Public trust in science-for-policymaking:

Understanding and enhancing the role of science in public policy debate in the UK

The British Academy

Report to the Prime Minister's Council for Science and Technology from the British Academy

March 2024

Preface

The British Academy is the UK's national academy for the humanities and social sciences. We mobilise these disciplines to understand the world and to shape a brighter future.

In early 2022, the Prime Minister's Council for Science and Technology, the main science advisory body to the Prime Minister, commissioned an independent review from the British Academy of science and public trust within the policymaking system. The following report sets out the initial findings of our review and distils its main implications.

Contents

Executive summary

Overview

Science increasingly plays a central role in public debates on policy, as starkly exposed during the Covid-19 pandemic. The pandemic highlighted significant challenges around the use and communication of science in policymaking, as well as varying levels of public trust in the rigour and relevance of scientific findings. While the case of Covid-19 may represent an outlier in terms of its public salience, it does raise key questions about trust in the science informing policymaking – making it vital to understand the factors influencing public interest and trust in science-for-policy.

Clearly, scientific knowledge – understood in the broad sense to capture new knowledge produced across all disciplines – is one of many forms of knowledge and information that need to inform policymaking and debate. But such knowledge is crucial in guiding decisions, especially in areas of complexity and risk. Public interest and trust in science-for-policy is therefore vital for the health of public policy debate. Where science is a key factor in policymaking, the evidence it generates can help foster better deliberation on policy. And where publics recognise the value of such science in policymaking, they will expect science to play a more central role, making the rigorous use of science key to the accountability of public policy.

This independent report sets out findings and initial recommendations across two main areas:

- Understanding the conditions under which the public view science as relevant and trustworthy in policymaking.
- Exploring what policymakers, researchers and knowledge brokers can do to enhance the role of science in public policy debate in the UK.

Key Insights:

1. Policymakers (both elected and unelected) play a central role in framing policy and the place of science in informing it.
2. In exercising this role, they should not underestimate the public's desire for nuance and transparency in the use of science-for-policy. Policymakers should:
    - Be open where there are uncertainties, while indicating how knowledge gaps will be addressed
    - Recognise that more information will not in itself increase trust in the use of science for policy
    - Avoid a simple 'follow the science' approach, instead acknowledging the diversity of considerations and evidence, including lived experience, shaping policy development
3. Policymakers, researchers and knowledge brokers should deepen their engagement with different publics to build trust in science. This should be done in a way that preserves the integrity and independence of the scientific process. Clearer principles should be developed to ensure transparency and accountability in both science-policy and science-public engagement.

These insights are underpinned by an extensive body of existing research and expertise brought together in this report and supplemented by two projects commissioned by the Academy. While many of the findings are familiar, to date they have not been systematically acted upon. The report provides a robust evidence base for developing a set of broad recommendations for policymakers, researchers and knowledge brokers. In a next step, the Academy will work in close collaboration with a range of partners to further elaborate practical measures for enhancing public interest and trust in science-for-policymaking

Findings

The report builds on existing studies, supplemented by two newly commissioned research projects. The commissioned research focused on three case studies: genetic modification, clean air zones and mpox (or monkeypox). The analysis deployed a range of methods including semi-structured interviews, natural language processing of social media, and experimental surveys. The emerging findings were stress-tested and contextualised through a series of events with a wider community of researchers, policymakers and science brokers, and finally synthesised by an expert Working Group.

The analysis identified four sets of factors that influence public perspectives of the relevance and trustworthiness of science-for-policy, discussed in turn below: features of the policy area and how it is framed; the types of scientific sources invoked in policy debate; how science-for-policymaking is communicated and brokered; and underlying attitudes amongst different members of the public.

1. Features of the policy area and how it is framed

- **Framing and science-for-policymaking.** Policymakers play an important role in 'framing' policy issues: determining which dimensions of an issue are foregrounded and which are regarded as less central, as well as how they are linked to potential policy solutions. Framing will influence how far scientific evidence is seen as relevant to policy deliberation. This means that policymakers can be instrumental in influencing the extent to which relevant, robust scientific findings are invoked in political debate.
- **Windows of opportunity.** Policymakers have most influence in shaping these frames early on in the process of problem definition – when policy problems first surface or resurface, and potential solutions are being debated. Over the course of the policy cycle, frames can become entrenched, meaning that there is less potential to influence framing after the initial stage of problem definition.
- **Science, values and interests.** When invoking science, policymakers need to avoid marginalising or crowding out value- and interest-based considerations, or other types of (experiential or lay) knowledge. They should not simply signal that they are 'following the science', but need to communicate how they have factored in scientific evidence in combination with a range of other considerations. Failure to do so risks publics simply discounting scientific evidence, as it does not resonate with their concerns and experiences.
- **Selective use of science.** There is a risk that highly selective use of science to support value- and interest-based positions may undermine the authority of science. Members of the public are more likely to trust science-informed policy where the evidence base, and its limitations, are set out as clearly as possible – even if this may appear less 'persuasive' than a more selective approach.

2. Types of scientific sources invoked in policy debate

- **Trust in scientific sources.** Policymakers and science communicators should be aware of different levels of trust in scientific sources across different policy areas. For example, our survey research found that on issues with location-specific implications (such as

clean air zones), local scientific work elicited greater support than findings emerging from overseas science bodies. This is consistent with wider evidence showing the importance of local knowledge systems.

- **Citizen engagement.** Public engagement in science-for-policymaking has the potential to generate greater levels of public trust. However, the effects are context-dependent and there is a need for nuanced analysis and systematic evaluation. (For further discussion, see Defra Social Science Expert Group, 2022)
- **Science and polarisation.** The evidence also identified cases where scientific findings from distinct fields were marshalled by different protagonists in highly selective and sometimes distorting ways. This may increase harmful polarisation, with participants speaking past one another. Researchers and science funders can play a role in helping reduce such polarisation through encouraging engagement across disciplines.

3. How science-for-policymaking is communicated and brokered

- **Acknowledging uncertainty.** When drawing on science in policy debate, policymakers and science communicators should acknowledge uncertainties in evidence and gaps in knowledge. Policymakers should invoke scientific findings with 'authority', setting out transparently how a body of evidence has been marshalled and used; but not in an 'authoritarian' way that invokes science in a simplistic or selective manner. They should also communicate clearly how gaps in knowledge will be addressed.
- **Communication and relatability.** There has been a clear shift in styles of science communication over the past decade, including the growing influence of communicators with a 'relatable' profile that is considered trustworthy by many members of the public. However, there are risks in grounding trust in a set of characteristics not related to the quality of the science, highlighting the need for those with scientific qualifications to learn, adapt and improve appropriately the accessibility of their engagement and communication.

4. Underlying attitudes amongst different members of the public

- **Avoiding the 'deficit' model.** Simply providing more evidence is unlikely to shift attitudes, especially where strong values are guiding public beliefs. A large body of evidence indicates that people's minds cannot simply be changed by providing more information.
- **Underlying trust in politics.** Underlying dispositions (especially around trust in politics) are strong predictors of public trust in science being invoked in political deliberation and in justifying decisions.
- **Confirmation bias.** There is strong evidence that individuals process information in a biased way, for example being more responsive to information that reinforces pre-existing beliefs. This form of confirmation bias is likely to be especially pronounced when people (not just publics) have strong attachment to particular positions (for example, on issues with high salience or emotional significance for them).

Implications: Grounding Trust in Science-for-Policy

The report sets out wider reflections that need to inform the use and communication of science in political debate, with fuller details of how to do this covered in detail in the main body.

- **Mistrust in politics and the risk of spillover to science.** Where publics are mistrustful of politics, this can spill over into scepticism about scientific findings used to justify policy. Where this occurs, science can lose its authority and traction as a resource for informing policymaking. Thus it is important to ensure that science is invoked in ways that augment trust in policymaking – rather than mistrust in policymaking undermining the authority of science.

- **Strengthening the transparency of science.** One way of augmenting public trust is to ensure that researchers and the scientific process are more accessible, transparent and familiar to everyone, instilling a sense of shared public 'ownership' of, and a critical faculty about, evidence generated. At the same time, researchers and science communicators should build better understanding of, and ways of factoring in, public priorities and concerns about policy issues relevant to science.
- **Protecting scientific independence.** Whilst emphasising the importance of transparency in science, it is also important to protect its independence and integrity. This is essential for building trust in the longer-term. Science is underpinned by a distinct set of processes and goals, which are not the same as those driving the political and policymaking process. While scientists are clearly influenced by values and interests, the scientific process is designed to protect the rigour and integrity of scientific knowledge.
- **Retaining a distinction between the logics and processes animating politics, policymaking and science.** While science is a crucial resource for informing policymaking and enhancing the legitimacy of policy decisions, there needs to be a clear differentiation between the logics and processes animating politics and science. Politics is – quite rightly – oriented towards mobilising public support for rival policy agendas. Science, by contrast, is oriented towards the production of knowledge. This creates the need for distinct checks, safeguards and forms of accountability. It is crucial that this distinction is made clear when policymakers and politicians invoke science to support policy decisions.

Ten considerations

We identified ten broad considerations for policymakers, researchers and science brokers to strengthen public interest and trust in science-for-policymaking. These considerations will be elaborated into more specific recommendations, in partnership with the science-for-policymaking ecosystem, as the next step of the British Academy's programme of work in this area.

For public officials and policy advisors:

1. Seek to invoke science early on in the framing process, to influence the extent to which scientific findings are part of political debate and policy development. Good examples of this include the case of mpox, which has built on many of the lessons learned through the Covid-19 pandemic response, and there are many examples from environmental policy, including the clean air zones case study this project explored.

2. Avoid an approach that simply 'follows the science', as was communicated at various points of the Covid-19 crisis. Make clear how scientific evidence has been integrated with a range of other considerations.

3. Promote transparency in how evidence is used, including through development of a shared transparency framework, for example as proposed in the evidence transparency framework campaign led by Sense about Science and the Institute for Government.

4. Acknowledge uncertainty and ambiguity, and if evidence is used selectively, explain why. Clarify the quality of evidence which is being used and how gaps in knowledge will be addressed.

5. Protect and sustain scientific integrity and independence in the way that science is marshalled in policymaking. This means ensuring advisory bodies retain independence, that their composition and deliberations are transparent as far as possible, but equally that they are not directly responsible for policy decisions.

For researchers and knowledge brokers:

6. Where research addresses contested policy issues, ensure sensitivity to different perspectives in communicating your findings. This may require bringing in appropriate expertise about public perspectives and public engagement. The new public engagement 'Observatories' are helpfully mapping and facilitating further engagement on key issues.

7. Play an active role in helping frame policy issues early on in the debate, clarifying the role of science in understanding and addressing policy challenges. Good examples are the UK Biobank or the Nuffield Council on Bioethics which have sought to anticipate important developments in the biosciences.

For all engaged in the science-for-policymaking system:

8. Avoid the 'information deficit model': simply providing more evidence is unlikely to shift people's views. A clear example is the unsuccessful attempt to induce acceptance of Genetically Modified (GM) food by focusing solely on 'informing' the public about the scientific evidence without taking account of the wider reasons for scepticism.

9. Recognise and respect the role of local perspectives and knowledge, especially on issues with highly localised implications (such as clean air zones) – and seek to integrate such local knowledge with other forms of scientific evidence.

10. Avoid contributing to polarisation: explicitly valuing and bringing together different disciplinary communities can help ensure scientific findings are integrated. An integrated evidence base across scientific disciplines can be more robust and strengthen trust in science-for-policy. This is relevant to both publicly funded, challenge-oriented research programmes, and advisory committees established by government.

1. Introduction

Science, used in the broadest sense of the term,[2] is invoked to inform policy decisions throughout the policy process – from the identification and mapping of policy problems, through to weighing up different responses, and assessing the efficacy and impact of policy interventions. Science also plays a key role in public debates on policy, as evident in discussions on complex global challenges such as responding to the Covid-19 pandemic, genetic modification, regulating generative AI, or mitigating global warming.

The prominence of science in policy deliberation makes it crucial to understand when and why people trust the science informing policy. When and why do people consider science to be relevant to informing policy? And what factors are likely to ground public trust in science for policymaking, across different types of policy issues?[3]

We suggest that these questions are important for the health of public debate and accountability. Where science is a key factor in policymaking, the evidence bases it generates can help foster critical deliberation on policy, potentially enhancing the accountability of policymaking. Conversely, where people do not trust science or see it as relevant to policy, this in turn may weaken the ability of policymakers to make the best use of science, potentially impacting the outcomes of policy choices.

The question of public trust and regard for science-for-policymaking has become more urgent, given the widely charted decline in trust in politicians and political institutions (IPSOS, 2022; Duffy *et al*., 2023). Although trust in science and scientists in general is relatively high (Smith and Jensen, 2016; Dommett and Pearce, 2019; IPSOS, 2022; Seyd, Jennings and Hamm, 2022), this abstract trust is not necessarily carried over into trust in science when it is deployed to inform policy. Indeed, there is a risk that declining trust in political institutions can 'spill over' to affect trust in science (Brown, 2015; Gundersen *et al*., 2022), especially where science is mobilised in contentious and polarised political debates (Weingart, 1999).

This report seeks to shed light on the conditions under which publics trust science and view it as relevant in policymaking. Based on this, it then explores what researchers, knowledge brokers and policymakers can do to enhance the role of science in public policy debates, focusing on levers that can be used by government.

The report is structured in 5 main sections. After an overview of the approach (Section 2: Scope and design) and an introduction to the case studies (Section 3: Case study overview), the report explores the conditions influencing public trust in science for policymaking (Section 4: Conditions) and the implications of these insights (Section 5: Implications). The report concludes with ten considerations arising from this review for those engaged in any aspect of the science-for-policymaking system, including policymakers, researchers and science brokers. Overviews of the two research projects that fed into this report are given in the Annexes while their detailed findings are published separately.

2. Scope and design

The relationship between public trust, science and policy has been the subject of extensive study and analysis over recent decades, much of which has been synthesised and presented through reports the British Academy has been involved with.[4] We have not attempted to rearticulate all of this analysis here and refer the reader throughout to literature and evidence which goes into greater depth on specific points. We also drew on existing evidence to inform the design and approach of this project. In this section, we set out some of our key assumptions and focus, and outline the methods used.

Starting points

Underpinning the project is a set of working assumptions about the value of public engagement with science as part of the policy process. Firstly, we assume that public engagement with science-for-policymaking is likely to improve the quality and accountability of public debate and policymaking. In this sense, there is no necessary trade-off between technocratic, science-informed policy, and more inclusive and participatory modes of policymaking. Instead, the two can be mutually reinforcing: where publics recognise the various uses of science in policymaking, they may come to expect and demand that science play such a role, potentially making the rigorous use of science key to the legitimacy and accountability of public policy. We explore this mechanism further through the report.

Secondly, we recognise that policy is shaped by a range of different types of knowledge and values. Robust and responsible science is one type of knowledge, which is particularly important in guiding decisions in areas of complexity and risk. One of the considerations in this report, therefore, is when and how science can be marshalled in a policy debate which also invokes strong interests and values, and where non-scientific knowledge is used alongside or is in tension with science.

Finally, given its focus on the *relationships between* science, publics and policy, the report does not examine the issue of trustworthiness of science in itself. Large areas of scientific enquiry – especially what is termed 'fundamental' or 'blue skies' research – do not have direct implications for policy (or at least not in the immediate term). Issues of trust are most likely to arise where scientific evidence is marshalled to inform decisions affecting people's lives. Thus our focus is on perceptions of the relevance and trustworthiness of science *when used to inform public policy.* However, we do touch on wider debates on responsible science and research integrity in Section 5.

Policy focus

Science is not invoked in public debates on all areas of policy, so we need to be clear about which types of policy debate we are focusing on. We focus on policy areas that display two features:

a. **The issue is contested in public debate,** implying it is the object of party political and/or interest group contestation and media coverage (including social media).

b. **Science is considered as relevant to informing** this contested debate, implying that it is deemed helpful in shaping policy responses – even if it is not necessarily invoked by all participants in the debate, or it is invoked in a tokenistic way.

It is in these contexts that it becomes particularly important to ensure that scientific advice is a relevant and trustworthy resource for guiding policymaking – noting, of course, that science will be just one input into public deliberation, alongside other forms of knowledge, values and interests.

Definitions

The report focuses on the three-way relationship between science, publics, and policy (see Figure 1) that comprise the science-for-policymaking system.

- **Policy ←→ Science**: Policymakers draw on science to inform their decisions (science advice), and also shape science through regulation and funding (science policy).
- **Policy ←→ Publics**: Policymakers communicate how they have used science to their voters, or publics (political communication), and they are guided by the public in how they prioritise and take decisions on policy issues (public opinion).
- **Publics ←→ Science**: Publics engage with science through the media and other forms of engagement (science communication), and they also feed into scientific research and findings through various mechanisms including citizen science and consultation (public engagement with science).

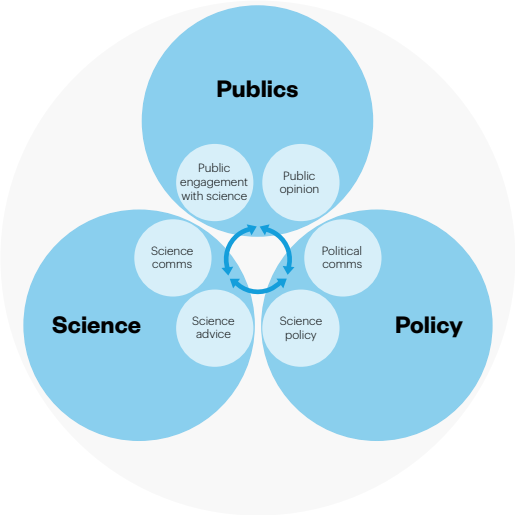

Figure 1: Simplified graphic illustrating the relationships between science, publics and policy.

This (inevitably simplified) schema helps define the focus of this report. We are most concerned with how the use of science-for-policymaking, political communication, science communication, and public engagement with science, influence public perspectives on the relevance and trustworthiness of science.

We also need to be clear about how we are using key terms in the report.

Science is used in a broad sense to describe research drawn from across all disciplines. Science involves the production of new knowledge using validated processes and methods.

Science-for-policymaking is shorthand for the set of methods, insights and findings produced by researchers that are invoked as (potentially) relevant to policymaking.[5]

The report uses this term to highlight the focus on science that is used in policymaking as opposed to science that has other purposes. We also refer to the *science-for-policymaking community* which comprises the researchers, science communicators, knowledge brokers, public servants and science funders who have a role in enabling, producing, communicating and deploying science-for-policymakers.

Policymakers refers to those directly involved in formulating policy. Within this group, we can distinguish between elected representatives (in the legislature and in government), whom we refer to as 'politicians'; and civil servants and senior advisors (scientific or otherwise), whom we refer to as 'officials'. Each of these groupings will use evidence, but they may invoke it or consider it at different stages or in different ways, and so attention to this nuance in who is using evidence in the science-for-policymaking system, and when, is important. We try to carefully distinguish which type of policymaker we are referring to throughout this report.

Public policy denotes the ideas, plans and programmes advanced by government to address societal challenges, which are adopted and implemented as collectively binding decisions.

The report uses the term *policymaking* or the *policy process* or *cycle* to indicate three stages of this process: issue definition, debate and decision, and implementation. Meanwhile, *politics* and *political debate* are understood as the process through which political parties and interested parties (including scientists, but other actors as well) mobilise public support for different policies.

Publics refers to the plurality of groups of people with varying levels of interest and involvement in an issue. There is no singular 'public'; rather, there are many different groupings, some stable, some shifting. Publics have become more fragmented and ways of engaging with them have multiplied (Defra Social Science Expert Group, 2022), making it important to differentiate specific 'publics' rather than treating people as a homogenous group. The adjective, *public*, is still used in the report to distinguish activities that concern or affect publics, such as public health.

Trust can be defined as a willingness to endow authority or responsibility in others to act on our behalf (Shapiro, 1987). Following recent work from the PERITIA project, which builds itself on previous British Academy work on *'Truth, Trust and Expertise'* (The British Academy and ALLEA, 2019), the report is most concerned with 'epistemic trust', defined as 'willingness to believe in, and to act on, the accuracy or truth of information provided' (Gundersen *et al.*, 2022). Throughout the report, when discussing trust in science we further distinguish between trust in particular scientific claims, trust in the system of sciences more generally, and trust in the conduct and motivations of scientists.

Trustworthiness refers to features of truth claims or conduct that warrant the trust of different stakeholders (O'Neill, 2018).

Trust in policymakers is typically grounded in confidence in their motivations, competence and conduct. Trust in science tends to be grounded in the perceived rigour of the scientific process, its political independence and the qualifications and competence of scientists, but may also hinge on confidence in the individual characteristics and motivations of those individuals.

Methods

The project was led by a small working group of experts who continuously reviewed, analysed and scrutinised the evidence emerging over a 12-month period. Early on in the project, the working group drew on existing literature and insights to scope and define the focus of the project. In collaboration with the commissioned project teams, we identified four sets of conditions, or dimensions, that were most important in influencing the relevance and trustworthiness of science-for-policymaking (see Figure 2 and further detail in Annex 1. Research design).

1. The **features of the policy area,** including how it is framed.
2. The **types of scientific sources** invoked in policy debate.
3. **How science-for-policymaking is communicated and brokered.**
4. **Underlying attitudes** amongst different members of the public.

These conditions provided a foundation for the commissioned research projects and stakeholder workshops.

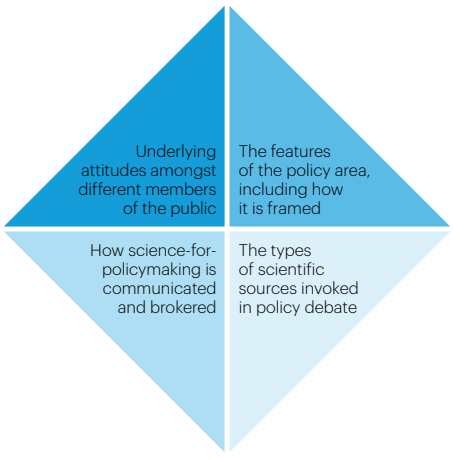

Figure 2: Graphic illustrating the four dimensions linking science, publics and policy that structure this report.

The first commissioned research project (see detailed methodologies in Annex 2.A) comprised three elements: evidence synthesis and literature review; comparative case study analysis using digital methods to analyse social media; and science communication experiments to evaluate different approaches. The second commissioned research project (see Annex 2.B) was a quantitative study comprising two elements: analysis of a large corpus of relevant text using natural language processing tools; and a series of conjoint experiments embedded in a nationally representative survey of UK residents. Both projects used three case studies as a lens to explore the research questions: genetic modification, clean air zones and mpox (previously known as monkeypox) (see Case study overview for details).

The Working Group drew on the project findings, alongside the existing literature, key reports, and the Group's own expertise on these questions. In addition, we drew on extensive consultation with the sector, in the form of a series of workshops and roundtables. These various sources were triangulated and integrated to produce the analysis and findings in this report. The reader is encouraged to refer to the independently published reports from the two research projects and the references to wider bodies of evidence and literature on which the Working Group regularly drew upon in its deliberations.

Before exploring the findings in detail, however, we summarise the case studies which were examined by the commissioned research.

3. Case study overview

The commissioned researchers selected three case studies in consultation with the project working group that display different degrees of political contestation, as well as divergence in the type of science being invoked in political debate, and in the ways it was invoked. Comparative analysis of the cases thus provides a useful framework for teasing out the relative role of these factors in shaping public perceptions of science-for-policymaking. It should be stressed that there is already an extensive body of literature on each of these case studies in addition to the broader literature on the topic of trust, science and policymaking and to which we refer throughout. The commissioned research builds on this broader and case study-specific literature, but provides an opportunity to focus more specifically on exploring the hypotheses set out earlier, and on leveraging insights through comparative analysis across the three selected cases.

Here we briefly introduce each case study, highlighting the features that relate to the four dimensions that structure the findings (see Conditions below). We note that this short summary is necessarily compressed and cannot hope to do justice to the complexity of each case. Further reference to the case studies is made throughout the report, and more detailed and nuanced analysis can be found in the two full project reports, published independently of this review (Horvath and Mabbett, 2023; Oliver and Pearce, 2023).

Case study 1 summary: genetic modification (GM)

The policy debate on genetic modification has been ongoing since the 1980s and has shifted over time. It is currently focused on food and framed around increasing shortages due to global conflicts and climate change, such as breeding plants for drought resistance. It draws on evidence from biological sciences around safety and transmissibility of genetic material between organisms, which is the object of some scientific consensus in the field. Other scientific (including social-scientific) questions in the debate focus on biodiversity in relation to pesticide use and gene transmissibility, corporate ownership of intellectual property, economic control of food chain systems, livelihoods and environmental protection. Despite the relative consensus around scientific knowledge about safety of ingesting and growing GMOS, public debate is shaped by a values-driven debate around the role of GM in food security, as well as the influence of corporate power. The messengers tend to be government (via consultations), environmental activist groups, and individuals sharing information. Narratives focus on themes of choice and agency, or pollution, purity and ‘naturalness’, as well as corporate behaviour and responsibility.

Case study 2 summary: clean air zones

Clean air zones were proposed in the UK in 2008 to address the policy problem of worsening air quality, particularly in urban areas. The policy instruments proposed have predominantly been road traffic control measures. The policy framing is contested, with different participants linking the issue to divergent policy challenges such as: air quality, net zero, obesity levels, or cost-of-living. In terms of the underpinning science, there is robust evidence showing that reduction in traffic improves air quality; while economic evidence emphasised by governments highlights improved high-street economies. However, many participants focus on value- or interest-driven arguments, including some of the socio-economic and distributive impacts of such policies. These debates can often be seen as ‘crowding out’ science, but this is to misinterpret the role of framing and the types of evidence bases brought out in these policy debates. The messengers tend to be public health organisations, which emphasise the air

quality case, and link this to individual cases such as Ella Adoo-Kissi-Debrah.[6] Local individuals also act as messengers presenting experiential claims. Narratives tend to focus on the lack of responsibility – that is the impinging of personal freedoms and choices; the unfairly distributed negative effects of the policy; and disputing the economic benefits.

Case study 3 summary: mpox (formerly known as monkeypox)

Mpox is framed technically as a pathogen exhibiting new transmission behaviours and significantly infecting men who have sex with men. The first human case was reported in 1970 in the Democratic Republic of the Congo. The UK policy response relates to the outbreak in 2022 that affected a range of previously unaffected countries, including the UK. Compared to the other two policy areas, public debate is less salient and contested. The nature of the evidence base reflects initial uncertainty around transmissibility, but high certainty of the effectiveness of the policy response. Evidence is drawn from epidemiological data, experiential data (shared over social media) and professional expert judgement and advice. The messengers included policy advisers such as the WHO (World Health Organisation), social media 'medfluencers', journalists (often highlighting stigmatisation or victim blaming factors). Public interest narratives around mpox tended to concentrate in specific communities (although not those clinically most at risk); parallels were drawn with HIV (referring to shaming and exceptionalism); and some narratives were characterised by a division between collective action and freedom of choice.

4. Conditions

This chapter distils findings about the conditions under which the public view science as relevant and trustworthy in policymaking. These conditions are grouped across four dimensions that influence public perspectives: features of the policy area, including how it is framed; the types of scientific sources invoked in debate; how science-for-policymaking is communicated and brokered; and underlying attitudes amongst different members of the public (see Methods). Although presented separately, the conditions need to be considered both individually and as mutually dependent parts of a wider system.

Dimension 1: Features of the policy area, including how it is framed

Two aspects of the policy issue are particularly important in influencing how members of the public view science in policymaking: the way the issue is framed; and the degree and nature of contestation on the issue. The body of evidence on these aspects, as well as the project's commissioned research, shows that policymakers can have a considerable influence on framing, and thus how science is invoked in debates. There is a particular window of opportunity for influencing framing in the initial stages of problem definition, as new issues are identified in political debate. We also argue that in highly contested policy areas, it is important to avoid marshalling scientific evidence in an overly selective way, or doing so in a way that crowds out important values and interests.

Condition 1.1: Framing of the issue

The wider literature has for many decades called attention to the importance of framing in shaping the role of science in public debate (Rein and Schön, 1991; Schön and Rein, 1994; Hajer, 2003; Science Advice for Policy by European Academies, 2019). Framing refers to the selection and presentation of different dimensions of an issue, in a way that promotes particular problem definitions and solutions and excludes others (Entman, 1993). For example, rising energy prices could be framed in terms of geopolitical threats, welfare and social inequality, or inadequate infrastructure and technology.

Framing is not immutable or fixed, but is subject to change over time, and can be influenced by policymakers or the actions of intermediary organisations and institutions, including scientists, civil society and the media (Kingdon, 1984). Framing is likely to be especially volatile in the early stages of issue definition, when new policy problems are first identified or where it resurfaces – for example, through a crisis, or a report setting out new evidence. Following this issue definition phase, how a policy is framed (or reframed) has important implications for which types of policies are then adopted, and which policy communities and publics participate in debate (Baumgartner and Jones, 2010).

In the context of this report, the relationship between two types of framing are relevant: science-led framings; and values or interest-led framings. Science-led framing refers to definitions of issues that emphasise the importance of scientific knowledge in understanding the problem and identifying solutions. Value- or interest-led framings define the policy as revolving mainly around issues such as fairness, propriety, or how costs and benefits are allocated across different groups.

In reality, no issue is ever defined solely as value or interest-led, or science-led: all policy issues will invoke some values and interests, and it is difficult to conceive of an issue that does not require some kind of specialised or scientific knowledge to inform the definition of, or appropriate responses to the problem. However, the relative emphasis on science as a resource for helping inform policy will vary across policy areas, and over time.

The case of clean air zone policies illustrates how one policy area can be subject to different types of framing (Oliver and Pearce, 2023). Some framings of this issue are science-led: the policy is a public health measure to reduce exposure to harmful nitrous oxide pollution and other pollutants like diesel particulates; or it is part of a suite of policies to cut carbon emissions from transport. Other framings are led by values and interests: for example, presenting the policy as part of an anti-car agenda that limits personal freedoms.

Politicians and especially those in government have a key role in influencing such framing, and thus the role of science in debate. Political incumbents typically have access to extensive expert knowledge and data, through their civil service and scientific advisory groups. Politicians and policymakers are also likely to get credit for drawing on such research: the project's commissioned research on public opinion showed that governments are perceived as more competent when they are seen to be drawing on science advice (Horvath and Mabbett, 2023). This held both for members of the public who were predisposed to support the policy, and those who were against it (although the effect was larger for those who supported it).

Policymakers are most likely to have traction in influencing framing where windows of opportunity present themselves, particularly at earlier stages of problem definition or redefinition, or when fresh events or evidence challenge existing frames. At such junctures, there is more fluidity in how the issue is defined and what responses might be appropriate (Heclo, 2010; Hoppe, 2011). Those in government, in particular, will have scope to influence such framings, given public and media interest in understanding how the government plans to act. Once a particular frame has been established, it becomes more difficult to change it (although, of course, such changes can and do occur – see, for example, Hall (1993) for an account of how dominant frames might be challenged and replaced).

In sum, our findings highlight the importance of policymakers explicitly invoking relevant scientific evidence as part of how they frame issues, but doing so carefully and mindfully of the other considerations at stake, including the framings which might be invoked by political leaders. As was put by the House of Lords Science and Technology Committee in a report from 2000 (House of Lords Science and Technology Committee, 2000), 'Some issues [that are] treated by decision makers as scientific issues … involve many other factors besides science. Framing the problem wrongly by excluding moral, social, ethical and other concerns invites hostility'.[7] In all cases, invoking scientific evidence in this process may have most traction at earlier stages of problem definition (or redefinition) when there is more scope to affect how issues are framed.

Condition 1.2: The degree and nature of contestation

The discussion above points to the importance of framing. However, even for issues with science-led framings, science can be invoked in a largely tokenistic or symbolic way (Boswell, 2009). This is most likely to occur where issues are highly contested.

The project's commissioned research showed that where policy issues are more contested, debate on science-for-policymaking often takes one of two forms: science may be 'crowded out' by value- or interest-led framings, or it may be mobilised in a highly partial way.

In the first scenario (where science is crowded out), there may be recognition of the relevance of science, but value and interest-based frames may dominate discussion of policy options amongst policymakers as they develop new policy ideas. In this case, while science is seen as informing some aspects of policy, rival values and interests effectively trump such considerations, with the result that science could play a marginal role in deliberation.

The case of clean air zones offers a good example here. The commissioned research showed that many participants in the debate looked beyond the science in favour of other kinds of knowledge such as experiential evidence (for example, local knowledge about traffic jams), in part because much of the evidence marshalled by the government was about economic benefits, but that wasn't a local concern (Oliver and Pearce, 2023). Such experiential evidence plays

an entirely valid and useful role in debate, but it can also displace other forms of knowledge, including scientific evidence that is relevant to understanding and addressing the issue. The mpox case illustrated a somewhat different variant of this, where initial evidence on the risks posed by the disease (for example to pregnant women) were not subsequently discussed: instead, the focus of the debate narrowed down to risks for men who have sex with men (Oliver and Pearce, 2023).[8]

In the second scenario, science may become unduly partisan, deployed as 'ammunition' to support a particular position. This may undermine the perceived objectivity and authority of science-for-policymaking (Gieryn, 1983, 1999; Weingart, 1999). This is likely to occur in science-led framings of the issue, where scientific evidence is deemed relevant to guiding decisions, but where there is also significant divergence of values or interests. A good example of this is the case of genetic modification. Supporters and critics both invoke science, but each side is invoking their 'preferred' scientific findings, linked to a distinct set of values. It is important to note that this applies across stakeholder groups, including policymakers, researchers and different coaltions of interests when findings from different types of science challenge various positions and commitments. Over time, these frames and patterns of contestation become familiar and entrenched, leading to an impasse in debate.

In sum, the findings suggest that contestation in public debate does not have a consistent effect: it may distract from science, or it may amplify and polarise competing scientific evidence, with science being marshalled in a highly selective way. The following box draws out some of the key implications of the findings discussed under this first dimension.

Implications for science advice and policymaking:

- **Framing and science-for-policymaking.** Policymakers play an important role in 'framing' policy issues: determining which dimensions of an issue are foregrounded and which are regarded as less central, as well as how they are linked to potential policy solutions. Framing will influence how far scientific evidence is seen as relevant to policy deliberation. This means that policymakers can be instrumental in influencing the extent to which relevant, robust scientific findings are invoked in political debate.
- **Windows of opportunity.** Policymakers have most influence in shaping these frames early on in the process of problem definition – when policy problems first surface or resurface, and potential solutions are being debated. Indeed, policymakers – and especially those in government - have substantial influence at this phase of agenda-setting, where government is likely to have privileged access to expert knowledge and to public attention. Over the course of the policy cycle, frames can become entrenched, meaning that there is less potential to influence them after the stage of problem definition. Policymakers thus have more scope to explicitly insert scientific considerations into policy frames at the earlier phase of problem definition.
- **Science, values and interests.** When invoking science, policymakers need to avoid marginalising or crowding out value- and interest-based considerations, or other types of (experiential or lay) knowledge. They should not simply signal that they are 'following the science', but need to communicate how they have factored in scientific evidence in combination with a range of other considerations. Failure to do so risks publics (or others, see endnote) simply discounting scientific evidence, as it does not resonate with their concerns and experiences.[9]
- **Selective use of science.** There is a risk that highly selective use of science to support value- and interest-based positions may undermine the authority of science. Members of the public are more likely to trust science-informed policy where the evidence base, and its limitations, are set out as clearly as possible – even if this may appear less 'persuasive' than a more selective approach. Thus policymakers should be cautious in how they mobilise science in policy communications, especially in areas where there are extensive gaps in knowledge (see also Dimension 3: How science-for-policymaking is communicated).

Dimension 2: Types of scientific sources invoked in policy debate

The second dimension captures how different features of science influence views of the relevance and trustworthiness of science-for-policymaking. In particular, we looked at the nature of the evidence invoked; and the degree of convergence/divergence in the types of evidence being marshalled. Both the literature and the project's commissioned research highlight how different members of the public may show varying levels of trust in different scientific sources, based on the extent to which evidence is seen as grounded in local understanding and concerns. The evidence also shows that participants may invoke distinct sources of science in debate, which can exacerbate polarisation and create a risk of participants 'talking past' each other.

Condition 2.1: The nature of evidence invoked

The nature of the scientific evidence used in policymaking, and its implications for public trust, has been much discussed and debated in the literature (see, for example, (Jasanoff, 1990, 2007; Funtowicz and Ravetz, 1993; Nowotny, Gibbons and Scott, 2001; Stirling, 2010; Owens, 2015). A key insight from this literature is that scientific evidence is itself socially constructed, and different types of scientific evidence can offer distinct answers to the same questions (Collingridge, 1982; Collingridge and Reeve, 1986). This implies that the evidence used to

inform policymaking must be broad, plural and conditional, and acknowledge divergences and tensions between different kinds of expertise. A good standard to aim at is producing 'socially robust knowledge' (Nowotny, 2003), which captures the wide range of culturally specific, locally contingent, and publicly deliberated 'knowledges' relevant to informing policy (see for example (Nowotny, Gibbons and Scott, 2001; Wynne, 2004; The British Academy and ALLEA, 2019). As we discuss later on (see Condition 3.1), members of the public frequently recognise such contingency, and the need for a diversity of types of knowledge. The wide-ranging literature on the nature of evidence which can be invoked in policymaking does suggest that where publics are able to engage with and acknowledge diverse, plural and conditional types of evidence, trust in science-for-policymaking is enhanced.

In addition to the nature of the evidence, the source of scientific evidence can influence public trust in science-for-policymaking in a number of ways. This was recently well documented by a review of public engagement practices by the Social Science Expert Group for the Department for Environment, Food and Rural Affairs in the UK (Defra Social Science Expert Group, 2022). A central insight of that review was the value of public engagement when it comes to complex issues, and in particular the value of the evidence generated from such public engagement exercises. Such evidence can play an important role in contextualising and deepening understanding of the evidence being invoked in policymaking.

Similarly, key aspects emerging from the project's commissioned research were the effect of the location and type of organisation producing the evidence. The survey research commissioned for this study (Horvath and Mabbett, 2023) has provided further empirical support for this observation where it asked respondents to consider the competence of different types of authorities who use science to inform different aspects of a policy area. The findings show that 'democratic cues', such as public consultation or 'citizen science' are strongly associated with 'local benefit', and for many are more important than 'science cues' in influencing public trust.

The survey research (Horvath and Mabbett, 2023), also found that incorporating some form of citizen science increased perceptions amongst those surveyed that science was robust, informative and benefitted local residents. The importance of public and local engagement will be further explored under Dimension 3, which analyses the role of communication in grounding trust in science-for-policymaking. Funding of research also influenced perceptions of competence. The survey research conducted for this project (Horvath and Mabbett, 2023) identified a clear preference for research funded by the UK government as opposed to research funded by industry (either the car industry in reference to clean air zones or the food industry in reference to genetic modification).

Condition 2.2: Conflicting Scientific Evidence

Where policy issues are contested, participants in debate may invoke different scientific sources to support rival positions (see Condition 1.2). The case of clean air zones offers a good example of this. Government actors frequently point to economic evidence (Bellamy and Hodgkiss, 2018; C.B.I.-Economics, 2020), while organisations supporting clean air zones tend to invoke public health and epidemiological evidence (Borrowman, 2021). By contrast, some of those opposed to the schemes focus on evidence about increased health inequities (such as the risks of displacing traffic to already poorer and busier areas). Condition 1.2 above also described the case of genetic modification, where supporters and critics tend to marshal different branches of science to support their claims.

The invocation of different scientific fields and findings can consolidate divergent positions in political debate. Participants in the debate may be drawing on distinct methods and approaches, which cannot be easily weighed up or evaluated against each other. The upshot is that meaningful policy debate may be impaired, with each side talking past the other. As we saw in Condition 1.2, the highly selective mobilisation of scientific findings may also lead to a general scepticism about the rigour of scientific evidence being invoked.

The risk of such polarisation implies the need for researchers and knowledge brokers to better integrate different approaches and methods, to avoid this silo effect when the evidence is subsequently invoked in policy debate. Interdisciplinary collaboration and evidence syntheses can encourage better engagement across disciplines, contributing to more integrated use of different scientific findings in policy debate, as well as being a way to work through the issues around framing, as discussed in Condition 1.1. One historic example of this is the emergence in the 1980s of the 'ecomodernist' frame which led to the move from sectoral control of serious pollutants to Integrated Pollution Control where the environment is treated more holistically. The shift took integrated pollution control from a bureaucratic approach to a focus on 'efficiency savings' and was achieved through integrating scientific evidence with experience, values and interests supported by evidence from the social sciences and humanities (Owens, 2015). The IPCC (Intergovernmental Panel on Climate Change) process also illustrates this point about integrated evidence bases well, providing a mechanism for drawing together multiple types of scientific evidence in a relatively open, peer-reviewed process, giving it significant political weight (De Pryck, 2021; Hulme and de Pryck, 2022).

Implications for policymaking and science advice

- **Trust in scientific sources.** Policymakers and science communicators should be aware of different levels of trust in scientific sources. This will depend in part on the policy area. For example, the commissioned survey research found that on issues with location-specific implications (such as clean air zones), local scientific work elicited greater support than evidence emerging from overseas science bodies. This is consistent with wider findings showing the importance of local knowledge systems. By contrast, industry-funded sources of knowledge may be less trusted because of public scepticism about corporate interests driving debate – indeed, surveys suggest that publics are more willing to trust scientific sources that are seen as 'independent'.
- **Citizen engagement.** Public engagement in science-for-policymaking has the potential to generate greater levels of public trust. However, the effects are context-dependent and there is a need for nuanced analysis and systematic evaluation. While the project's case study research found evidence that research involving citizen engagement could at times generate greater levels of public trust, a recent review of public engagement for Defra found that the effects of engagement on public trust are highly contextual (Defra Social Science Expert Group, 2022).
- **Science and polarisation.** The evidence considered also identified cases where distinct scientific fields (and findings) were marshalled by different protagonists selectively, to support diverging views (Owens, 2015). This may increase harmful polarisation, with participants speaking 'past' one another rather than engaging in constructive dialogue. Researchers and science funders can play a role in addressing this, through encouraging engagement across scientific disciplines, so that evidence from different disciplines is integrated rather than siloed – for example through comprehensive evidence reviews and syntheses.

Dimension 3: How science-for-policymaking is communicated

The third dimension focuses on how science is invoked and communicated in political debate. The project findings highlight the importance of being transparent about the uncertainty of science, with members of the public often expecting, and readily accommodating, such uncertainty. Evidence also points to the importance of familiarity and having a stake in local issues as a basis for building trust (Giddens, 1994). Finally, our findings point to how styles of communication, including the presentation of data and the use of visualisation can influence trust in science-for-policymaking.

Condition 3.1: Acknowledging uncertainty

A common misconception is that scientific uncertainty will contribute to mistrust in science (Kerr *et al.*, 2022).[10] It is often assumed that exposure to scientific findings that are not settled or definitive will encourage scepticism amongst publics. However, literature on social understanding of science has shown that people can be 'reflexive' about science: that is, they recognise contingency and accept that new findings may be fallible, and superseded by new evidence or shifts in scientific paradigms (Giddens, 1994). Partly because of this 'reflexive turn', in many cases people are able to accommodate and embrace such uncertainty. Indeed, different publics may be sceptical where policymakers and scientists overclaim the certainty of scientific claims.

Recent research supports this analysis, showing that the communication of uncertainty does not, in itself, affect people's trust in scientific claims (Van Der Bles *et al.*, 2020; Kerr *et al.*, 2022). Exposure to scientific uncertainty only affects trust in scientific statements where such uncertainty is linked to a disagreement or lack of consensus in science (Gustafson and Rice, 2020). In other words, whereas gaps in knowledge do not engender mistrust, a lack of agreement between scientists may do so.

Analysis of public attitudes to science during the Covid pandemic found that there is a need for more clarity on government's use of evidence, acknowledgement of gaps in knowledge, and their 'chain of reasoning' for decisions.[11] A 2022 survey by Sense About Science and Ipsos (Sense about Science, 2022a) also revealed 61% of the public think it is important the government shows all the evidence used to make important policy decisions.

The science communication experiments run as part of this project (Oliver and Pearce, 2023) confirmed these findings. The experiments indicated that transparency around the science informing policy is an important element to a policy being seen as having integrity and being trusted. The researchers emphasise that the most valued approach is incorporating the limitations of the evidence throughout a presentation of the policy options.

Moreover, the idea that scientists alone should be the ones to consider the nature of uncertainty within the evidence base has been criticised as elitist, and contrary to the principles of honesty and responsibility that are likely to ground trustworthiness. Scientists and policymakers should be transparent about gaps and limitations in knowledge, as it will reinforce the integrity of the evidence being presented. Sense About Science has characterised this approach as 'authoritative' rather than 'authoritarian' (Sense about Science, 2022b).

Finally, the workshops convened by Sense About Science showed that acknowledging uncertainty is only the first step. Policymakers also need to be proactive in communicating how they plan to address the uncertainty. People have high tolerance for uncertainty and ambiguity as long as proposals are made to find the missing evidence to fill in the knowledge gap and responsibility is taken for decisions under these conditions. All the participants at the workshops found that acknowledging uncertainty alone is not enough: in order to build public trust in science, clear communication is needed on how the limitations of the research will be addressed.

Condition 3.2: Characteristics of the messenger

Both the wider literature and the project's commissioned research highlight the importance of the messenger in building trust in science-for-policymaking. The literature review conducted for this project (Oliver and Pearce, 2023) suggests that where there is uncertainty or scepticism about the validity of different scientific claims, people use a variety of short-cuts and rules of thumb to help guide decisions on which messengers to trust.[12] One of these short-cuts is the messenger's track record: publics may infer trustworthiness from familiarity with the previous findings produced or communicated by a particular source, which were shown to be helpful or valid in the past.

Moreover, evidence suggests that local champions and opinion leaders who are familiar sources of information often build up a reputation as trusted communicators (Baycheva-Merger, 2019). A history of trustworthy communication is an important factor in increasing levels of trust, particularly face to face and regular interactions (see for example Seyd, Jennings and Hamm, (2022) who explore these issues in the context of vaccine engagement). These insights resonate with the findings set out in 2.1, which identified the role of local engagement in building trust (Horvath and Mabbett, 2023).

The project case studies also demonstrated the more general role of 'relatability': how far messengers are seen to share the perspectives and lived experience of their audience. The proliferation of social media platforms has engendered a new style of science communicator, who eschews conventional tropes associated with scientists in favour of more down-to-earth and accessible profiles. For many social media users, such relatable profiles can help build trust in the science being communicated.

A good example of this is found in the commissioned research on mpox. The case study identified the influence of two leading science communicators on TikTok, a short-format video sharing platform (Oliver and Pearce, 2023). The personas developed by these two communicators differed. One of them (known as @marenmicrobe) adopted the style of a 'best friend'– an emphasis on her personal rather than professional characteristics, informal communications, and swift, conversational responses. The other (known as @Dr.Noc) adopted a more professional persona, and kept his communications shorter and less conversational. However, both always foregrounded their own lives and humanity in their clips, which helped viewers connect to them first as people 'like them'. Both also have substantial followings and report positive responses to their videos, suggesting the appeal of different styles to different audiences.

While acknowledging that highly relatable communicators can have more traction in building trust in science, it is also important to recognise that such messengers can also build public support for anti-science messages. Relatability itself is no guide to whether evidence presented by participants in a public debate is trustworthy.

Condition 3.3: The style of communication

The research commissioned for this project confirmed findings in the wider literature (for example (Blastland *et al.*, 2020)) about good practice in how science is communicated in policy materials. In particular, the science communication workshops (Oliver and Pearce, 2023) examined the suitability of different ways science and evidence is presented in policy communications and whether this had an impact on how the policy was perceived.

The findings, supported by prior work (Royal Society, 2012), highlight the effectiveness of certain presentational features: separation of the evidence from the policy argument or rationale (use of boxes and separate evidence sections); clear definitions (use of a glossary); and the use of design elements such as infographics and colours. Beyond presentational factors, the workshops reiterated the importance of case studies that elaborate on the evidence. The findings on different approaches to referencing highlighted an important generational divide: younger audiences seemed to prefer hyperlinked references, as opposed to more traditional footnotes.

One particular style – visualisation – was examined in depth through one of the workshops (Oliver and Pearce, 2023). The diverse group of participants generally supported the wider use of visuals in communicating the science around a policy area. This highlights the effectiveness and speed of visuals in conveying complex or abstract concepts, and the potential benefits of using heuristics to connect with people's emotional responses. Alongside these benefits, experts in visualisation also caution that the tool needs to be tested on the target audience to ensure its suitability and accessibility for different audiences (especially those with visual, hearing or other impairments).

Implications for policymaking and science advice

Based on the conditions (relatability of the messenger, the efficacy of the style of communication and vigilance around the deployment of science in political communications), we can identify the following implications:

- **Acknowledging uncertainty.** When drawing on science in policy debate, policymakers and science communicators should acknowledge uncertainty in evidence or gaps in knowledge. They should avoid marshalling evidence in a way that appears highly selective or designed to substantiate pre-given preferences. Indeed, there is a risk that using evidence slectively to support value-based positions may undermine the authority of science in the longer-term. Government should marshal scientific findings with 'authority', setting out transparently how evidence was used and what gaps in knowledge still exist; but not in an 'authoritarian' way that invokes science in a simplified and selective way. Where there is uncertainty, be open about its existence, clarify the quality of the evidence that is known, and indicate how knowledge gaps will be addressed.
- **Communication and relatability.** The research we commissioned identified a shift in styles of science communication, including the growing influence of communicators with a 'relatable' profile that is considered more familiar and trustworthy to many members of the public. There is a need for better understanding of the appeal and traction of these different styles. Notably, we identify some risks in grounding trust in a wider set of characteristics that may not always be related to the quality or rigour of the science being invoked. This highlights the need for those with scientific qualifications to learn, adapt and improve appropriately the accessibility of their engagement and communication.

Dimension 4: Underlying attitudes among different members of the public

Dimension 4 covers the underlying dispositions and characteristics of publics – the plurality of groups of people with varying levels of interest and involvement in an issue. There is extensive research suggesting that pre-existing beliefs and attitudes are crucial in shaping public trust in science-for-policymaking. Indeed, evidence suggests that simply providing more evidence will not be effective in influencing people to 'trust the science'. Our commissioned research also produced interesting findings on the relationship between underlying dispositions of different members of the public, and their views on the relevance and trustworthiness of science across the three policy areas.

Condition 4.1: Pre-existing beliefs and the 'deficit model'

There is an (often implicit) assumption amongst many science communicators that providing more evidence can help convince publics of the merits of particular policy options – the so-called 'deficit model'. The idea is that more or better information will help persuade people of the relevance and value of scientific findings, thus leading them to accept scientific recommendations. The Gateway Belief Model formalises this assumption into a theory which claims that more effective messaging of scientific claims leads to changes in public attitudes about science (van der Linden, 2021). If this were true, misinformation could be dealt with by simply 'drowning out' incorrect claims with more accurate information (Jacobsen, 2019).

However, there is limited empirical evidence that this notion of knowledge deficit holds, outside of short-term experimental studies (van der Linden, Leiserowitz and Maibach, 2019), and the model is widely regarded as an oversimplification. Instead, research has shown that where members of the public are sceptical about the science informing policy, more extensive information is unlikely to augment their trust. Far more significant in shaping trust are the (pre-existing) dispositions of different publics to trust certain (types of) science, scientists and researchers. We consider these dispositions in Condition 4.2.

Condition 4.2: The propensity of publics to trust science on an issue

Our commissioned research built on wider evidence about the relationship between underlying dispositions to trust science, and trust in science invoked on particular policy issues.

It is useful to start by considering broader findings about public trust in science. There is evidence showing that trust in scientists and in experts in the UK – as abstract categories – is relatively high (Smith and Jensen, 2016; BEIS, 2019; Dommett and Pearce, 2019). Trust in government scientists is slightly lower, with survey data during the Covid-19 pandemic showing 55% compared with 60% saying they find scientists who advise government trustworthy (Skinner, Garrett and Navin Shah, 2020).

This project's public opinion research (Horvath and Mabbett, 2023) explored how such underlying trust is transferred onto trust on particular issues. The research confirmed findings (Jennings *et al.*, 2021; Han, 2022; Horvath *et al.*, 2022) showing that a respondent's baseline level of trust in science could be used to predict their general attitude to the case study policy areas. This suggests, as we would expect, that underlying propensity to trust science is associated with trust on a particular issue.

The public opinion research also suggested that people predisposed to mistrust science will be especially resistant to considering scientific evidence where debate is highly polarised. This was borne out in the case studies on Clean Air Zones (which is highly polarised), and mpox (less polarised) (Horvath and Mabbett, 2024). This suggests that pre-existing dispositions may become more entrenched in contexts of political polarisation.

The wider literature suggests a number of factors likely to influence the propensity to trust in science-for-policymaking. These include:

- Socioeconomic status: there is some evidence that trust in science in general is higher in the more advantaged socioeconomic groups, although the difference is small in absolute terms (Skinner, Garrett and Navin Shah, 2020). This coheres with findings about the role of socioeconomic status in influencing trust institutions more generally (Kennedy, 2020; Steedman, Kennedy and Jones, 2020) and with findings from this project's commissioned survey research (Horvath and Mabbett, 2023).
- Education level: on some issues, such as genetic modification and climate change, there is evidence of a positive correlation between education level and scepticism, although this is highly contested in the literature (Taylor-Gooby, 2006; Kahan *et al.*, 2012; Hornsey *et al.*, 2021).
- Place: the commissioned public opinion research (Horvath and Mabbett, 2023) also highlighted that these pre-existing attitudes vary by region and by type of place. The effect was more pronounced on clean air zones, which has a local impact: variation across local authorities was able to account for 32% of variation in support on clean air zone policies.

Implications for policymaking and science advice

- **Avoiding the 'deficit' model.** Simply providing more evidence is unlikely to shift attitudes, especially where strong values are guiding public beliefs. Policymakers, researchers and knowledge brokers must recognise there is a large body of evidence indicating that one cannot change people's minds simply by producing more information.
- **Underlying trust in politics.** Underlying dispositions (especially around trust in politics) are strong predictors of public trust in science being invoked in political deliberation, and in justifying decisions.
- **Confirmation bias.** There is strong evidence that individuals process information in a biased way, for example being more responsive to information that reinforces pre-existing beliefs. This form of confirmation bias is likely to be especially pronounced when people (not just publics, but all those involved in the science-for-policy system as well) have strong attachment to particular positions (for example on issues with high salience or emotional significance for them).

5. Implications

The analysis in Section 4 produced a number of insights on how to enhance public trust and interest in science-for-policymaking. However, it also drew out a wider challenge, related to declining public trust in politics and policy. We argue that this problem of political trust has a range of knock-on effects for trust in science-for-policymaking. In this section we explore these issues in more depth, arguing for a two-fold focus on transparency and independence in science-for-policymaking as a means to achieving trust and accountability in science-for-policymaking.

Trust and accountability in science-for-policymaking

Our analysis thus far has focused on a range of conditions influencing public interest and trust in science-for-policymaking related to how policy issues are framed, what kinds of science is invoked, how science-for-policymaking is communicated, and dispositions of different publics.

Yet time and again, our analysis pointed to a deeper, underlying problem affecting public trust in science-for-policymaking: the decline in public trust in politics and policymaking processes. This decline in political trust clearly has major ramifications for the public's willingness to trust science that is being invoked to support policy decisions. In particular, we suggested that where science is mobilised selectively to support rival positions, it may lose its traction and authority – or, put another way, mistrust in politics may spill over to affect trust in the science invoked in policymaking. Here, we offer some insights into the risks created by this form of spillover.

As indicated in our definition of trust (see Definitions), trust in science and trust in politics are grounded in somewhat different ways, reflecting the goals and function of these two spheres. *Trust in politics* is typically understood to be grounded in the competence and integrity of political representatives and institutions to deliver democratically mandated policies. By contrast, *trust in science* is understood to be grounded in the capacity of science to produce valid truth claims – traditionally, this is seen to rest on features such as the qualifications of scientists, the methodological rigour of the scientific process, and validation through peer review.

As we have argued throughout the report, where science is marshalled to inform political decisions, the trustworthiness of science is – quite understandably – likely to come under the spotlight. Public mistrust in the motives or conduct of politics and policymaking may also create doubt about the validity of the science underpinning policy claims. The upshot is that scientific claims, scientists, and/or the system of science as a whole may become the objects of mistrust.

This leads us to identify four interrelated implications for grounding trust in science-for-policymaking. We suggest that this broader challenge may be addressed in two main ways: strengthening trust in science and scientists; and enhancing the relevance of science to the priorities and concerns of members of the public (as outlined in 5.1 and 5.2). However, we also note some of the risks in rendering science more accountable. We argue that even as science is made more transparent, accessible and relevant to publics and policy debate, we need to ensure we protect the integrity and independence of science and the scientific system (as set out in 5.3 and 5.4). Each implication is explored in turn.

5.1: Building trust in science

One important way of enhancing trust in science is to promote the accessibility and transparency of science to public audiences, making science more familiar and instilling a sense of public 'ownership'. This may include various kinds of outreach – through citizen science, the work of civic actors, school engagement, public events and festivals, and wider media coverage of science.

5.2: Ensuring the relevance of science

Scientists and science communicators can be encouraged to build better understanding of, and ways of factoring in, public priorities and concerns about policy issues relevant to science. There is a range of established approaches for capturing public attitudes, concerns and lived experience in scientific research, including: Patient and Public Involvement panels that input into projects, deliberative methods to understand public attitudes towards particular issues or broad techno-scientific developments, or co-production of research questions, approaches and dissemination with stakeholder groups. Good examples of such engagement include: the work of the Nuffield Council on Bioethics, the dialogues on nanotechnologies discussed in Defra's Social Science Expert Group review (2022), the many public dialogues that have been supported by Sciencewise over the last nearly 20 years, as well as new approaches which develop public engagement 'Observatories' to map existing and facilitate further engagement on key issues.

We would expect that effective modes of public engagement can enhance the accountability of science, creating more 'buy-in' and 'ownership' by affected publics. However, as noted earlier in the report, evidence on these effects, and the mechanisms underlying them, is nuanced and often inconclusive. We suggest the need to better synthesise existing insights and carry out more systematic evaluation of different approaches to public engagement.

5.3: The distinctiveness of the scientific process

Public engagement and co-production are clearly valuable ways of building trust in science, as noted above. However, there are also limits to how far science can and should be the object of public engagement. Even the strongest advocates of co-production would agree that not all aspects of science can be co-designed: there will be a need for some 'ring-fencing' of expertise and methods, to ensure research findings are robust. In other words, while public involvement in science may legitimately influence chosen methods and approaches, such engagement should not lead to a dilution in the rigour of science. Indeed, an excessive blurring of the distinction between scientific knowledge and public input creates a risk that science will lose its credibility, thus undermining trust (Gieryn, 1983, 1999). This implies that there is a balance to strike between public engagement and co-productive methods, and preserving the credentials and processes that ground the validity of (and thus trust in) science.

5.4: Scientific independence

A similar point applies to the boundaries between science and policy. As we have argued, policymakers may understandably be keen to 'borrow' credibility from science, underpinning claims with scientific knowledge. Yet this dependence on science should be handled in a way that does not undermine the integrity of scientific findings or the scientific process. Where that happens, trust in science is also eroded – weakening its potency as a resource for grounding trust in policy.

One way of addressing this is to promote greater transparency in how science is drawn on in policymaking – in a way that clearly communicates the integrity and independence of the science being drawn on in policymaking. Possible measures include, for example: establishing independent expert panels whose deliberations are minuted; commissioning external/public

reports or enquiries; routinely publishing commissioned research; and giving more air time/prominence to scientific advisors to communicate the evidence base for particular policies (and in a way that is clearly independent of government) (Gieryn, 1983, 1999). One well-considered proposal that reflects these findings puts forward five rules for evidence communication: inform, not persuade; offer balance, not false balance; disclose uncertainties; state evidence quality; and, inoculate against misinformation (Blastland *et al.*, 2020).

Conclusions and considerations

In conclusion and to summarise the implications above, policymakers have a clear interest in protecting the distinctions between policy and science: as we have suggested, differentiating the two spheres is important for preserving trust in science. In summary:

- **Mistrust in politics and the risk of spillover to science.** Where publics are mistrustful of politics, this can spill over into scepticism about scientific findings used to justify policy. Where this occurs, science can lose its authority and traction as a resource for informing policymaking. Thus it is important to ensure that science is invoked in ways that augment trust in policymaking – rather than mistrust in policymaking undermining the authority of science.
- **Strengthening the transparency of science.** One way of augmenting public trust is to ensure that researchers and the scientific process are more accessible, transparent and familiar to everyone, instilling a sense of shared public 'ownership' of, and a critical faculty about, evidence generated. At the same time, researchers and science communicators should build better understanding of, and ways of factoring in, public priorities and concerns about policy issues relevant to science.
- **Protecting scientific independence.** Whilst emphasising the importance of transparency in science, it is also important to protect its independence and integrity. This is essential for building trust in the longer-term. Science is underpinned by a distinct set of processes and goals, which are not the same as those driving the political and policymaking process. While scientists are clearly influenced by values and interests, the scientific process is designed to protect the rigour and integrity of scientific knowledge.
- **Retaining a distinction between the logics and processes animating politics, policymaking and science.** While science is a crucial resource for informing policymaking and enhancing the legitimacy of policy decisions, there needs to be a clear differentiation between the logics and processes animating politics and science. Politics is – quite rightly – oriented towards mobilising public support for rival policy agendas. Science, by contrast, is oriented towards the production of knowledge. This creates the need for distinct checks, safeguards and forms of accountability. It is crucial that this distinction is made clear when policymakers and politicians invoke science to support policy decisions.

Drawing this together, we conclude by putting forward **ten considerations for those engaged in any aspect of the science-for-policymaking system.**

We identified ten broad considerations for policymakers, researchers and science brokers to strengthen public interest and trust in science-for-policymaking. These recommendations will be further elaborated in partnership with the science-for-policymaking ecosystem, as the next step of the British Academy's programme of work in this area.

For public officials and policy advisors:

1) Seek to invoke science early on in the framing process, to influence the extent to which scientific findings are part of political debate and policy development. Good examples of this include the case of mpox, which has built on many of the lessons learned through the Covid-19 pandemic response, and there are many examples from environmental policy, including the clean air zones case study this project explored.

2) Avoid an approach that simply 'follows the science', as was communicated at various points of the Covid-19 crisis. Make clear how scientific evidence has been integrated with a range of other considerations.

3) Promote transparency in how evidence is used, including through development of a shared transparency framework, for example as proposed in the evidence transparency framework campaign led by Sense about Science and the Institute for Government.

4) Acknowledge uncertainty and ambiguity, and if evidence is used selectively, explain why. Clarify the quality of evidence which is being used and how gaps in knowledge will be addressed.

5) Protect and sustain scientific integrity and independence in the way you marshal science in policymaking. This means ensuring advisory bodies retain independence, that their composition and deliberations are transparent as far as possible, but equally that they are not directly responsible for policy decisions.

For researchers and knowledge brokers:

6) Where research addresses contested policy issues, ensure sensitivity to different perspectives in communicating your findings. This may require bringing in appropriate expertise about public perspectives and public engagement. The new public engagement 'Observatories' are helpfully mapping and facilitating further engagement on key issues.

7) Play an active role in helping frame policy issues early on in the debate, clarifying the role of science in understanding and addressing policy challenges. Good examples are the UK Biobank or the Nuffield Council on Bioethics which has sought to anticipate important developments in the biosciences.

For all engaged in the science-for-policymaking system:

8) Avoid the 'information deficit model': simply providing more evidence is unlikely to shift people's views. A clear example is the unsuccessful attempt to induce acceptance of GM food by focusing solely on 'informing' the public about the scientific evidence without taking account of the wider reasons for scepticism.

9) Recognise and respect the role of local perspectives and knowledge, especially on issues with highly localised implications (such as clean air zones) – and seek to integrate such local knowledge with other forms of scientific evidence.

10) Avoid contributing to polarisation: explicitly valuing and bringing together different disciplinary communities can help ensure scientific findings are integrated. An integrated evidence base across scientific disciplines can be more robust and strengthen trust in science-for-policy. This is relevant to both public funded, challenge-oriented research programmes; and advisory committees established by government.

Annexes

1. Research design

Below is an extract from the scheme notes for the commissioned research which demonstrates how the research was framed prior to commencement, in particular, highlighting the factors hypothesised to play a role.

This call for research aims to understand how government and the scientific community can help foster public interest and engagement in the science underpinning policy. It does so through focusing on the conditions under which science and scientific claims come to be viewed as relevant, authoritative and trust-worthy by publics, with particular attention to the role of government and the scientific community in communicating science. The call focuses on the following question: **Under what conditions is science viewed as relevant and authoritative in policymaking?**

This question can further be broken down into two elements: Which factors influence why particular policy issues are seen (by the media and by publics) as requiring scientific evidence to underpin decisions? And what types of scientific claims have most traction and ability to elicit trust?

Based on existing literature, we recognise that the following factors are among those likely to play a role:

- Nature of the societal challenge (more technically complex areas, or those characterised by risk, may be more obviously amenable to scientific interventions)
- Level of political contestation (more salient and contested areas may encourage marshalling of science to support rival positions, undermining the authority of science and/or may encourage mis/disinformation to surface in different ways)
- Level of scientific certainty (scientifically contested theories or claims may be less likely to elicit trust or consensus)
- Extent to which and how the relevant publics think they will be affected by the societal challenge in question.
- Government approach to invoking science (more visible/prominent marshalling of science may influence public views on the relevance of science)
- Features of the scientific disciplines/communities being mobilised (e.g. medical sciences may elicit more trust because of proven success/advances in medicine and trust in health professionals)
- Effectiveness of science communication (investment in training/ professionalisation of science communication may lead to more exposure and traction in public communications)

2. Methods

Below we present summarised methodologies of the two research projects that this report draws on.

A. Under what conditions is science considered relevant and authoritative in policymaking? (Oliver and Pearce, 2023)

This research project sought to answer and unpack two questions:

1. Which factors influence why particular policy issues are seen (by the media and by publics) as requiring scientific evidence to underpin decisions?, and
2. What types of scientific claims have most traction and ability to elicit trust?

It used three methods: evidence synthesis, comparative case study analysis and user-testing workshops.

Evidence synthesis

The initial phase of the project aimed to bring together existing reports, survey data, and existing published research evidence. From each of these sources data were extracted about key factors which influence trust in science-informed decision-making, including the nature of the policy problem, the nature of the evidence base, the message and messenger, and the relationship between publics, scientists and government.

To identify these sources, structured searches were undertaken in electronic databases, including Web of Science and Scopus. Boolean terms were used to limit results, combining text and indexed terms including ('trust', 'trustworthiness', 'confidence', 'reliance') and ('science' or 'scientific' or 'research' or 'evidence' or scientist). Searching with these terms in close proximity of each other enabled the large number of results to be more focused. Relevant studies were included if papers reported: (a) empirical research data about different stakeholders' trust in science, or factors influencing trust in science, (b) literature reviews about trust in science, or (c) reports from the grey literature published by the National Academies, learned societies, or policy organisations.

Data from these sources were collated using a structured template based on the conceptual framework for the study, which analysed the importance of four elements, or groups of elements:

1. The nature of the policy problem
2. Nature of the evidence base
3. Message and messenger
4. Relationship between publics, scientists and government

Each of these elements was considered as source documents were reviewed, and relevant information extracted from each study. Finally, these were collated, and analysed for major themes within and across each theme.

Comparative case studies

The next phase of the project was to explore how these factors play out in three different cases: Clean Air Zones, GM crops (in particular precision-breeding), and mpox (also known as Monkeypox). For each case, the project:

- Developed a timeline which documented major publications (e.g. from funders, government or major activist organisations), critical events, and media reports. To identify these, searches were undertaken on news archive sites, and on the websites of identified key organisations. We also used the references of identified reports to identify further key publications. We continued until saturation was reached, i.e. no further new perspectives or information was identified.
- Conducted semi-structured interviews to gather perspectives on the role of science, trust and the media in determining how the policy was developed, implemented and received by the public. We identified potential interviewees through authorship of publications, prominence in media reports, and/or long-standing activity around the case study topic as a researcher, science communicator, policymaker, funder or activist.
- Analysed social media: led by Sheffield, we looked at the major discourses and opinion leaders around each case using cutting-edge digital methods. This involved identifying major scientific commentators around each case, collecting information about their social media profiles, content and followers. We also visualised the communications networks around each case to identify key figures and discourses, looking specifically at scientific content and claims.

User-testing workshops

Finally, led by Sense about Science, three workshops explored with members of the public how different visualisations with publics which vary across region, class, occupation, sex and age. The materials for the workshops were co-developed with the STEaPP students from UCL as part of their MSc project. The aim of the workshops was to find out how participants responded to different formats and presentation styles and what their preferences were in communicating the evidence behind policies in a clear, convincing and authoritative way:

- Format A - referenced the evidence in statements without providing detailed explanation. It is left to the reader to follow-up on the source to get further information.
- Format B - integrated the evidence as part of the policy justification argument through the document, explaining the benefits and limitations of the evidence in the decision-making process.
- Format C - the evidence was presented separately from the policy argument in a standalone section where all the evidence relevant to the policy is presented but without any argumentation or linking to the policy decision.

The formats were user-tested by preparing three hypothetical policy papers (one in each format) about the introduction of vehicle charging as a way of reducing air pollution. Each format was presented as coming from a different government department - distinguished as Department A, Department B and Department C respectively.

As well as the three formats, three different presentation styles for presenting a policy document were tested. The three styles were:

- Style A - a typical traditional policy paper style.
- Style B - a more academic style with academic presentation of evidence.
- Style C - defined as more accessible or popular style with simpler presentation of evidence incorporating more design elements such as infographics and colour.

B. Exploring citizens' responses to science in public policy through natural language processing and conjoint experiments (Horvath and Mabbett, 2023)

This research project collected two types of data:

- a textual corpus comprising news stories from UK print media as well as Parliament debate transcripts, and
- a survey experiment embedded in a nationally representative poll.

Both data sources relate to each of the three science-based policy cases: clean air zones, GM crops, and mpox case investigation.

This overview of the project's methodology describes the case selection strategy as well as both text and survey methods in more detail.

Case selection

The case studies represent three science-based policies within a fixed national political context (UK, but a mixture of local and national-level implementing authorities). They are:

- Clean Air Zones or (Ultra) Low Emission Zones, implemented by local governments to improve air quality. In clean air zones, vehicles exceeding current emission standards have to pay a charge when driving through.
- Surveillance and case investigation by local and national health authorities following a suspected case of mpox (monkeypox) infection. This includes identifying contacts who were in proximity to the infected individual in order to isolate, test or treat them.
- Approval of novel genetically modified (GM) crops by the UK Government's Department for Environment, Food & Rural Affairs for experimental use, with controls to ensure safety for human or animal health and the environment.

Text study methods

All three policy cases are widely discussed in different UK-based forums, including traditional and social media. This project captured text to explore this discussion from two forums:

- the print media (national and local), from which the project obtained news content querying the Lexis Nexis archive for policy-related keywords
- text segments from all parliament debate transcripts (both Houses and committees) that contained the same keywords as above, using the Hansard database.

Table 1: Sample size of documents in news corpus

Clean air zone news stories	Mpox news stories	GM news stories*
N = 6,847	N = 2,176	N = 6,887

** timeline cut at 2008 to obtain a similar corpus size with clean air zones. All clean air and mpox articles were extracted that matched the keyword search criteria.*

Table 2: Overview of sources (print titles) in news corpus

Clean air zones 278 sources		**Mpox** 145 sources		**GM** 304 sources	
	N		N		N
The Evening Standard	788	The Independent	555	The Guardian	662
The Independent	452	Daily Record	344	The Times	592
Birmingham Evening Mail	416	The Herald	76	The Independent	504
Bath Chronicle	312	The Western Mail	52	The Daily Telegraph	360
The Herald	308	Daily Star	45	Financial Times	349
Birmingham Post	288	Scottish Daily Mail	40	Daily Mail	232
Bradford Telegraph	223	The National	32	The Sunday Times	195
	...		...		...
South Wales Guardian	1	Barry and District News	1	Daily Echo	1
Romsey Advertiser	1	Western Morning News	1	Scarborough Evening News	1
Falmouth Packet	1	Central Fife Times	1	Keighley News	1
Clacton and Frinton Gazette	1	Brentwood Gazette	1	The Gazette	1
The Scottish Farmer	1	Braintree and Witham Times	1	Lynn News Friday	1

The project's analysis of the textual corpuses relied on the following key methods:

1. Topic modelling. Topic models summarise content in large text corpuses using a automated, computational method. These are used in an exploratory way: the resulting 'topics' may represent key themes, events, key locations etc. and they have been used in previous work to infer policy frames or narratives. The resulting topics are described by top keywords and a corresponding probability distribution which we report. Documents featuring the top keywords of topic T are assigned some (high) probability of featuring topic T.

2. Machine learning (ML) classification. This builds on first manual classification of a sample of news stories and story segments into 'opposition' and 'support' texts, then processing using an ML algorithm to learn about which words and combinations of words are associated with support and which with opposition. This way, it is possible not only learn about the vocabulary associated with different (media-) attitudes to the case study policies, but also to assess the relative importance of 'science' vocabulary across these positions.

Survey study methods

The survey work was completed in two phases: a pilot round which provided interim insights, and the final survey work with Delta Poll comprising N = 1,596 respondents, with surveys completed 9–15 June 2023. Respondent demographics mirror the UK national distribution on key demographics such as age 18+, gender, and education, as well as 2019 General Election vote recall, but with an equal representation of respondents from all UK statistical regions.

The project's analysis of this survey data was conducted in two ways:

1. Baseline attitudes to science-based policies examined public opinion about clean air zones, GM, and mpox interventions prior to any experimental manipulation. Regression modelling explored the impact of respondent characteristics such as demographics on policy support.

2. Survey experiments presented respondents with a series of policy cases and research programmes with varying descriptions of science. 'Conjoint' experiments allowed manipulation of several such descriptors simultaneously and independently, resulting in a very large number of randomly generated cases. When describing policies, the project team varied whether or not scientists supported the policy alongside other political variables such whether public consultation took place or whether public opinion was in favour of policy. When describing research programmes, the team varied the extent of local and citizen input in the research programme itself among other variables such as funding source or framing.

3. Stakeholder workshops and deliberations

The following workshops and deliberations were convened as part of the project.

- Roundtable on The Use of Science in Policymaking, 6 October 2022
- Roundtable on Trust in Science, 21 October 2022
- Roundtable on Publics and Engagement, 27 October 2022
- Science, Trust and Policy Synthesis workshop, 9 February 2023
- PERITIA Knowledge Exchange workshop, 12 July 2023
- Science, Trust and Policy Report Synthesis workshop, 15 September 2023

Bibliography

All European Academies (2018) *Science in Times of Challenged Trust and Expertise.* ALLEA General Assembly. ALLEA Expert Working Group. Available at: https://allea.org/portfolio-item/science-in-times-of-challenged-trust-and-expertise/.

All European Academies (2019) Trust within Science. *Dynamics and Norms of Knowledge Production.* ALLEA Discussion Paper 2. Available at: https://www.allea.org/allea_discussion_paper_2/ (accessed 17/01/2019).

Baumgartner, F.R. and Jones, B.D. (2010) *Agendas and Instability in American Politics, Second Edition*. University of Chicago Press (Chicago Studies in American Politics). Available at: https://books.google.co.uk/books?id=0WtEOcK_Y8wC.

Baycheva-Merger (2019) 'Forest Policy Information Networks and the Role of Trust: Cooperative and Competitive Orientations and Underlying Causes', *Forests*, 10(4), p. 359. Available at: https://doi.org/10.3390/f10040359.

BEIS (2019) *Public attitudes to science 2019*. Available at: https://www.gov.uk/government/publications/public-attitudes-to-science-2019 (Accessed: 18 September 2023).

Bellamy, N. and Hodgkiss, G. (2018) *Birmingham Clean Air Zone Feasibility Study.*

Blastland, M. *et al*. (2020) 'Five rules for evidence communication', *Nature*, 587(7834), pp. 362–364. Available at: https://doi.org/10.1038/d41586-020-03189-1.

van der Bles, A.M. (2020) 'The effects of communicating uncertainty on public trust in facts and numbers', Proceedings of the National Academy of Sciences of the United States of America', *National Academy of Sciences,* 117(14), pp. 7672–7683. Available at: https://doi.org/10.1073/PNAS.1913678117/SUPPL_FILE/PNAS.1913678117.SAPP.PDF.

Borrowman, P. (2021) *The case for clean air zones'*. Green Alliance. Available at: https://green-alliance.org.uk/publication/the-case-for-clean-air-zones/ (Accessed: 5 September 2023).

Boswell, C. (2009) *The Political Uses of Expert Knowledge: Immigration Policy and Social Research*. Cambridge: Cambridge University Press.

Broomell, S.B. and Kane, P.B. (2017) 'Public perception and communication of scientific uncertainty.', *Journal of Experimental Psychology: General*, 146(2), pp. 286–304. Available at: https://doi.org/10.1037/xge0000260.

Brown, M.B. (2015) 'Politicizing science: Conceptions of politics in science and technology studies', *Social studies of science*, 45(1), pp. 3–30.

C.B.I.-Economics (2020) 'Breathing life into the UK economy''. Available at: https://www.cleanairfund.org/resource/breathing-life-into-the-uk-economy-cbi-economics-2020/.

Chilvers, J. *et al*. (2021) 'A systemic approach to mapping participation with low-carbon energy transitions', *Nature Energy*, 6(3), pp. 250–259. Available at: https://doi.org/10.1038/s41560-020-00762-w.

Collingridge, D. (1982) *The social control of technology.* London New York: Frances Pinter St. Martin's press.

Collingridge, D. and Reeve, C. (1986) *Science speaks to power: the role of experts in policy making.* London: Pinter.

De Pryck, K. (2021) 'Intergovernmental Expert Consensus in the Making: The Case of the Summary for Policy Makers of the IPCC 2014 Synthesis Report', *Global Environmental Politics*, 21(1), pp. 108–129. Available at: https://doi.org/10.1162/glep_a_00574.

Defra Social Science Expert Group (2022) *Review of public engagement*. Department for the Environment, Food and Rural Affairs (Defra). Available at: https://www.gov.uk/government/publications/review-of-public-engagement.

Department for Health and Social Care (2022) *Chief Medical Officer's annual report 2022: air pollution*. Available at: https://www.gov.uk/government/publications/chief-medical-officers-annual-report-2022-air-pollution (Accessed: 14 November 2023).

Dommett, K. and Pearce, W. (2019) 'What do we know about public attitudes towards experts? Reviewing survey data in the United Kingdom and European Union', *Public Understanding of Science,* 28(6), pp. 669–678. Available at: https://doi.org/10.1177/0963662519852038.

Duffy, B. *et al.* (2023) *Trust in trouble? UK and international confidence in institutions*. London: Kings College London. Available at: https://doi.org/10.18742/pub01-126.

Entman, R.M. (1993) 'Framing: Toward Clarification of a Fractured Paradigm', *Journal of Communication*, 43(4), pp. 51–58.

European Commission (2023) *Competence Framework 'Science for Policy' for researchers | Knowledge for policy.* Available at: https://knowledge4policy.ec.europa.eu/visualisation/competence-framework-%E2%80%98science-policy%E2%80%99-researchers_en (Accessed: 14 November 2023).

Funtowicz, S.O. and Ravetz, J.R. (1993) 'Science for the post-normal age', *Futures*, 25(7), pp. 739–755. Available at: https://doi.org/10.1016/0016-3287(93)90022-L.

Giddens, A. (1994) 'Risk, trust, reflexivity', in U. Beck, A. Giddens, and S. Lash (eds) *Reflexive Modernization. Politics, Tradition and Aesthetics in the Modern Social Order.* Cambridge: Polity Press, pp. 184–197.

Gieryn, T.F. (1983) 'Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists', *American Sociological Review*, 48(6), p. 781. Available at: https://doi.org/10.2307/2095325.

Gieryn, T.F. (1999) *Cultural boundaries of science: credibility on the line*. Chicago: University of Chicago Press.

Gundersen, T. *et al.* (2022) 'A New Dark Age? Truth, Trust, and Environmental Science', *Annual Review of Environment and Resources,* 47(1), pp. 5–29. Available at: https://doi.org/10.1146/annurev-environ-120920-015909.

Gustafson, A. and Rice, R.E. (2020) 'A review of the effects of uncertainty in public science communication', *https://doi.org/10.1177/0963662520942122,* 29(6), pp. 614–633. Available at: https://doi.org/10.1177/0963662520942122.

Hajer, M. (2003) 'A frame in the fields: policymaking and the reinvention of politics', in M. Hajer and H. Wagenaar (eds) *Deliberative Policy Analysis: Understanding Governance in the Network Society.* Cambridge: Cambridge University Press, pp. 88–110.

Han, H. (2022) 'Trust in the scientific research community predicts intent to comply with COVID-19 prevention measures: An analysis of a large-scale international survey dataset', *Epidemiology & Infection*, 150, p. 36. Available at: https://doi.org/10.1017/S0950268822000255.

Hay, C. (2007) *Why We Hate Politics.* Cambridge: Polity Press.

Heclo, H. (2010) *Modern social policies in Britain and Sweden: from relief to income maintenance.* First published by the ECPR Press. Colchester: ECPR Press (ECPR Classics).

Hoppe, R. (2011) 'The Governance of Problems. Puzzling, Powering, Participation', *Robert Hoppe* [Preprint].

Hornsey, M.J. *et al.* (2021) 'Resolving the small-pockets problem helps clarify the role of education and political ideology in shaping vaccine scepticism', *British Journal of Psychology,* 112(4), pp. 992–1011. Available at: https://doi.org/10.1111/bjop.12500.

Horvath, L. *et al.* (2022) 'Adoption and continued use of mobile contact tracing technology: multilevel explanations from a three-wave panel survey and linked data', *BMJ Open*, 12(1), p. 053327. Available at: https://doi.org/10.1136/bmjopen-2021-053327.

Horvath, L. and Mabbett, D. (2023) *Project Findings Report: Exploring citizens' responses to science in public policy through natural language processing and conjoint experiments.* The British Academy.

Horvath, L. and Mabbett, D. (2024) 'Polarisation, Consensus, and Citizens' Responses to Science-Based Policies (forthcoming)', *Working Paper*.

House of Lords Science and Technology Committee (2000) *House of Lords - Science and Technology - Third Report*. Available at: https://publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3801.htm (Accessed: 18 September 2023).

Hulme, M. and de Pryck, K. (2022) *A Critical Assessment of the Intergovernmental Panel on Climate Change.* Cambridge. Available at: https://doi.org/10.1017/9781009082099.

IPSOS (2022) *Ipsos Veracity Index 2022.* Available at: https://www.ipsos.com/en-uk/ipsos-veracity-index-2022 (Accessed: 18 September 2023).

Jacobsen, G.D. (2019) 'How do different sources of policy analysis affect policy preferences? Experimental evidence from the United States', Policy Sciences, 52(3), pp. 315–342. Available at: https://doi.org/10.1007/s11077-019-09353-3.

Jasanoff, S. (1990) *The Fifth Branch*. Cambridge, MA: Harvard University Press.

Jasanoff, S. (2007) *Designs on nature: science and democracy in Europe and the United States*. 5. print., 1. pbk. print. Princeton, NJ: Princeton Univ. Press.

Jennings, W. (2009) 'The Public Thermostat, Political Responsiveness and Error-Correction: Border Control and Asylum in Britain, 1994–2007', *British Journal of Political Science*, 39(4), pp. 847–70.

Jennings, W. *et al.* (2021) 'Lack of trust, conspiracy beliefs, and social media use predict COVID-19 vaccine hesitancy', *Vaccines*, 9(6), p. 593. Available at: https://doi.org/10.3390/vaccines9060593.

Kahan, D.M. *et al.* (2012) 'The polarizing impact of science literacy and numeracy on perceived climate change risks', *Nature Climate Change*, 2(10), pp. 732–735. Available at: https://doi.org/10.1038/nclimate1547.

Kennedy, H. (2020) 'Should more public trust in data-driven systems be the goal?, Ada Lovelace Institute'. Available at: https://www.adalovelaceinstitute.org/blog/should-more-public-trust-in-data-driven-systems-be-the-goal/.

Kerr, J.R. *et al.* (2022) 'Transparent communication of evidence does not undermine public trust in evidence', *PNAS Nexus*. Edited by J. Van Bavel, 1(5), p. pgac280. Available at: https://doi.org/10.1093/pnasnexus/pgac280.

Kingdon, J.W. (1984) *Agendas, alternatives, and public policies*. Boston: Little, Brown.

van der Linden, S. (2021) 'The Gateway Belief Model (GBM): A review and research agenda for communicating the scientific consensus on climate change', *Current Opinion in Psychology,* 42, pp. 7–12. Available at: https://doi.org/10.1016/j.copsyc.2021.01.005.

van der Linden, S., Leiserowitz, A. and Maibach, E. (2019) 'The gateway belief model: A large-scale replication', *Journal of Environmental Psychology,* 62, pp. 49–58. Available at: https://doi.org/10.1016/j.jenvp.2019.01.009.

Norris, P. (2011) *Democratic Deficit: Critical Citizens Revisited*. Cambridge: Cambridge University Press.

Nowotny, H. (2003) 'Democratising expertise and socially robust knowledge', *Science and Public Policy,* 30(3), pp. 151–156. Available at: https://doi.org/10.3152/147154303781780461.

Nowotny, H., Gibbons, M. and Scott, P. (2001) *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty.* Polity Press: London.

Oliver, K. and Pearce, W. (2023) *Project Findings Report: Under what conditions is science considered relevant and authoritative in policy-making?* The British Academy.

O'Neill, O. (2018) 'Linking Trust to Trustworthiness', *International Journal of Philosophical Studies,* 26(2), pp. 293–300. Available at: https://doi.org/10.1080/09672559.2018.1454637.

ONS (2022) *Trust in UK government*. ONS. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/bulletins/trustingovernmentuk/2022 (Accessed: 25 September 2023).

Origgi, G. (2022) 'The Social Indicators of the Reputation of an Expert', *Social Epistemology*, 36(5), pp. 541–549. Available at: https://doi.org/10.1080/02691728.2022.2116962.

Owens, S. (2015) *Knowledge, Policy, and Expertise: The UK Royal Commission on Environmental Pollution 1970–2011.* Oxford University Press. Available at: https://doi.org/10.1093/acprof:oso/9780198294658.001.0001.

Rein, M. and Schön, D. (1991) 'Frame-reflective policy discourse'', in P. Wagner *et al*. (eds) *Social Sciences and Modern States.* Cambridge: Cambridge University Press, pp. 262–89.

Royal College of Physicians of London (2016) *Every breath we take: the lifelong impact of air pollution: report of a working party.* London: Royal College of Physicians of London.

Royal Society (2012) *Science as an Open Enterprise, Science Policy Centre Report 02/12.* London: The Royal Society. Available at: https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/.

Schön, D.A. and Rein, M. (1994) *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. New York: Basic Books.

Science Advice for Policy by European Academies (2019) *Making sense of science for policy under conditions of complexity and uncertainty.* DE: Science Advice for Policy by European Academies. Available at: https://doi.org/10.26356/masos (Accessed: 8 September 2023).

Sense about Science (2022a) *Public call on Government to show all the evidence used to make important policy decisions - Sense about Science.* Available at: https://senseaboutscience.org/activities/public-call-on-government-to-show-all-the-evidence-used-to-make-important-policy-decisions/ (Accessed: 14 November 2023).

Sense about Science (2022b) *What Counts? A scoping inquiry into how well the government's evidence for Covid-19 decisions served society - Sense about Science.* Sense about Science. Available at: https://senseaboutscience.org/what-counts/ (Accessed: 14 November 2023).

Seyd, B., Jennings, W. and Hamm, J.A. (2022) *Trustworthiness of COVID-19 Information Sources: Enhancing information reception across the population*. The British Academy. Available at: https://doi.org/10.5871/c19-recovery/B-B-W-J-J-H.

Shapiro, S. (1987) 'The social control of impersonal trust', *American Journal of Sociology,* 93(3), pp. 623–658.

Skinner, G., Garrett, C. and Navin Shah, J. (2020) 'How has COVID-19 affected trust in scientists?''. Ipsos MORI. Available at: http://www.ipsos-mori.com/terms.

Smith, B.K. and Jensen, E.A. (2016) 'Critical review of the United Kingdom's "gold standard" survey of public attitudes to science', *Public Understanding of Science,* 25(2), pp. 154–170. Available at: https://doi.org/10.1177/0963662515623248.

Steedman, R., Kennedy, H. and Jones, R. (2020) 'Complex ecologies of trust in data practices and data-driven systems', *Information, Communication & Society*, 23(6), pp. 817–832. Available at: https://doi.org/10.1080/1369118X.2020.1748090.

Stirling, A. (2010) 'Keep it complex', *Nature*, 468(7327), pp. 1029–1031. Available at: https://doi.org/10.1038/4681029a.

Stoker, G. (2006) *Why Politics Matters: Making Democracy Work*. Basingstoke: Palgrave Macmillan.

Taylor-Gooby, P. (2006) 'Social Divisions of Trust: Scepticism and Democracy in the *GM Nation?* Debate', *Journal of Risk Research,* 9(1), pp. 75–95. Available at: https://doi.org/10.1080/13669870500288742.

The British Academy and ALLEA (2019) *Truth, Trust and Expertise.* Available at: https://www.thebritishacademy.ac.uk/projects/knowledge-frontiers-truth-trust-expertise/.

Van Der Bles, A.M. *et al*. (2020) 'The effects of communicating uncertainty on public trust in facts and numbers', *Proceedings of the National Academy of Sciences,* 117(14), pp. 7672–7683. Available at: https://doi.org/10.1073/pnas.1913678117.

Weingart, P. (1999) 'Scientific expertise and political accountability: paradoxes of science in politics', *Science and Public Policy,* 26(3), pp. 151–161. Available at: https://doi.org/10.3152/147154399781782437.

Wynne, B.E. (2004) 'May the sheep safely graze? A reflexive view of the expert-lay knowledge divide.', in S. Lash, B. Szerszynski, and B. Wynne (eds) *Risk, environment and modernity: towards a new ecology [Brazilian translation of a book previously published in 1996]*. Sage.

Endnotes

[1] Including: the four reports of the ALLEA Truth, Trust & Expertise Working Group (The British Academy and ALLEA, 2019); SAPEA *Making Sense of Science under Conditions of Complexity and Uncertainty* (Science Advice for Policy by European Academies, 2019); Defra Social Science Expert Group *Review of Public Engagement* (Defra Social Science Expert Group, 2022); and outputs of the PERITIA *(Policy, Expertise and Trust)* Horizon 2020 project (https://peritia-trust.eu/peritiaresearch/), not least, 'A New Dark Age, Truth, Trust and Environmental Science' (Gundersen *et al*., 2022).

[2] As set out in our definitions section, science is used in a broad sense to describe research drawn from across all disciplines. Science involves the production of new knowledge using validated processes and methods.

[3] Science policy (as opposed to science for policymaking) and its purposes are not discussed in this report, although an overview of the history of science policy is given by The British Academy's *Lessons from the History of UK Science Policy* (2019).

[4] Including, for example, Truth, Trust and Expertise (The British Academy and ALLEA, 2019), *Making sense of science for policy under conditions of complexity and uncertainty* (Science Advice for Policy by European Academies, 2019), and the *PERITIA project* (https://peritia-trust.eu/peritiaresearch/), concluded in 2023 which produced a range of outputs, including *A New Dark Age? Truth, Trust, and Environmental Science* (Gundersen *et al*., 2022).

[5] The phrase science for policy or science for policymaking is also in use within the European Commission's *Competence Framework for researchers* (European Commission, 2023)

[6] More context on policy issues around air pollution available in (Department for Health and Social Care, 2022) and (Royal College of Physicians of London, 2016)

[7] Indeed, to ignore the importance of other types of evidence and solely frame policy issues as only needing 'scientific evidence' could actively diminish public trust, as outlined by the House of Lords Science and Technology Committee in its *Science and Society* report (House of Lords Science and Technology Committee, 2000).

[8] Further discussion of these points is available in (Oliver and Pearce, 2023). They discuss reports on the impact of mpox in central Africa (see https://www.washingtonpost.com/world/2022/05/24/africa-europe-monkeypox-virus-outbreak/) that are not debated in the UK media; the risks posed by the disease (for example to pregnant women) (see https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON381 and https://www.washingtonpost.com/world/2022/05/24/africa-europe-monkeypox-virus-outbreak/).

[9] It is important to note, here, that even though this point is made about publics specifically in regard to our evidence base, that it is not just publics who might 'discount scientific evidence'. So do policymakers and different coalitions of interests when findings challenge their commitments (they have values and ideologies too); and indeed researchers, when, for example, they have different ideas about valid research design, appropriate hypotheses, confounding factors etc., or when they question the reliability of the researchers involved.

[10] Concerns that scientific uncertainty contribute to mistrust are illustrated in, for example (Broomell and Kane, 2017). However, such studies have weaknesses as considered in the findings of the literature review commissioned as part of this project. Meanwhile, recent research suggests that on the contrary, communication of uncertainty does not affect people's trust in scientific claims (van der Bles, 2020).

[11] Sense about Science's *What Counts?* scoping inquiry into how well government evidence for Covid-19 served society (Sense about Science, 2022b) called for more clarity on government's use of evidence and their chain of reasoning for decisions. It noted that people from all walks of life, including the retail, education, transport, small business, health and hospitality sectors, sought a better conversation about the evidence behind policies.

[12] In a blog, Professor Maria Baghramian provides a good overview of a range of characteristics supporting trust in experts based on research conducted by the PERITIA project (https://jerichochambers.com/trust-in-experts-why-and-why-not/); supporting PERITIA research outputs include (Origgi, 2022). Other research also supports these broader points: for example, an ONS survey based on an OECD methodology (ONS, 2022) identified openness, fairness and reliability as particular drivers of trust in the UK, with responsiveness and integrity less likely to drive trust in the UK than the OECD average

[13] There is an extensive literature on political trust and its causes, and a range of proposals on how to address it (Stoker, 2006; Hay, 2007; Jennings, 2009; Norris, 2011), and it is beyond the scope of this project to contribute to this wider discussion

[14] See for example, www.sciencewise.org.uk

[15] See, for example, (Chilvers *et al.*, 2021). Further exploration of this issue is given by the Defra Social Science Expert Group (2022) review.

Acknowledgements

This report presents the conclusions of the British Academy's Science, Trust & Policymaking project. The Academy is immensely grateful for the time, insights and expertise of all those who participated in the workshops and roundtables for their contributions.

The British Academy's Public Policy team have played a crucial role in delivering the project and bringing together the conclusions in this report. In particular, the Academy would like to thank Sharaiz Asin, Chizitera Pennington and Henry Richards.

Finally, the project would not have been possible without the advice, guidance and extensive support of the project Working Group. The Academy extends its gratitude to them all for their continuous support.

Professor Christina Boswell FBA (Chair)	Professor of Politics, University of Edinburgh; and Vice President of Public Policy, The British Academy
Professor Peter Jackson FBA	Professor of Geography, University of Sheffield
Dr Molly Morgan Jones	Director of Policy, The British Academy
Professor Susan Owens OBE FBA	Emeritus Professor of Environment and Policy, University of Cambridge
Professor Brooke Rogers OBE	Professor of Behavioural Science and Security, King's College London
Ray Shostak CBE	Former Head of the Prime Minister's Delivery Unit, Director General Performance Management and member of the Board of Her Majesty's Treasury 2007-11
Professor Albert Weale FBA	Emeritus Professor of the Department of Political Science, UCL
Karen Folkes (Observer)	Head of Strategic Futures, Government Office for Science

The views and conclusions expressed here are not necessarily endorsed by individual Fellows but are commended as contributing to public debate.

About the British Academy

The British Academy is the UK's national academy for the humanities and social sciences. We mobilise these disciplines to understand the world and shape a brighter future. From artificial intelligence to climate change, from building prosperity to improving well-being - today's complex challenges can only be resolved by deepening our insight into people, cultures and societies. We invest in researchers and projects across the UK and overseas, engaging the public with fresh thinking and debates, and bring together scholars, government, business and civil society to influence policy for the benefit of everyone.

The British Academy
10–11 Carlton House Terrace
London SW1Y 5AH

Registered charity no. 233176

thebritishacademy.ac.uk
Twitter: @BritishAcademy_
Facebook: TheBritishAcademy

Published March 2024

The British Academy