NERC staff indicated that there is an internal appetite to see more research that explores the interaction between the environment and human health on issues such as mental health, green prescribing and green infrastructure. Our research explored current priorities and future ambitions with equal weight, and the search terms we used are outlined in the introduction. Other research councils also explore questions related to the natural environment, including the AHRC, BBSRC, EPSRC, and ESRC.

It would be possible for a public dialogue to take place on any of the specific subject areas within the healthy environment remit. For each area, there are pressing questions which would benefit from public engagement, and we have heard compelling arguments from academics and experts about the kinds of questions that could be explored. It would also be possible for a public dialogue to cut across several of the interrelated subject areas, and we've also heard compelling arguments for the value of a public dialogue with a wide, interdisciplinary scope. It will be for NERC/UKRI to decide which subject areas it chooses to discuss with the public, depending on the purpose of the public dialogue.

This chapter does not seek to discuss each of the subject areas in turn, or to rule areas in or out. Instead, we have drawn out the key lessons from both public and expert opinion on all the subject areas we have explored. By understanding what drives opinion about the most suitable areas to explore, we hopefully provide a framework through which a decision can be taken.

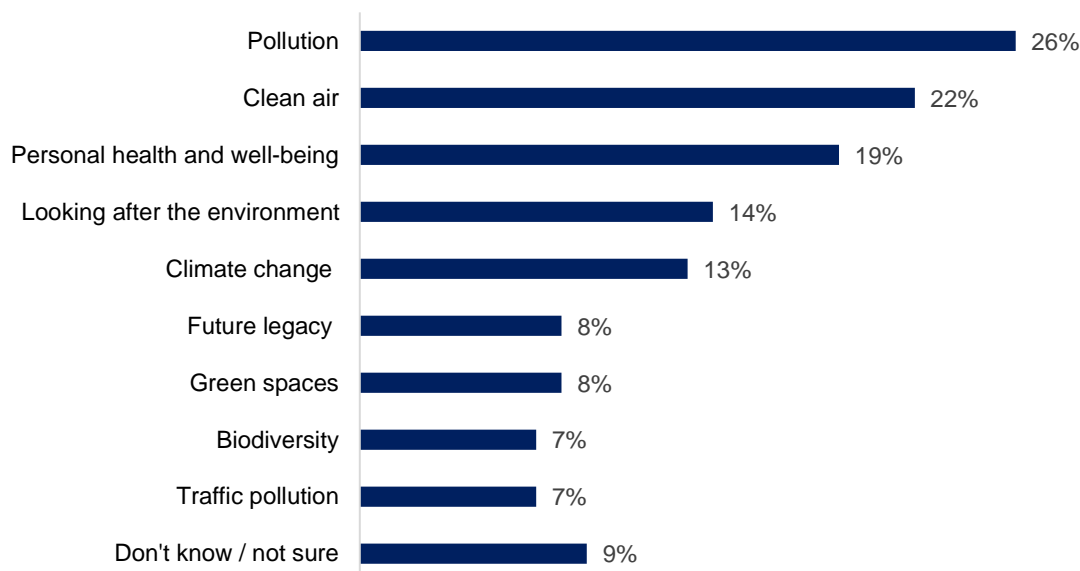## 3.1 Insight from public and expert opinion

3.1.1 Pollution is the most significant environmental health concern for the public

Our survey revealed that pollution is the most significant environmental health concern for people, when they were asked unprompted in an open question. We asked survey respondents to tell us, in their own words, what the most important issue is to them when they think about the environment and their own health. We grouped these open responses, and the top ten answers are presented in figure 6. The top two areas – 'pollution' (or 'emissions') and 'clean air' – account for 48 per cent of all responses, and answers relating to pollution accounted for 83 per cent of all open responses.

Figure 6. Public views on what is most important to them in relation to the environment and their health

Q3. The Natural Environment Research Council is interested in understanding the public's priorities for research on the environment and health. What's most important to you when you think about the environment and your health?

(Open ended question, top ten responses displayed.)

Pollution	26%
Clean air	22%
Personal health and well-being	19%
Looking after the environment	14%
Climate change	13%
Future legacy	8%
Green spaces	8%
Biodiversity	7%
Traffic pollution	7%
Don't know / not sure	9%

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

Responses to this open question also shed light on which types of pollution concern people. While the top response - pollution - doesn't specify, the second highest response was related to 'clean air' (22 per cent) and only five per cent of open responses were related to 'clean water' or 'water quality'. Other surveys confirm that air pollution is perceived as a greater threat than water pollution. A previous Ipsos MORI poll conducted in February 2020 found that out of those who believe they have personally been negatively impacted by environmental change, 48 per cent described being affected by air pollution while 13 per cent described being affected by water pollution. [13]

As part of this study, we also asked participants to pick from a list which, if any, of four subject areas within NERC/UKRI's current programme that relate to protecting and improving the natural environment they felt is most important for scientist to focus on. Pollution of air and water was again the most popular response, with 52 per cent selecting it (see figure 7). A higher proportion of the youngest respondents to

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[13] Ipsos MORI survey, February 2020 https://bit.ly/2xL2g9m

our survey believe that research into air and water pollution is the most important issue, with 63 per cent of respondents aged 18-34 selecting it.[14]

Figure 7. Public views on research priorities in relation to protecting/improving the natural environment

Q11. When thinking about ways to protect and improve the natural environment, which, if any, of the following issues do you think it is most important that scientists and researchers focus on?

Issue	Percentage
Pollution of air and water	52%
Conservation of the natural environment	26%
Preventing natural hazards like floods	15%
Healthy soil	4%
None of the above	1%
Don't know	3%
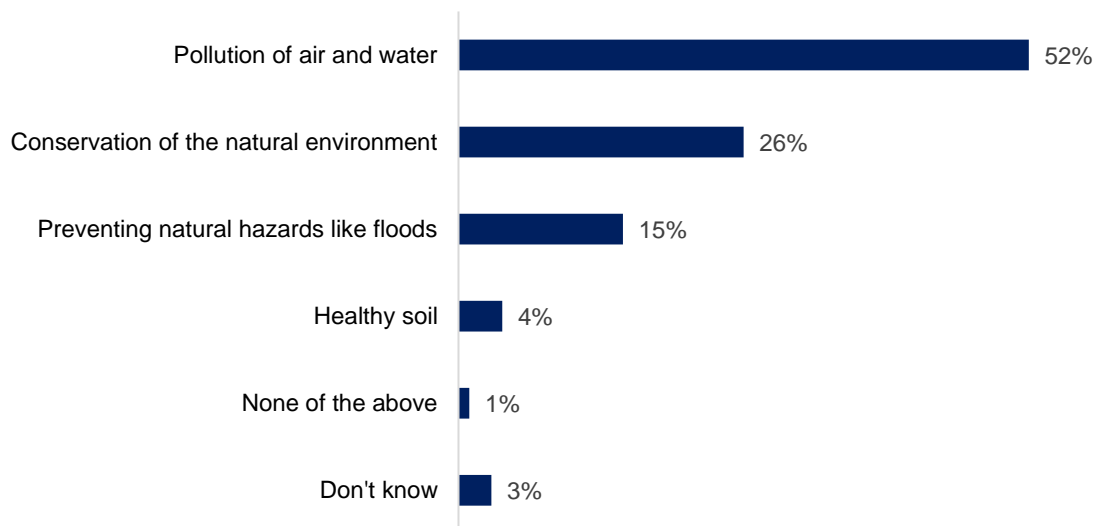
Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

Our evidence review has also shown that research councils and other similar organisations have conducted public dialogues covering the topic of pollution. For example, participants in the National Ecosystem Assessment public dialogue, used air quality to define their experiences of the environment, emphasising the desirability of living in 'clean' and 'unpolluted' communities. [15] Similarly, participants in a public dialogue for BBSRC described feeling fortunate to live in a country with clean drinking water where water borne diseases are extremely rare.[16] A public dialogue on water policy in Scotland found that participants had low awareness and interest in the water system and wastewater services. However, once engaged, the participants expressed concerns about the disposal of non-soluble items through wastewater and the potential knock-on effects upon the environment. [17] Similarly, in a public dialogue on 'significant water management' participants supported measures to make the public more aware of water management issues and improve personal behaviours.[18] The impact of pollution on cognitive development did not appear in any of the public dialogues and surveys reviewed.

We also explored public awareness of microplastics in our evidence review, another area of research covered by NERC's delivery plan. Focus groups held in 2016-2017, conducted with a mix of those with and without previous knowledge of microplastics, found that few made connections between their personal use of plastics and ocean pollution.[19] There appears to have been no public dialogues which have directly addressed the issue of microplastics, although the dialogue on Scottish water policy did cover micro-beads as one of a series of threats to water quality.[20]

If looking to further explore public engagement on the issue of pollution, NERC/UKRI may want to draw lessons from the public dialogues and polls described above, or how current NERC/UKRI research

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[14] Ipsos MORI survey for UKRI and NERC, April 2020.

[15] *Naturally speaking: a public dialogue on the UK National Ecosystem Assessment*, 2015, University of Exeter for Defra and NERC. https://bit.ly/3cHX8Sk

[16] *Public views on strategic priorities for Basic Bioscience Underpinning Health*, Ipsos MORI for BBSRC, 2012 https://bit.ly/3dnnRUs

[17] *Consumer Participation in Water Policy*, Ipsos MORI and Involve for Citizen's Advice Scotland https://bit.ly/3cujg2O

[18] Public Dialogue on Significant Water Management Issues, 2013, Ipsos MORI & 3KQ for Sciencewise https://bit.ly/3cCeIHz

[19] Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. Marine Pollution Bulletin, 152. https://doi.org/10.1016/j.marpolbul.2020.110908

[20] *Consumer Participation in Water Policy*, Ipsos MORI and Involve for Citizen's Advice Scotland https://bit.ly/3cujg2O

priorities might be informed by public priorities identified in these dialogues, before scoping out or commissioning a new exercise.

3.1.2 Stakeholders and the public suggest a need to explore the interdependencies between the subject areas

Stakeholders emphasised the need to explore the interdependencies between the subject areas presented within the healthy environment theme. This was both at the level of what needs to be understood through scientific research and what the public deem to be most important when consulted. Many of the subject areas have interrelating impacts and ultimately have to be understood holistically, even if the research itself drills down into specific elements. As a University public engagement professional told us during a stakeholder interview:

> *"The environment isn't seen in isolation - it's jumbled, people see it that way, not siloed like research. People think holistically."*

One interdependency that was consistently referenced by interviewees was the relationship between human health and planetary health. This hinged on the argument that some subject areas are too abstract without relatable context, and that the way to engage the public on most scientific issues is through the impact it has on their health and life. As one expert in food security told us:

> *"People find it hard to engage with the environment, as something separate from themselves. Always focus on human impacts...things that people really care about."*

Another stakeholder interviewee, who specialises in pollution and biodiversity, made a similar point, pointing to the American One Health Initiative to unite human and veterinary science:

> *"Engage the public with the idea of the One Health Initiative: it started with understanding that animal and human health is the same (with food security and the health of interactions we have as animals) and that's grown to encompass the idea that human health and environmental health is the same."*

However, interviewees cautioned against ignoring the nuances in this argument, highlighting the tensions that can sit between planetary and human health. They suggested that this could also be usefully explored in a public dialogue. One stakeholder interviewee, a biodiversity specialist, commented:

> *"There's confusion at the heart of the terminology 'healthy environment'- what do we mean? It's healthy for people? And there's also an implicit assumption that what's healthy for people is healthy for wildlife or nature- what's healthy for soil is healthy for humans- these things are not necessarily true. What might be best for nature isn't necessarily best for humans- dense tangled scrub and woodland, you can't even walk through with a nice view. What's nice for people, the environments people really like, which are culturally, and historically imbued ... those are landscapes that we think of as beautiful and would call healthy landscapes – but they are not particularly good for soil, water, carbon, wildlife. This is one of the problems with rewilding- again, an implicit assumption that a wild habitat is the best, but for who?"*

Stakeholder interviewees also pointed to the importance of a more multi-disciplinary approach to the research challenges in the healthy environment space. This ranged from bringing health professionals to public dialogue, to incorporating economic, social and cultural perspectives into the theme. Some stakeholders we spoke to noted how their background in economic, social or political science has helped inform a more complete view of healthy environment research. As one interviewee noted:

"There is disconnect in health and environment research; a lot of this is about the language we use. We need to understand what's needed through multi-disciplinary approaches."

Our survey posed a closed question to the participants, asking them to pick between the two strands of NERC's healthy environment programme – the health of the environment and the impact that has on the health of humans. A comparably higher proportion of respondents (54 per cent) felt that it is most important for scientists and researchers to focus on "the relationship between the environment and human health and wellbeing" than on "how to protect and improve our natural environment" (43 per cent). However, as we highlight elsewhere in this report, the public are quick to identify the interdependencies between human and ecological health when provided more information (as would be the case in a public dialogue).

Figure 8. Public views on overall research priorities

Q4. Which, if either, of the following statements comes closest to your views?

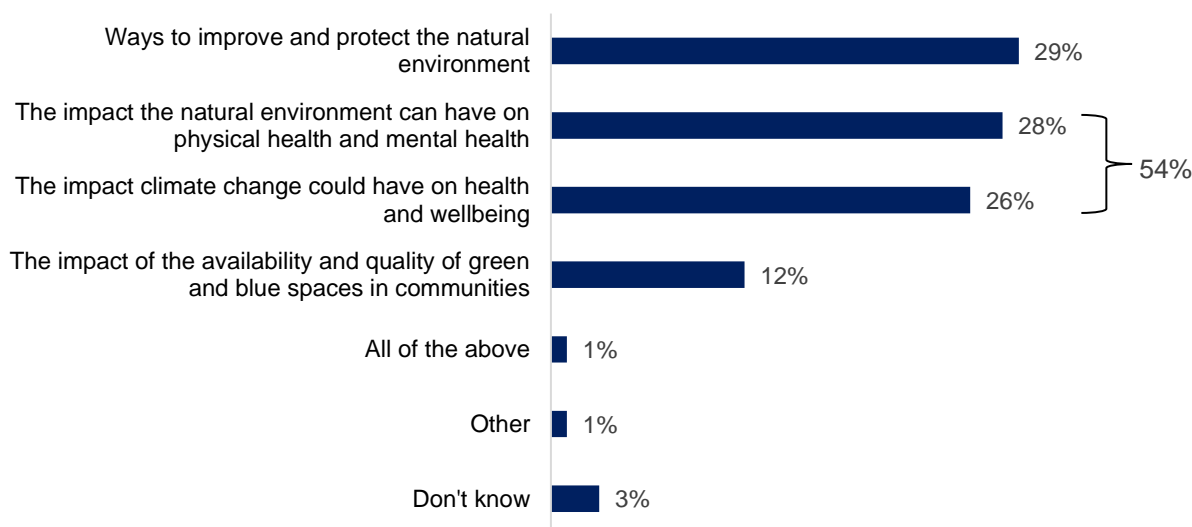|			
54%	It is most important for scientists and researchers to focus on the relationship between the natural environment and human health and wellbeing	**43%**	It is most important for scientists and researchers to focus on how to protect and improve our natural environment
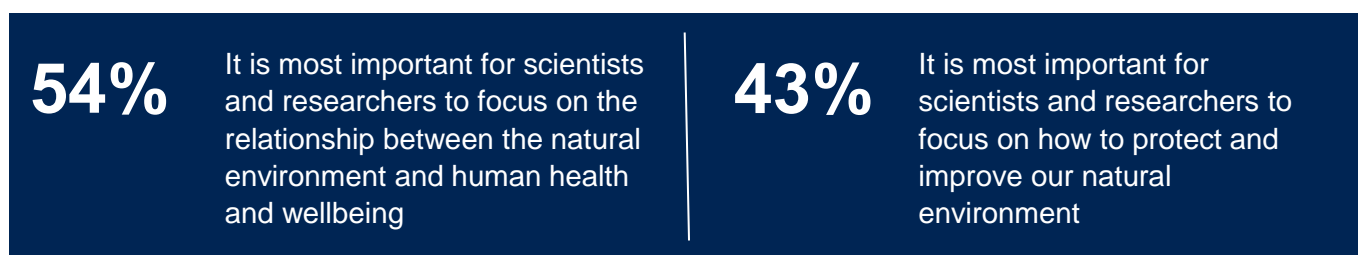
Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

We also asked the public to choose between four broad possible areas for a public dialogue, including two options explicitly related to human health. Together, these two options were selected by more than half of respondents.

Figure 9. Public views on specific research priorities

Q9. Still thinking about issues that affect people in this country rather than globally... Which, if any, of the following issues do you think is most important for scientists and researchers to explore?

Ways to improve and protect the natural environment	29%
The impact the natural environment can have on physical health and mental health	28%
The impact climate change could have on health and wellbeing	26%
The impact of the availability and quality of green and blue spaces in communities	12%
All of the above	1%
Other	1%
Don't know	3%

(28% and 26% bracketed together: 54%)

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

Without much difference between the top three issues in Figure 9, the answers to this question are not particularly useful in isolation. However, after they had answered this question, we asked those who named an issue (n=999) to tell us, in their own words, why they thought this was the most important issue. Discounting the tautological responses, which simply rephrased the responses to the previous

question, some links and interdependencies between these research priorities emerge. For example, these participants often gave the need to 'protect physical health', a subset of the physical/mental health research priority, as a reason for prioritising the other three research priorities. 23 per cent of those who prioritised green and blue space research reported this (n=111), 25% who prioritised research on the impact climate change could have on health (n=291) and 12% of those who prioritised research into protecting the natural environment (n=301). In contrast, the need to 'protect mental health' was only linked to one of the other priorities, by 18 per cent of those who prioritised green and blue space research (n=111). In line with this, participants from multiple public dialogues frequently highlighted the wellbeing benefits of green and blue spaces over physical health, commonly associating them with 'freedom' and 'escape'[21] while the National Trust's *Noticing Nature* project finds that those who feel that their life is worthwhile are more likely to have recently visited a local green space[22].

The survey participants did not link climate change and health research to the other research priorities as much as the other three; 14 per cent of those who prioritised research on ways to improve the natural environment gave 'climate change' as the reason for selecting this (n=301) compared to 4% of those who prioritised research on the natural environment's impact on physical/mental health (n=281) and 4% of those who prioritised green and blue spaces research (n=111). This may be because some members of the public see climate change as a future rather than imminent issue in relation to health. In the March 2020 BEIS Public Attitudes tracker, 15 per cent of the public had already noticed more health problems in relation to climate change while 41 per cent expected that this would become more of an issue in the next 15-20 years [23].There is evidence, however, that public dialogue may enable people to more readily draw links between climate change and health. Participants in a public dialogue on Neuroscience and Mental Health by Ipsos MORI for Wellcome, for example, suggested 'climate change and the effects of pollution and deforestation on our health' as a future research priority. [24]

Considerations for NERC/UKRI

Pollution is clearly an important area for the public, and one that they feel strongly about. However, we know that certain aspects of **planetary health** have less resonance with the public such as healthy soil. It would be crude to discount a broader public dialogue about planetary health, just because certain aspects of this field of research are less understood. In fact, it may present an opportunity for NERC/UKRI to explore an interdisciplinary area like this.

Given that both stakeholders and the public see protecting the environment, the availability of green and blue spaces, physical and mental health as highly interlinked and interdependent, NERC/UKRI may want to bring different areas of research and expertise to bear on the design, oversight and use of a public dialogue.

If NERC/UKRI also want to include the topic of climate change, it would be prudent to recognise in the design of a public dialogue that the public do not so readily link this research priority with other topics and learn from previous public dialogues which have explored these links.

3.1.3 Stakeholders highlighted the importance of public dialogue for refining the role of scientific research in a changing environment which has direct impacts on the public

Stakeholders noted that the COVID-19 pandemic has offered an opportunity to explore the relationship of the public to nature and 'natural' spaces in their proximity, and a possible renewed interest in understanding our engagement with green spaces and the associated mental and physical health risks. One interviewee commented that the pandemic marks a crucial point to examine how people are

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[21] *Consumer Participation in Water Policy*, 2017, Ipsos MORI and Involve for Citizen's Advice Scotland https://bit.ly/3fsFrZa ; *Romsey Citizens' Assembly,* 2019, The Democratic Society and the Sortition Foundation for Test Valley Borough Council https://bit.ly/35EZtuJ ; *Naturally speaking: a public dialogue on the UK National Ecosystem Assessment*, 2015, University of Exeter for Defra and NERC. https://bit.ly/3cHX8Sk

[22] *Noticing Nature*, 2019, University of Derby and YouGov for National Trust. https://bit.ly/2X46KC4

[23] BEIS Public Attitudes Tracker, March 2020 (Wave 33), https://bit.ly/3fzOura

[24] *What matters to the public in neuroscience and mental health research?*, Ipsos MORI for Wellcome, 2020 https://bit.ly/3cceAhZ

"experiencing their local environment in ways they haven't before" in terms of the links between a healthy environment and their daily lives. When we can understand what healthy environments mean tangibly to people's lives, researchers can map these issues back onto the healthy environment theme and translate them into research questions.

The public's engagement with the natural environment, including green infrastructure, and green and blue spaces, were identified as subject areas which may benefit from exploration in public dialogue due to disjunct between the positive benefits of green/blue spaces and the lack of access to them for certain publics. Natural England's monitor of engagement with the natural environment found that those who are white, older, more affluent, from rural areas and with access to a car describe access to the natural environment on more positive terms[25]. While Natural England's review found that people from lower socio-economic groups, in particular those from BAME and minority groups are significantly less engaged in the natural environment[26]. Participants from the National Ecosystem Assessment dialogue echo this disparity, arguing that green urban spaces should be made more inclusive and enable more diverse experiences for having contact with nature[27]. This also aligns with our poll – a higher proportion of people from C2DE socio-economic groups (15 per cent) believed that research on the impact of the availability and quality of green and blue spaces in communities was most important than those from ABC1 socio-economic groups (9 per cent) – and feedback from stakeholders arguing that COVID-19 had made research into unequal access to green/blue spaces all the more urgent. In addition, they suggested that those most affected (lower socio-economic grades and/or in urban areas) would be most appropriate to engage in order to tap into their lived experiences. NERC/UKRI may want to draw upon successful existing public dialogues that have explored the lived experience of health and urban green spaces such as the GHIA project (Green Infrastructure to Promote Health and Wellbeing in an Ageing Population)[28]

Consideration for NERC/UKRI

Inequality of access to the health and wellbeing benefits of green/blue spaces is not a new issue, but COVID-19 has heightened its place in the public imagination. As a result, NERC/UKRI could take advantage of this emerging deliberative trend through public dialogue. If this area were to be chosen by NERC/UKRI for a public dialogue, stakeholder interviews suggested that certain subgroups (e.g. socio-economically disadvantaged) would need to be involved, instead of solely engaging a more 'general' public, as has been done in relation to the 'healthy ageing' theme.

3.1.4 The public want to be engaged about future environmental challenges but it is important to root the topics of these complex scientific discussions in their day-to-day lives

According to our survey, 94 per cent of the public think that it is important for scientists and researchers to focus on the impact climate change could have on health and wellbeing. This aligns with other public attitudes polls. A separate Ipsos MORI poll in February 2020 (before the Covid-19 pandemic) showed that climate change is the third most important issue for the British public, after the NHS and EU Exit[29] and the latest BEIS Public Attitudes Tracker (March 2020) showing that 76 per cent of the public said they were either very or fairly concerned about climate change, up from 65 per cent in 2012.[30] However,

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[25] *Monitor of Engagement with the Natural Environment – The national survey on people and the natural environment*, Natural England (2019) https://bit.ly/2wWrP6O

[26] http://publications.naturalengland.org.uk/file/4631369804152832

[27] Naturally speaking: a public dialogue on the UK National Ecosystem Assessment, 2015, University of Exeter for Defra and NERC. https://bit.ly/2C822eM

[28] Nature and Ageing Well in Towns and Cities: Why the natural environment matters for healthy ageing. (2019) Green Infrastructure to Promote Health and Wellbeing in an Ageing Population (GHIA) https://bit.ly/2zhxd5i

[29] Ipsos MORI survey, February 2020 https://bit.ly/35ORQC3

[30] BEIS Public Attitudes Tracker, March 2020 (Wave 33), https://bit.ly/3fzOura

there is some evidence that this concern is not currently being linked to human health due to media and government discussion of the issue.[31]

Our survey asked participants to choose between scientific research which affects people's lives right now, and scientific research on wider challenges which could affect people globally in the future. Just over half picked "Wider issues which could affect people globally in the future". This result was notably different for some demographic groups, with 'issues affecting people in this country right now' preferred by those over 64 (53 per cent) and people from social grades C2DE (51 per cent). Younger people (18-34-year-olds) were much more likely (62 per cent) to select global challenges which could affect people in the future.

Figure 10. Public views on research priorities between future issues / issues affecting people now

Q12: Which, if either, of the following statements comes closest to your view? When it comes to scientific research on the environment and human health, The Natural Environment Research Council should prioritise funding research which relates to…

52%	… wider issues which could affect people globally in the future	**45%**	… issues affecting people in this country right now

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

However, the open question responses to our survey reveal that even if people perceive environment and human health areas as a future global issue, they understand the importance of taking action in the present for 'future generations':

> *"I think of my grandchildren - you want to leave them with at least what they have now if not better"*

In order to engage both present and future-focused members of the public through public dialogue, NERC/UKRI may want to take inspiration from Scott et al.'s concept of 'bridges': using examples from public engagement exercises on local planning. They describe 'bridges' as topics that many publics can understand (e.g. 'community assets'), that can be used to link to more abstract scientific concepts (e.g. ecosystems).[32] In relation to healthy environments, an example might be to use a deliberation on green and blue spaces as a 'bridge' to discussions on health and protecting the natural environment at a more systemic level. As one interviewee pointed out, it is useful to present to the public *"not just examples of research, but examples of delivery."* In conversation about air pollution, one of the stakeholders pointed out that benefits are also a useful way of communicating the ways in which scientific research can help to improve public health:

> *"It's important that you not only communicate the risks of air pollution but also the health benefits of clean air – where have we found solutions, where can we posit further solutions and highlight the positives of research?"*

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[31] Watts, N., et al. (2019), The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. *Lancet.* (394, 10211) https://doi.org/10.1016/S0140-6736(19)32596-6

[32] Scott et al. (2018). Mainstreaming ecosystem science in spatial planning practice: Exploiting a hybrid opportunity space. Land Use Policy, 70, 232–246. https://doi.org/10.1016/j.landusepol.2017.10.002

Consideration for NERC/UKRI

Our research shows that there is high public awareness of - and concern about - wider environmental challenges, however some see the impact of these upon their health as a 'future' concern. NERC/UKRI may want to use 'bridging' topics that are more grounded in people's daily lives (e.g. pollution/green/blue spaces) in combination with climate change or biodiversity loss, rather than deliberating these research priorities in isolation.

3.1.5 There is low public awareness and understanding of how aspects of NERC's programme relate to a healthy environment, but potential to explore these through public dialogue

Low awareness or understanding of an environmental challenge is not a rationale in itself for public dialogue. However, such topics are difficult to explore with the public in standard qualitative or quantitative research due to the lack of time for deliberation and the opportunity to involve experts. As a result, this may be one factor to consider when deciding how a public dialogue could add value to NERC/UKRI and its work.

A finding from our research is that the public have a poor understanding of how some of NERC's research areas relate to the theme of the healthy environment. For example, healthy soil features in NERC's funding programme but only five survey respondents referred spontaneously to healthy soil as the environmental health issue most important to them. In response to a closed question, where soil health was presented as an option for ways to improve and protect the natural environment, only four per cent (37 participants) chose this as the most important research priority. In our own review of previous public engagement, we did not find evidence to suggest that the public has been engaged (through public dialogue or other deliberative methods) in healthy soil.

Another area where public salience is low is the environmental aspect of antimicrobial resistance, with nobody making explicit reference to it in our survey's open questions. This lack of public recognition was recognised by Wellcome's 'Reframing Resistance' project which aimed to increase the effectiveness of communications on antimicrobial resistance (AMR). The project concluded that the way to increase public awareness was to root discussions of AMR in everyday lives, which aligns with findings from across this research. [33] However, the open question responses to our survey – like the one shown below - suggest that, though the public may not use the terminology, they understand the challenge of environmental AMR:

> *"I'm worried about the destruction of the countryside...how farm animals are kept, and the medicine they are given. That's important as we eat the meat as well. What they eat we ingest."*

Our review of public dialogues also shows that that complex and lesser known topics are suitable for discussion in dialogue. Ipsos MORI's public dialogue for the John Innes Centre, for example, found that the public had low initial understanding of bioscience, but by the end of the dialogue prioritised antibiotic resistance and readiness for global epidemics as major challenges which bio-scientists have a public duty to work on. Additionally, these participants believed that this topic matched their perceptions of the types of research they believe scientists should focus on and expressed support for increasing awareness of these lesser-known topics.[34]

The roundtable, which offered stakeholders an opportunity to discuss the survey findings from our research, prompted a widespread reflection on the subject areas which are prioritised by the public and the framework from which they are doing so. From the expert perspective, some issues such as pollution are skewed by familiarity, through being in public discourse for longer. As a public engagement expert argued *"there is a high degree of awareness among public about pollution because it is well lobbied as an issue and is visible rather than because of any impact in addressing it."* Roundtable participants

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[33] *Reframing resistance: How to communicate about antimicrobial resistance effectively*, 2019, Wellcome. https://bit.ly/2WVZpmB

[34] *Public Dialogue to Inform Science Strategy*, Ipsos MORI for the John Innes Centre, 2015 https://bit.ly/3bbmJSg

cautioned against the focus on 'populist' subject areas and stressed the need to inform the public about seldom-heard issues before assessing how they would prioritise scientific areas for exploration.

The topic of soil repeatedly arose as a key area where there is felt to be a disparity between scientists' prioritisation and that of the public. It was simultaneously seen as the least recognised healthy environment issue among the public and one which requires more attention both in the public and in research as a critical contributor to the health of the environment. As one academic environmental research scientist argued during a stakeholder interview:

> *"there're hugely important issues, for example soil, which have a huge impact on the public's health but maybe they don't quite understand that yet."*

A climate expert made a similar point at the roundtable:

> *" The danger is that if NERC builds its policy and strategy on the results of an uninformed audience...you'll simply be reinforcing the prejudices they have and not the true situation."*

Another topic which was frequently mentioned by research participants as both under-researched and ill-understood by the public was antimicrobial resistance (AMR). One research charity-based specialist on AMR argued that the human health implications of AMR are often overlooked by scientists, and suggested that people struggle to draw the connection between AMR and people's day-to-day lives:

> *"In general, it feels as though the environmental aspect of AMR is at the bottom of the list... It can also be outside of people's usual understanding of what's relevant to the everyday lives – you cannot see AMR as much as rivers and countryside. You're talking about pollution that people can't even see."*

Consideration for NERC/UKRI

Public dialogue is a method of engagement that brings the public voice into complex and technical subject areas. Geoengineering, genomics, nanotechnologies and stratified medicine represent just some of the many areas that have been explored through dialogue.

By virtue of their complexities, these topics are often unfamiliar to the public and thus require time to introduce people to the topics so that they can discuss them in an informed and meaningful way, leading to outputs that are useful for decision makers.

As stakeholders cautioned, areas should not be avoided because they have low salience among the public. Instead, this research suggests that diverse public voices can be meaningfully involved in public dialogue through engaging them in topics that would be otherwise difficult to gather public opinion on. For example, there may be opportunity for NERC/UKRI to explore topics such as **Antimicrobial resistance (AMR) and soil** with the public through dialogue.

3.1.6 Identifying emerging issues which the public can be engaged with to help shape future research activity

Stakeholders in both interviews and the roundtable identified emerging issues in environmental scientific research that would particularly benefit from engagement with the public. It was noted that these research concerns are categorised as both demonstrating increasing risks and a correlative need to understand them through further research and building of an evidence base. The uncertainty around these issues both in the public and expert sphere highlight the need for better comprehension across both audiences.

One of the key features shared across all the emerging issues mentioned by stakeholders - particularly in antimicrobial resistance, epidemiological concerns and pandemics; soil quality; the impacts of climate change; and associated mental and physical health risks - was the level of uncertainty around them. These issues are identified as emerging but important because the risks are still being assessed. Speaking on this, one of our stakeholders explained the relationship between scientists, the public, and communicating uncertainty through complexity theory:

> *"The way that we approach complex issues is the way we approach complicated issues – the role of researchers is to eliminate uncertainty by studying the system. As scientists, and physical scientists especially, we have tried to apply this approach to complex systems – but in complex systems, uncertainty is inherent. We need to change the narrative that scientists have to remove uncertainty. But they can manage it."*

Stakeholders explained that both understanding potential associated risks and understanding impact are key concerns for some of the subject areas, and the degree of progress across all is varied. Some stakeholders suggested there is value in engaging the public in questions around futures and uncertainty. Areas which were said to require further research included *"risks associated with the broader natural environment".* Examples included pollution and how humans interact with other species, citing issues such as Lyme disease and coronavirus. One interviewee, a specialist on AMR, suggested it might be interesting to explore how the public feel about the unknown impact of AMR:

> *"We do know that there are 'x' amount of antibiotic resistant bacteria in the Thames, and many global rivers, but that we don't fully know how and why that matters – we don't really know what the impact is…we explain what we think could happen in terms of spreading bugs. It could be interesting to see how people feel about that, how much they feel it matters to people."*

Longitudinal studies were also proposed to understand issues like impacts on mental health. As exemplified earlier in the example of flooded communities and mental health impacts, long-term local engagement is suggested to help get ahead of the curve in some research areas. In the context of public engagement, it could be useful to consider how these might be embedded. One stakeholder gave the example of child mental health:

> *"The other huge gap in understanding positive engagement with nature is children's exposure to the environment. A lot of diseases including mental health start in childhood – contact with environment really requires study with young people who are deprived from that experience. Getting closer to urban and rural settings – and the socioeconomic deprivation side of all this discussion."*

3.2　The importance of local engagement

Stakeholder interviewees stressed that accounting for local context and lived experience is crucial to the research and public dialogue process. When setting up a public dialogue, any local experiences of environmental impacts can play a key role in how conversations will be interpreted and received, and in understanding the relationship between the public and stakeholders in the room.

Incorporating this is especially important when considering the symbiotic nature of human and environmental health, or the effects of environmental change both caused by and impacting on humans. For example, communicating the meaning of green infrastructure may be framed within the local geography for an audience living in an urban area, or consideration may need to be taken for those who have experienced exacerbated health issues as a result of local environmental factors when discussing research priorities.

The impact of climate change and specifically flooding was mentioned by some stakeholders as clear example of climate change impact on human's everyday lives, and where public engagement and involvement has been a decisive factor in developing effective research practices. A few stakeholders mentioned cases whereby local organisations, government bodies, scientists and researchers and local

communities worked together to mitigate the effects of flooding.[35] Working at a multi-disciplinary level with a participatory approach has enabled projects whereby the public has aided in monitoring river levels, land management was discussed at a governance level, and scientific research contributed to and benefitted from the outputs.

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[35] https://www.forestresearch.gov.uk/research/slowing-the-flow-at-pickering/slowing-the-flow-at-pickering-about-the-project/

4 Designing a public dialogue

Key insights

This chapter explores the key design challenges that are presented by developing a dialogue on healthy environment research in the current climate. It outlines a series of insights for NERC/UKRI:

Insight 7: It is highly likely that the public dialogue will be delivered online, but this should be seen as an opportunity to do dialogue differently rather than simply recreating face-to-face methods. Designing the public dialogue around what people are already comfortable doing online might help boost inclusion.

Insight 8: It is important to consider how to make the public dialogue as inclusive as possible. This could include making sure those most affected by the issue being discussed are well represented, as well as considering who is missing from sampling, and questioning why that might be.

Insight 9: Innovative methods should be explored with experts and practitioners as tools for emotionally engaging participants' and enabling them to grapple with complex subjects, prioritising the potential of drama, technology, citizen science and futures-thinking.

Insight 10: In addition to meeting all the well-established principles for dialogue, there are three especially important design considerations for a dialogue on environmental science. First, the language used should be consistent and clear to facilitate participant understanding. Second, it is important to frame a dialogue in people's lived experience. Third, the public engagement should be as meaningful as possible, allowing the outcomes of the dialogue to lead to change.

4.1 Support for a public dialogue on the healthy environment theme

Our research shows that the public's understanding of complex environmental questions is generally low.[36] It also suggests that there is sizeable public appetite for engaging with environmental issues, science funding decisions, and building an understanding of issues relating to environmental health.[37]

From our review of public dialogues, there are mixed findings in relation to the public's perception of its own ability to contribute to research informing science strategy. Some public dialogues have concluded that citizens do not feel well informed enough to do so,[38] while others suggest that people feel that the process of becoming more informed, through public dialogue, could enable the public to contribute to science strategy.[39]

As we outlined in chapter two, stakeholder interviewees were supportive of meaningful public engagement with a wide range of people. Interviewees also demonstrated support for a deliberative dialogue approach, with one expressing the importance of understanding the values and experiences

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[36] One example of this is McNulty CAM, Collin SM, Cooper E, et al. Public understanding and use of antibiotics in England: findings from a household survey in 2017. BMJ Open 2019. http://dx.doi.org/10.1136/bmjopen-2019-030845)

[37] *Kingston Citizens Assembly on Air Quality*, 2019, Sortition Foundation and Involve for Royal Borough of Kingston upon Thames. https://bit.ly/2WYpWzB ; *Public dialogue on significant water management issues*, 2013, Environment Agency, 3KQ and Ipsos MORI for Environment Agency https://bit.ly/3dHfEKS ; *Naturally speaking: a public dialogue on the UK National Ecosystem Assessment*, 2015, University of Exeter for Defra and NERC. https://bit.ly/3cHX8Sk ; *A guide to the Global Food Security Food Futures panel outputs*, 2016, OPM Group for Food Futures Panel ; *Public engagement in shale gas and oil developments*, 2014, TNS BMRB for OUGO. https://bit.ly/2Z3TZbO ; *A guide to the Global Food Security Food Futures panel outputs*, 2016, OPM Group for Food Futures Panel. https://bit.ly/3686BQD ; *UK response to climate change*, 2013, Hopkins Van Mil for Committee on Climate Change. https://bit.ly/3cEiEHS

[38] *Public dialogue to inform science strategy*, 2015, Ipsos MORI for John Innes Centre and BBSRC. https://bit.ly/3dRITdV

[39] *Public Dialogue on Future Strategy for the Babraham Institute*, 2015, Ipsos MORI for BBSRC and the Babraham Institute https://bit.ly/2Ta0W7g ; *What matters to the public in neuroscience and mental health research?* (2020), Ipsos MORI for Wellcome. https://bit.ly/2Lxy590

that drive answers. They stressed that surveys are "reductionist" and argued it is important to understand in more detail where opinions come from. A public dialogue approach will enable NERC/UKRI to understand the values and experiences that drive citizens' views. It will allow for controlled sampling that brings together a wide range of people whilst ensuring they are all able to engage through a variety of activities. This cannot be replicated in a survey approach, which uses one format i.e. paper text, online text or telephone. Public dialogue also enables this wide range of people to interact and deliberate their views, resulting in higher quality insights and, if built into the design, shared recommendations that reflect divergent views.

In the survey conducted as part of this work, 67 per cent expressed that they would feel confident sharing views in a face-to-face discussion with others, and 69 per cent reported they would feel confident doing so online. Yet, overall, there was more expressed confidence for giving feedback on documents and presentations through a website in people's own time (75%).

We know from our own experience of conducting many public dialogues informing science strategy, that the public are often surprised by how much they enjoy the process.[40] We also know that different people favour different levels of involvement.[41] Public dialogue demonstrably enables citizens to understand and critically engage with complex topics. Drawing on innovation and citizen science techniques may build on this further. Public dialogues also offer the opportunity for prolonged engagement with a group, which allows time for opinions to shift thus bringing about a more nuanced exploration of views, as pointed out by a stakeholder in the roundtable.

Stakeholder interviewees frequently raised the importance of engaging a wide range of people, and this was echoed in the roundtable with a call for robust representative sampling. One interviewee broadened this call and mentioned the importance of *"equity and different voices"* being heard in the public dialogue, suggesting participant recruitment must *"go beyond the usual suspects."* Stakeholders also raised the importance of being clear on the purpose of the dialogue and how the findings will be used, as well as setting a specific question which might act as a means for establishing who should be in the room.

4.2   Online methods

Our research has highlighted several benefits to online engagement. First among these is that hosting deliberation online provides an opportunity to increase inclusion. It offers increased accessibility for those who struggle to attend face-to-face deliberations due to travel, caring responsibilities or social anxiety and could engage younger people who may be less comfortable in face to face settings.

Online methods can also help expand the conversation "beyond the room", as pointed out by stakeholders in the roundtable, broadening reach to others through social media or continued conversations. Online methods can also provide increased anonymity, as well as offer the opportunity for a wider range of people to be involved.

However, research participants also raised several concerns about online public dialogues which will need to be addressed in any research design.

Several research participants pointed out the challenge of digital exclusion.[42] Internet access is not equal, and even where people are online, they may not have access to a private and quiet space in their home which is suitable for participation in a lengthy discussion and/or with adequate and stable internet connection. There is some suggestion the number of digitally excluded people may be getting smaller, but it remains a significant concern for those over 75.

Digital exclusion also reflects those who are online, but do not have the skills to confidently navigate the digital world.[43] Any online deliberation hosted by NERC/UKRI should build in resource to support

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[40] *What matters to the public in neuroscience and mental health research?* (2020), Ipsos MORI for Wellcome. https://bit.ly/2Lxy590

[41] Public Attitudes to Science 2019, Kantar for BEIS (unpublished)

[42] Lansdell, S., 2020, *Deliberative Democracy in the Age Of Covid-19*, 2020, Involve. https://bit.ly/2AwbrLT

[43] https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04

participants to navigate the platform and, for those without a stable internet connection or a computer, to provide tablets and temporary internet access (for example, by sending a low-cost pre-paid dongle) to widen inclusion. Resource to 'onboard' participants, teach them how to use the technology and support them through the process is also required. As with face-to-face public dialogue work, people with visual and hearing impairments should also be considered when choosing a platform and designing an inclusive deliberative process.

Stakeholders at the roundtable pointed out that while online spaces may make some people feel more confident, it may also encourage others to feel less safe without the ability to physically see other people. It was also suggested at the roundtable that online platforms may not enable the same positive relationship building, as well as possibly inhibiting the depth of interactions that people are able to have. This has been reinforced by findings in public dialogues, including the Big Energy Shift which concluded that conversations in smaller numbers of people worked better than larger, more formal, formats.[44]

Stakeholders in the roundtable were very clear that – in an ideal world – online and offline methods should be considered together, rather than separately. Arguments should be distilled into accessible online content such as infographics, videos, podcasts and summaries. Capacity for engagement should also be varied, using discussion boards (with moderation) that have 'reaction' tools (love heart, high five etc.) that are familiar, mapping tools, storytelling capabilities, Q&A sessions, quick polls and surveys.[45]

A recent sector wide discussion hosted by Involve also offered reflections on online deliberations, including offering opportunities for improved learning phases and being mindful of how to create an environment that enables deliberation amongst participants, rather than more traditional qualitative research. Notably, moving public dialogue online will not be any less time consuming – it may prove to be more so.[46]

4.2.1 How the public feel about online public dialogues

The findings from our survey show that while overall there is little difference in confidence in engaging in face-to-face discussions with others (68 per cent) and those online (69 per cent), there are apparent differences by characteristics. As figure 10 shows, a higher proportion of people in higher socio-economic groups ABC1 reported feeling confident (72 per cent) engaging in face-to-face discussions compared to those in lower socio-economic groups C2DE (61 per cent). Education also appears to be an influencing factor with just over half (54 per cent) of those without formal qualifications reporting that they would *not* feel confident sharing their views in a face-to-face discussion with others. In contrast 76 per cent of those with a bachelor's degree or higher would feel confident sharing their views in a face-to-face discussion with others.

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[44] *The Big Energy Shift*; Report from Citizens Forums, DECC, 2009, Ipsos MORI for the Northern Ireland Executive, Welsh Assembly Government and DIUS.

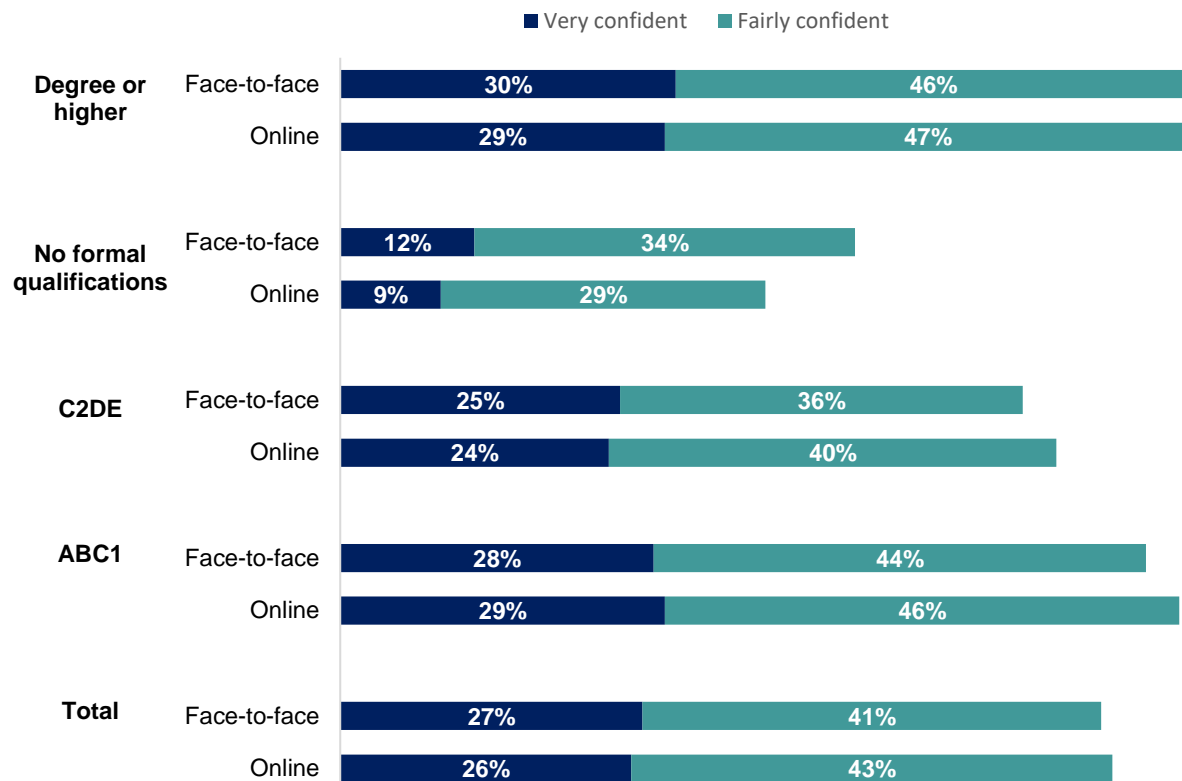[45] *7 Questions About Digital Inclusion and Online Participation*, 2020, Bang the Table. https://bit.ly/3dOnoL4

[46] Lansdell, S., 2020, *Deliberative Democracy in the Age Of Covid-19*, 2020, Involve. https://bit.ly/2AwbrLT

Figure 10. Public confidence participating in a face to face/online public dialogue by education and social grade

Q13. The Natural Environment Research Council is planning to ask members of the public to come together in the future to discuss the research it funds on the issues we've just been talking about. I would like you to imagine you have been invited to participate in this discussion.
How confident, if at all, would you feel about sharing your views in a <u>face-to-face discussion</u> with others?
Q14. How confident, if at all, would you feel about sharing your views in an <u>online discussion</u> with others?

|		Very confident	Fairly confident
Degree or higher	Face-to-face	30%	46%
	Online	29%	47%
No formal qualifications	Face-to-face	12%	34%
	Online	9%	29%
C2DE	Face-to-face	25%	36%
	Online	24%	40%
ABC1	Face-to-face	28%	44%
	Online	29%	46%
Total	Face-to-face	27%	41%
	Online	26%	43%

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

One stakeholder interviewee spoke of experience of hosting web-based engagement, reflecting on positive experiences of a web-based youth engagement platform and scheduled question and answer sessions (AMAs) on Reddit with adults. They suggested that the young people they interacted with preferred the medium because *"they had time to think about what they were writing… they need time to formulate their opinion."* Our survey echoed these findings, with a higher proportion of both those aged 18-24 years old and 25-34 years old reporting more confidence in online engagement than face-to-face. Our survey also explored what would make people - those reporting a lack of confidence sharing their views online or face-to-face with others - feel more confident in doing so. Knowledge, information and guiding materials appear most important, as can be seen in the word cloud (figure 11).

Figure 11. Frequently appearing terms in relation to confidence in public dialogue participation

Q15. What would help you feel more confident about sharing your views?

(Open ended question)
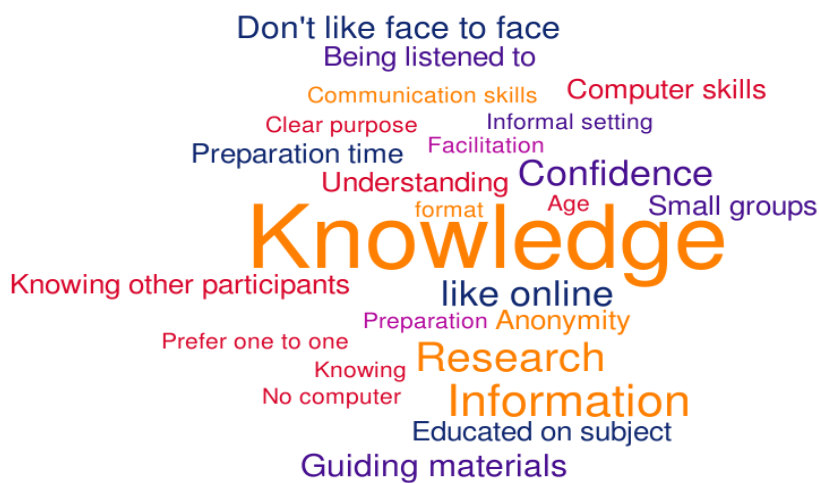
Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

Box 4. Key recommendations for designing an online dialogue:

- Think and plan online dialogue as a complimentary tool to face-to-face dialogue that can form part of a range of multi-method approaches to greater inclusion in the future (not only as a temporary replacement for face-to-face deliberation).

- Explore the potential of online methods rather than (only) trying to directly translate the face-to-face experience online through video enabled meetings – make use of how comfortable many people feel online, and how they would normally behave.

4.3   Inclusivity in public dialogue

Public dialogues often take a 'general population' approach to sampling and do not always prioritise engaging with seldom-heard groups or those most likely to be affected by environmental change. Concerns have been raised by public dialogue participants about measures taken, for example to increase energy efficiency, furthering inequality,[47] and recommendations made that household changes should be incentivised to include low-income households and those who don't believe action is needed.[48] Many polls indicate that education level dramatically impacts views on environmental issues,[49] [50] [51] with one poll also demonstrating that household income impacts dietary behaviours.[52]

A hallmark of the public dialogue process is to support and encourage participants to engage with structures and concepts that are unfamiliar and, whilst sampling often takes a representative approach, stakeholder groups who may be disproportionately impacted by decisions or will hold divergent views of importance can be over-sampled or included in sampling criteria. A diverse sample for a public dialogue

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[47] Bioenergy dialogue, 2013, BBSRC and Ipsos MORI for BBSRC https://bit.ly/35YYR3s
[48] UK response to climate change, 2013, Hopkins Van Mil for Committee on Climate Change. https://bit.ly/3cEiEHS
[49] McNulty CAM, Collin SM, Cooper E, et al. Public understanding and use of antibiotics in England: findings from a household survey in 2017. BMJ Open 2019. http://dx.doi.org/10.1136/bmjopen-2019-030845
[50] Ipsos MORI survey, November 2019 https://bit.ly/3dybpC2
[51] Ipsos MORI survey, November 2019 https://bit.ly/2QOPtZM
[52] Ipsos MORI survey, August 2018 https://bit.ly/2QMAwri

on environmental research could include criteria around deprivation or education levels as well as more standard criteria, such as geographical location. Our research indicates that divergent views and disproportionate impacts of decision-making in environmental policy should be accounted for in the sample.

Interviewees often mentioned the inclusion of specific voices. Suggestions included:
- Considering generational differences
- Specific values to different groups (e.g. greenspaces increase house prices, which some people will view favourably and others not)
- The urban versus rural context
- Including those with mental health problems
- Including residents in economically disadvantaged areas
- Including people from ethnic minorities
- Including people with health risks
- Considering issues of power, money and inequality to reach a range of voices.

These groups were viewed by interviewees as stakeholders of relevance, or areas where divergent views are likely to be held. NERC/UKRI will need to explore these before designing a sample and nuances will need to be considered. For example, the visibility of green space making a significant difference to the interpretation of accessibility.[53] Perceptions of circumstance will need to be explored with citizens to define sampling criteria.

In the stakeholder roundtable, some suggested how NERC/UKRI might use environmental health inequalities (for example distribution of pollution) to help frame the environment in a health context. Framing is an important element of public dialogue, one that forms part of building trust with the public who attend dialogue events (and the public more broadly). NERC/UKRI would benefit from making a concerted effort in engaging with a diverse public, and projecting diversity when representing NERC/UKRI at events and in visual materials. Engaging a diverse public also means considering the access needs of different people; events should be wheelchair accessible and translation and subtitles made available. Furthermore, facilitation style should be active, welcoming and adaptive, and informed by engagement with stakeholders who work with various communities or individuals. For example, a blind person may feel more included by someone taking the time to sit with them and explain what they can't see, and members of the deaf community may prefer a Q&A discussion (with British Sign Language interpreters present) over a presentation format.

The use of language is also important considering who to engage in a public dialogue. The term 'hard-to-reach' is contested, in that it is attributed to the person rather than the service who put up some of the barriers.[54] Seldom heard is a preferred term, as is under-represented. Crucially, whoever is regarded as seldom heard is context driven. As previously stated, those who are likely to be disproportionately impacted are those with lower incomes. Further exploration should be given to who will be regarded as a seldom heard group in a healthy environment research context. An interviewee also raised the word 'vulnerable' as one to avoid, arguing that it is a term *"frequently used to describe others"* but that *"people never put themselves in this bracket."*

Considerations of bias when working with seldom-heard groups are often raised in research. There is a standardised approach in therapy that some researchers are using to address bias in their work engaging with seldom-heard groups that looks at the multiplicity of cultural influences that make up a person's identity,[55] which – interestingly – links to one interviewee's request that this work use psychology-based approaches to public dialogue. This specific approach may again inform sampling, in

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[53] Contribution of green and open space to public health and wellbeing, 2014 James Hutton Institute, OPENSpace Edinburgh University, University of Glasgow, Heriot-Watt University, Biomathematics and Statistics Scotland for the Scottish Government. https://bit.ly/2Z75vDq

[54] Flanagan, S.M. and Hancock, B., 2010, 'Reaching the hard to reach'-lessons learned from the VCS (voluntary and community Sector). A qualitative study. *BMC health services research*, 10(1), p.92. https://doi.org/10.1186/1472-6963-10-92

[55] Hays, P. A. (2001). Addressing Cultural Complexities in Practice: A Framework for Clinicians and Counselors. Washington, D. C.: *American Psychological Association.* https://doi.org/10.1037/10411-000

that participants should not be recruited on the basis of one criterion; the intersections of their identities should be considered. Other psychology-based approaches may inform facilitation and material design. Participants in one public dialogue supported creating a legacy of engaging materials for wider awareness raising,[56] thereby 'including' more people and raising education. Participants in another public dialogue expressed support for involving people from low and middle income countries and scientists from across the globe in dialogue.[57] There were several generic suggestions made by attendees of the stakeholder roundtable around inclusive, but also accessible engagement:

- **The importance of supporting participants to engage in the process** (whether online or offline) by providing training in engaging in workshops online, demos of the platforms and by providing on-hand support for those who need it throughout.

- **The need to familiarise the public with concepts** such as panels and advisory boards as these descriptors and their dynamics are not necessarily going to be familiar with people.

- **Considerations around accessibility**, by thinking through how participants arrive at event locations, providing health, disability and faith informed adjustments, ensuring that stimulus is accessible to those with different learning styles and people who are illiterate.

There is a clear distinction between including a diversity of perspectives, potentially through a representative sample that reflects values as well as demographics and including relevant perspectives from special interest communities and stakeholders. Work will need to be done to understand how to prioritise within and accommodate both. For instance, based on the views of one mini-public who have discussed the environment and steps that our society needs to take to address climate change,[58] the most crucial views to include are those who are likely to be disproportionately impacted and a range of perspectives where divergent views would cause difficulty in the application in a policy choice. This aligns with the findings of the Overseas Development Institute's international review of deliberative public engagement, which stressed the importance of engaging marginalised groups most affected by the issues (e.g. by poor housing): those on low incomes, those with less formal qualifications and ethnic minorities.[59] Risks to a healthy environment are frequently found to disproportionately impact those from lower income groups, for example in relation to air quality[60]. Although our survey did not explicitly ask the public which groups should be engaged, we did find that those in lower socio-economic groups and with fewer qualifications felt less confident about taking part in a public dialogue (see 4.2.1 above).

Box 5. Key recommendations towards inclusive sampling and accessibility:

- Explore who is likely to be impacted by decisions made through the dialogue and the range of diverse perspectives that should be included – the dialogue should, at minimum, include people across educational, income and rural versus urban divides.

- Consider also who is missing from the representative sampling approach that has previously been applied to dialogues on the environment and, importantly, why they are missing. Consider the barriers to inclusion, such as lack of awareness, inaccessible formats or messaging that does not resonate. NERC should consider who to include who have not previously been accommodated.

- Take the time to engage with specific target groups and stakeholders to understand the range of situations within them and the context of individual experiences.

- Consider accessibility requirements for all of those involved.

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[56] *Food Systems Challenges*, 2015, TNS BMRB for Which? and the Government Office for Science. https://bit.ly/3cAyiUK

[57] Experiment Earth; report on a public dialogue on Geoengineering, 2010, Ipsos MORI for NERC. https://bit.ly/3byiFvM

[58] UK response to climate change, 2013, Hopkins Van Mil for Committee on Climate Change. https://bit.ly/3cEiEHS

[59] *Lessons from deliberative public engagement work: a scoping study*, 2011, Overseas Development Institute https://bit.ly/2WjtEnV

[60] *Shrubsole et al. 2015, Impacts of energy efficiency retrofitting measures on indoor PM2.5 concentrations across different income groups in England: a modelling study. https://doi.org/10.1080/17512549.2015.1014844*

4.4 Innovative methods

As we have already discussed, citizens typically initially lack confidence when engaging with environmental topics, despite there being interest, and there are a range of groups who will need to be included in discussion.

Citizen science (also known as crowd/civic/networked science) has received positive attention for making science more accessible and accountable.[61] Engaging participants in 'homework' activities that reflect the participant-led principles of citizen science could further their levels of engagement, understanding of the topic and enjoyment of the process. This could involve working with citizen science projects that are already underway or creating discrete citizen science project that relate to participants' local area. For example, monitoring the activity of animals in their local park or assessing the 'health' of their local green spaces.

Box 6. Citizen Science

Citizen science is the involvement of the public in scientific research. The principal behind citizen science is to use the power of collaborative volunteer research to explore or collect huge data sets, that researchers couldn't manage by themselves and computers can't analyse. There are two mains types of citizen science; either participants observe, record and submit data or they go through existing data and log what they find. Many projects require no specialist skills or knowledge though others draw on the knowledge of e.g. amateur gardeners or bird spotters. There are a huge range of subjects for citizen science projects, including astronomy, photo-tagging, wildlife surveys, public health, air pollution. They all engage the public to advance our collective understanding of the world.[62]

There is also support for scientists being involved in public dialogue. Not only are scientists trusted figures, but participants have also reported that scientists have helped them in terms of their thinking and understanding.[63] [64] [65] There are mutual benefits to bringing scientists into the design and delivery of public dialogue too, with opportunity for scientists to engage with the public and hear what is important to them. As one interviewee stated:

> *"As a scientist you assume you are the only person worth listening to because of your relationship with the data, but in a meeting, you realise you only have a small vote and others views also have validity."*

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[61] *Research futures: Drivers and scenarios for the next decade*, 2019, Elsevier and Ipsos MORI. https://bit.ly/35Z2Ixs

[62] https://www.bbc.co.uk/programmes/articles/4BZZdHm64S051q2lnZ1Nr7p/citizen-science

[63] *Public Dialogue to Inform Science Strategy*, Ipsos MORI for the John Innes Centre, 2015 https://bit.ly/3bbmJSg

[64] *Public Dialogue on Future Strategy for the Babraham Institute*, 2015, Ipsos MORI for BBSRC and the Babraham Institute https://bit.ly/2Ta0W7g

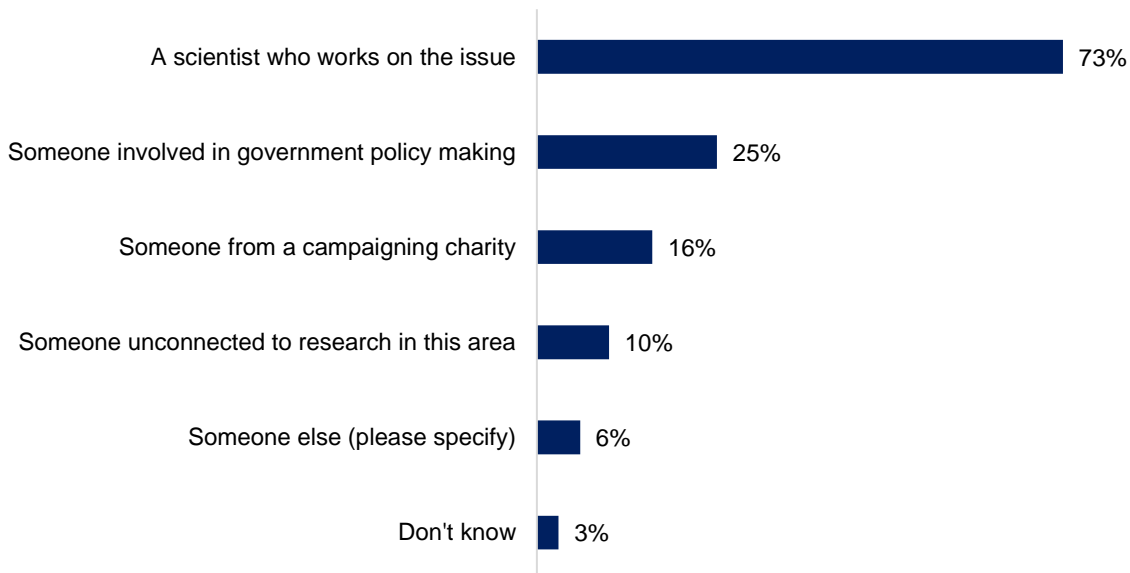[65] *What matters to the public in neuroscience and mental health research?*, Ipsos MORI for Wellcome, 2020 https://bit.ly/3cceAhZ

Our survey also suggests that approaching three-quarters of participants (73 per cent) would like to hear scientists introduce environmental topics to them if they were to participate in face-to-face or online discussions (figure 12).

Figure 12. Public views on who they would like to introduce a public dialogue

Q16 - Please continue to imagine you have been invited to contribute in a face-to-face or online discussion. Who would you most like to hear from to introduce the topic to you?

(Semi-open question, participants asked to specify if they choose 'Someone else')

A scientist who works on the issue	73%
Someone involved in government policy making	25%
Someone from a campaigning charity	16%
Someone unconnected to research in this area	10%
Someone else (please specify)	6%
Don't know	3%

Base: 1,031 UK adults 18+. Telephone interviews 17- 26 April 2020

However, where scientists are involved in dialogue with the public, it is important to ensure that they are clear on what they are, and are not, there to do. As one stakeholder interviewed suggested, it is very important that scientists are thoroughly briefed on when and when not to answer questions, and to take care not to influence participants with their own views. Given that there is high trust in scientists, participants would find it easy to follow the lead of the scientists in decision-making. There should therefore be active facilitation in managing power dynamics and ensuring participants can challenge the scientists. Close attention should be paid to the choice and framing of a discussion, so that the views of the public and the views of the scientists have equal value. For example, how to practically embed steps needed to be taken by the public to effectively create a healthier environment.

Artistic and creative methods are cited as being useful for exploring environmental topics.[66] [67] The importance and validity of emotions were raised by interviewees, one of whom suggested that creative professionals are needed to engage people emotionally. Similarly, in the stakeholder roundtable, suggestions were provided for how a public dialogue about the natural environment might lend itself to taking participants for a walk outside to really bring the environment to life for people. Arguably this could be created through video. Other suggestions made within the roundtable include gamification, and visualisation such as live animation, that can also aid members of the public dialogue to engage and process information. Both methods also provide the opportunity to take learnings away from the session in another form other than written notes.

The 'chew it over' report highlights participants' appreciation for the like-for-like nature of the dramatised stimuli, which reflected a range of voices on the issue based on precisely what had been said by the

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[66] Chew it over: Dramatised Dialogue, 2016, Hopkins Van Mil and Look Left Look Right for Wellcome. https://bit.ly/2Z4Sbzb
[67] Peltola. T. et al. (2018) Missing the Peacock – Arts, Sciences, Creativity and Chronic Environmental Conflicts. *Polymath: an interdisciplinary arts and sciences journal.* http://nora.nerc.ac.uk/id/eprint/520630/1/N520630JA.pdf

participants themselves. These dramatised approaches helped participants to engage emotionally and consider issues at scale, as well as on a personal level, and through various lenses.[68] One participant said:

> *"it [the verbatim theatre and workshops] made it much easier to learn and take in the information."*

Ipsos MORI recently used an art piece to explore attitudes towards genome editing with the public for the Babraham Institute.[69] The experience highlighted the importance of discussion with the artist alongside viewing the art piece to promote understanding and stimulate discussion. Another recent Ipsos public dialogue demonstrated online targeting by enabling participants to use the internet, on tablets, through the eyes of an imaginary persona, enabling them to experientially understand the topic. [70]

There is also scope to apply a future lens to discussions, which will enable participants to think outside of current societal norms.[71] One project consulted participants on the future of a local environment by engaging people familiar and unfamiliar with the landscape, using virtual realities to demonstrate how the landscape could be used in various scenarios,[72] again enabling participants to engage experientially through technology.

Stakeholder interviewees referenced their own use of forum theatre, Lego models, board games and video to communicate and "help people to think beyond themselves", putting themselves in the shoes of others when considering their views. Notably, one public dialogue report stated that interactive and visually attractive stimulus worked best, on all platforms,[73] while participants in another felt appropriate channels for engagement are Q&As, interactive exhibitions and online forums.[74]

Box 7. Key recommendations on innovative methods:

- Innovative methods should be explored with experts and practitioners as tools for engaging participants' emotions and enabling them to grapple with complex subjects, prioritising the potential of drama, technology, citizen science and futures-thinking.

4.5   Guiding principles for a public dialogue on the theme of healthy environment

There are well established principles for dialogue that are widely known and upheld.[75] Our research participants frequently raised points akin to these, and we will not reiterate all of them here. Instead, we highlight three core considerations for a public dialogue on the theme of healthy environment.

The importance of language

Several interviewees brought up language as a key consideration. Language should be consistent, translating complex scientific language into clear terms that participants are able to understand and discuss. One interviewee advised that utilising science communicators could help to bridge the gap:

> *"the language is impenetrable. Every discipline has its own language and way of thinking about process and systems."*

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[68] Chew it over: Dramatised Dialogue, 2016, Hopkins Van Mil and Look Left Look Right for Wellcome. https://bit.ly/2Z4Sbzb

[69] Publication forthcoming

[70] Public Attitudes Towards Online Targeting, 2020, Ipsos MORI for the Centre for Data Ethics and Innovation and Sciencewise. https://bit.ly/2yPIHxi

[71] *Approach*, 2015, CIMULACT & Foresight. https://bit.ly/3bDKvXb

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Some helpful advice was provided during interviews, including:

- Having scientists summarise complex information as if writing exhibition labels in a museum or writing a tweet.

- Using language like 'manage' rather than 'solutions', 'strategies' and 'control', as people tend to expect scientists to eliminate uncertainty. Enabling participants to understand the uncertain ground that scientists operate in and explore methods for managing situations rather than finding end-game solutions will enable them to provide realistic and useful feedback.

The need to frame a public dialogue in people's lives

Framing was also a strong theme, with one interviewee explaining that participants should be asked about what concerns them, rather than what to research. Participants in a public dialogue on how to engage the public in scientific research funding also advised talking in terms of human effect rather than scientific language.[76]

Our review of public dialogues has found evidence that the public and stakeholders are more likely to support scientific approaches that relate to their own lives. For example, the 'Food Systems Challenges' public dialogue for the Government Office for Science, found that people were initially drawn to priorities concerned with quality, price and health. Once participants had engaged with the wider framework affecting food production, they chose to focus on behavioural solutions rather than industry wide changes because they felt this was in their control.[77] Participants in the Geological Disposal Dialogue tended to like projects that were local, had long term benefits to the community and benefited a wide range of people. They frequently referenced safeguarding community interests and avoiding self-interest, corruption and undue influence of political or business interests.[78] Similarly, the '2050 deliberative dialogue' presented local politicians and stakeholders with four big themes that would shape the carbon reduction path and found that energy efficiency was the most popular because it was most relevant to people's everyday lives.[79]

In addition to this, we found significant evidence that the public is inclined to try and relate discussions about science to their own lives. In the 'Our Food Future' public dialogue, for example, participants found it challenging to discuss the global food system and were instead inclined to engage from a consumer level, thinking about the role food plays for them and people they know.[80] In the 'Nuclear Energy and Society' public dialogue, which sought to explore how the nuclear industry should communicate with the public, participants were most interested in information that was directly relevant to them, such as energy supply, their energy bills and the local economy. However, older participants associated nuclear power with negative past experiences while younger participants were keen to understand the economic impact.[81]

Learnings from public dialogues repeatedly show that participants engage best if the topics are framed to be directly relevant to their lives i.e. on a consumer level as opposed to a service provision level.[82] [83] [84] Though other suggestions are that issues should be framed in terms of public concern,[85] and mass action towards solving big problems.

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Engagement needs to be meaningful

Meaningful engagement was raised throughout the research, highlighting expectations around clarity of purpose, transparency and accountability for acting.[86] [87] [88] Several interviewees felt engagement should be embedded, rather than hosting a 'one-off' or 'bolt-on' public dialogue. Whilst all engagement can be argued as meaningful, public dialogues can be highly meaningful processes where participants can change the framing of the discussion through an iterative process. This is not true of surveys, discussion groups or consultation. Whilst a one-off public dialogue is inherently meaningful in this sense, an ongoing and embedded engagement approach is seen to be more valuable in that it can retain and grow engagement over a long period of time over a wide range of topics.

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Survey questionnaire

As part of this research, we conducted a telephone survey with a representative sample of 1,031 adults aged 18+ across the United Kingdom. Research was conducting using Ipsos MORI's telephone Omnibus (CATIBUS) between 17th – 26th April 2020.

Survey script

These questions are about your views on scientific research related to the natural environment and human health. They are being conducted on behalf of the Natural Environment Research Council, the UK's largest public funder of environmental science, delivered through universities and research centres. The Natural Environment Research Council want to understand what environmental issues are most important to you, and your views on the inclusion of public opinion in its work.

Q1. The Natural Environment Research Council is responsible for distributing public money to scientists. Who do you think it is most important the Natural Environment Research Council listens to when deciding what research to fund? Please select up to two from the following:

1. Scientists and researchers

2. Government policy makers

3. The public

4. Campaigning charities

5. Business and industry

6. Don't know [DO NOT READ OUT]

Q2. The Natural Environment Research Council uses a range of methods to try and involve the public in decisions about science funding. There are lots of reasons why they do this. Which, if any, of the following do you think is the main reason that the public should be engaged in research decisions? The public should be engaged in research decisions because…

1. … scientific research affects people's lives

2. … public money is being spent

3. … the public bring a different and fresh perspective

4. … it opens up science to the public

5. … I don't think the public should be engaged in research decisions – FIX

6. A different reason that I've not read out [please specify] - FIX

7. None of these [DO NOT READ OUT]

8. Don't know [DO NOT READ OUT]

Q3. The Natural Environment Research Council is interested in understanding the public's priorities for research on the environment and health. What's most important to you when you think about the environment and your health? [OPEN QUESTION]

Q4. Which, if either, of the following statements comes closest to your views?

1. It is most important for scientists and researchers to focus on how to protect and improve our natural environment

2. It is most important for scientists and researchers to focus on the relationship between the natural environment and human health and wellbeing

3. Neither [DO NOT READ OUT]

4. Don't know [DO NOT READ OUT]

Q5. The Natural Environment Research council has limited public funds to allocate and needs to make decisions about what to prioritise in research. Thinking about issues that affect people in this country rather than globally….How important, if at all, do you think it is that scientists and researchers focus….

ROWS

1. ….on ways to protect or improve the natural environment?

2. ….on the impact climate change could have on health and wellbeing?

3. ….on the impact of the availability and quality of green and blue spaces (such as parks, woodlands, rivers and the sea) in communities?

4. ….on the impact the natural environment can have on physical health and mental health?

COLUMNS

1. Very important

2. Fairly important

3. Not very important

4. Not at all important

5. Don't know [DO NOT READ OUT]

Q9. Still thinking about issues that affect people in this country rather than globally….Which, if any, of the following issues do you think is most important for scientists and researchers to explore?

1. the impact the natural environment can have on physical health and mental health

2. the impact of the availability and quality of green and blue spaces in communities

3. the impact climate change could have on health and wellbeing

4. ways to improve and protect the natural environment

5. Something else [Please specify]

6. Don't know [DO NOT READ OUT]

Q10. Why did you feel that (INSERT ANSWER FROM Q9) was the most important issue? [OPEN QUESTION]

Q11. When thinking about ways to protect and improve the natural environment, which, if any, of the following issues do you think it is most important that scientists and researchers focus on?

1. Pollution of air and water

2. Conservation of the natural environment

3. Healthy soil

4. Preventing natural hazards like floods

5. None of the above [DO NOT READ OUT]

6. Don't know [DO NOT READ OUT]

Q12. Which, if either, of the following statements comes closest to your view? When it comes to scientific research on the environment and human health, The Natural Environment Research Council should prioritise funding research which relates to…

1. …Issues affecting people in this country right now

2. …Wider issues which could affect people globally in the future

3. …Neither [DO NOT READ OUT]

4. …Don't know [DO NOT READ OUT]

Q13. The Natural Environment Research Council is planning to ask members of the public to come together in the future to discuss the research it funds on the issues we've just been talking about. I would like you to imagine you have been invited to participate in this discussion. How confident, if at all, would you feel about sharing your views in a face to face discussion with others?

1. Very confident

2. Fairly confident

3. Not very confident

4. Not at all confident

5. Don't know [DO NOT READ OUT]

Q14. How confident, if at all, would you feel about sharing your views in an online discussion with others?

1. Very confident

2. Fairly confident

3. Not very confident

4. Not at all confident

5. Don't know [DO NOT READ OUT]

[ASK ALL WHO ARE FAIRLY, NOT VERY OR NOT AT ALL CONFIDENT ABOUT SHARING THEIR VIEWS FACE-TO-FACE OR ONLINE AT Q14 OR Q15 CODES 2-4]

Q15. What would help you feel more confident about sharing your views in a face-to-face/online discussion? [OPEN QUESTION]

Q16. Please continue to imagine you have been invited to contribute in a face-to-face or online this discussion. Who would you most like to hear from to introduce the topic to you?

1. Someone unconnected to research in this area

2. Someone from a campaigning charity

3. Someone involved in government policy making

4. A scientist who works on the issue

5. Someone else [please specify]

6. Don't know [DO NOT READ OUT]

Q17. How would you prefer to receive information about the topic being discussed?

1. Verbal presentation

2. Video content

3. Written information

4. Through an interactive website

5. In another way [please specify]

6. Don't know [DO NOT READ OUT]

Q18. The discussion might take place entirely online. How confident, if at all, would you be participating in video or telephone conferencing where you can see and/or hear other participants and discuss your views?

1. Very confident

2. Fairly confident

3. Not very confident

4. Not at all confident

5. Don't know [DO NOT READ OUT]

Q19. How confident, if at all, do you feel you would be participating in online chat rooms where you type your views during a live discussion?

1. Very confident

2. Fairly confident

3. Not very confident

4. Not at all confident

5. Don't know [DO NOT READ OUT]

Q20. How confident, if at all, would you be participating in giving feedback on documents and presentations through a website in your own time?

1. Very confident

2. Fairly confident

3. Not very confident

4. Not at all confident

5. Don't know [DO NOT READ OUT]

Q21. There might be a lot of information to digest during the online discussion. Would you prefer to…

1. …have a few long discussions over several days

2. …have lots of shorter discussions over several weeks

3. Don't know [DO NOT READ OUT]

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Virtual roundtable attendees

The list below outlines the organisations represented by the 36 attendees at the virtual roundtable.

- Arts and Humanities Research Council

- British Science Association

- Department for Business, Energy & Industrial Strategy

- Department for Environment, Food & Rural Affairs

- Economic and Social Research Council

- Eden Project

- Involve

- James Lind Alliance

- Kent University

- Medical Research Council

- National Co-ordinating Centre for Public Engagement

- Natural Environment Research Council

- Natura History Museum

- Sciencewise

- UK100

- UK Research and Innovation

- University College London

- University of Bath

- University of Exeter

- University of Northumbria

- University of Southampton

- University of York

- Wellcome Trust

Ipsos MORI's standards and accreditations

Ipsos MORI's standards and accreditations provide our clients with the peace of mind that they can always depend on us to deliver reliable, sustainable findings. Our focus on quality and continuous improvement means we have embedded a 'right first time' approach throughout our organisation.

ISO 20252

This is the international market research specific standard that supersedes BS 7911/MRQSA and incorporates IQCS (Interviewer Quality Control Scheme). It covers the five stages of a Market Research project. Ipsos MORI was the first company in the world to gain this accreditation.

ISO 27001

This is the international standard for information security designed to ensure the selection of adequate and proportionate security controls. Ipsos MORI was the first research company in the UK to be awarded this in August 2008.

ISO 9001

This is the international general company standard with a focus on continual improvement through quality management systems. In 1994, we became one of the early adopters of the ISO 9001 business standard.

Market Research Society (MRS) Company Partnership

By being an MRS Company Partner, Ipsos MORI endorses and supports the core MRS brand values of professionalism, research excellence and business effectiveness, and commits to comply with the MRS Code of Conduct throughout the organisation.

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Ipsos MORI Public Affairs works closely with national governments, local public services and the not-for-profit sector. Its c.200 research staff focus on public service and policy issues. Each has expertise in a particular part of the public sector, ensuring we have a detailed understanding of specific sectors and policy challenges. Combined with our methods and communications expertise, this helps ensure that our research makes a difference for decision makers and communities.

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