UK Energy Research Centre

From Public Acceptance to Societal Responsiveness of Net Zero Infrastructures

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Contents

Summary

- Contemporary energy and climate change policy focuses on getting society to accept the widespread infrastructural changes deemed necessary for realising net zero. This emphasises approaches such as information provision, financial incentives, compensation and instrumental public engagement to secure public acceptance of predefined transition pathways. However, such acceptance-based approaches typically overlook public values and concerns and can lead to implementation delays and unsustainable transitions in the longer term.

- In light of a renewed policymaker commitment to getting publics to rapidly accept net zero infrastructures, there are critical calls to ensure the transition is also socially just. These calls emphasise how narrow *public acceptance and societal acceptability perspectives are increasingly problematic and highlight the need for societal responsiveness of* net zero infrastructures.

- This briefing synthesises insights from a collaborative UK Energy Research Centre (UKERC) project that reviewed and analysed social science literature and UK policy discourse to explore such alternative perspectives and approaches.

- A novel framework is introduced, setting out four distinct perspectives on the relations between publics and infrastructural change. These perspectives are corroborated with evidence from the exemplifying case study areas of wind energy, greenhouse gas removal technologies, and smart home technologies.

- The review suggests that alongside dominant *public acceptance* and *societal acceptability* perspectives, emerging social science understandings challenge the bulk of contemporary policy for net zero by emphasising the need for *societal responsiveness*, both in specific contexts and more systemically.

- These alternative perspectives challenge the misrepresentation of public views and actions in acceptance-based approaches and suggest that successful net zero transitions depend on moving beyond acceptance to be *more*, not less, responsive to society.

- These emerging social science perspectives also emphasise the need for a more systemic approach to *societal responsiveness* that will help ensure the net zero transition is both efficiently delivered and socially just. This requires new research and policy developments, including:

  - Understanding public responses as being place-based, contextual and interrelated across systems;

  - Taking a systemic approach to public engagement with net zero infrastructures; and

  - Cultivating new forms of societal responsiveness across systems.

- Novel institutional architectures, new modes of responsive governance, and taking practical steps to become more responsive to public concerns, values and actions across whole systems are needed to achieve societal responsiveness of net zero infrastructures.

- While such people-centered approaches can be challenging, they provide a better alternative to acceptance-based approaches. Only when policymakers become fully aware of the multiplicity and diversity of public actions and views can they effectively respond to the social challenges of net zero.

Introduction

While dominant science and policy understandings diagnose the problem of delivering net zero as one of getting publics to accept proposed infrastructural changes, social science evidence suggests that a successful energy transition depends on being *more* actively responsive to society.

In the context of renewed policymaker commitments to rapidly deliver net zero under the current Labour government[1], there is increasing interest in: (i) securing "*public buy-in*" of widespread infrastructural and behavioral changes deemed necessary[2]; (ii) "*building trust, knowledge and confidence*"[3]; (iii) reducing delays from public opposition during a streamlined planning process for new infrastructures[4,5]; and (iv) addressing the perceived rise of anti-net zero sentiment[6,7,8].

Public acceptance of technologies and infrastructures by local communities in particular is seen as simply a matter of building or obtaining a "*social license to operate*" as a necessary precondition for policy to achieve its net zero goals[9,10,11].

However, increasing evidence suggests that acceptance-based approaches – including one-way communication and financial incentives or compensation – are not sufficient to deliver on the promise of accelerating the net zero transition. This has been the case where the development of low carbon infrastructures and technologies has been delayed, prevented, or failed to operate as intended[12,13,14].

Such failures have brought forward drives to more fully engage with publics, especially through citizen assemblies, consultations, and other deliberative or opinion elicitation processes. However, such processes can often reconstruct a framing of acceptance – in this case a broader, more process-oriented framing of *societal acceptability* – whereby public views are sought on an instrumental basis to justify largely pre-ordained decisions[15]. This lack of meaningful public engagement can further undermine public trust in institutions and overall support for net zero[16,17].

In this briefing[I] we present insights from a collaborative project[II] in UKERC that critically examined narrow acceptance-based approaches to delivering net zero infrastructure and explored alternatives that emphasise the need for net zero transitions to be more, not less, responsive to society. We introduce *societal responsiveness* as an alternative framing, and analyse evidence suggesting it could lead to more just, sustainable and effective transitions in the longer term[18,19].

The project involved:

1. Reviewing social science literature and contemporary policy discourse on the relations between publics and net zero infrastructures.

2. Analysis of evidence from exemplifying case study areas across the energy system – namely wind energy, greenhouse gas removal (GGR), and smart home technologies[III].

3. Reflecting on the implications of a *systemic societal responsiveness perspective* for research, policy and practice.

I This briefing presents key highlights from an academic paper published in the journal *Energy Research & Social Science* – see: Stephanides P, Chilvers J, Honeybun-Arnolda E, Hargreaves T, Pallett H, Groves C, et al. Beyond public acceptance: Towards systemic societal responsiveness of net zero infrastructures. Energy Res Soc Sci. 2025;127:104251.

II The project involved researchers from UKERC's Public Engagement Observatory based at the University of East Anglia and researchers from the Understanding Risk Group at Cardiff University. The collaboration formed part of a broader series of linked projects under the heading "Infrastructure Transformation: The First 10 Years of Net Zero" undertaken by UKERC in 2024.

III Selection of these case areas was informed by the need to account for: a) policy-relevant technologies and infrastructures at different scales and levels of maturity; and b) developments across the production- and consumption-ends of net zero systems, rather than dealing with societal responses to renewable technologies in isolation as is typically the case.

Four Perspectives on Relations Between Publics and Net Zero Infrastructures

Through synthesising social science literature and conceptual insights, we set out a framework that defines four distinct perspectives on how publics relate to net zero infrastructures.

Perspective	Key intention	Example approaches
Public acceptance	Getting members of the public to accept decisions or technologies relating to individual infrastructure projects as prescribed by decision-makers	• Communication & information provision • Financial incentives & compensation • Technology roll-out
Societal acceptability	Gaining broader societal acceptance of individual decisions or technologies relating to infrastructure developments through invited public engagement	• Public consultations • Eliciting public views (e.g. surveys, focus groups) • Deliberative processes with recruited (invited) samples of publics
Situated societal responsiveness	Responding to emerging public concerns and actions around discrete infrastructure developments, including diverse uninvited publics and communities of relevance	• Documenting uninvited public engagements • Interviews & ethnography with excluded groups • Mapping public engagements & issues
Systemic societal responsiveness	Responsiveness of distributed net zero infrastructures to diverse public engagements and their interactions across systems	• Mapping public engagement systems • Public engagement observatories • Distributed and reflexive governance

Table 1. Four perspectives on the relations between publics and net zero infrastructures.

As shown in Table 1, this contrasts two traditional *public acceptance* and *societal acceptability* perspectives that still dominate in science and policy, and two emerging perspectives that emphasise the need for *societal responsiveness* in specific situations, around discrete infrastructure developments, and in a more systemic sense, across the energy system.

The following sections outline these perspectives with reference to empirical evidence that shows how narrow *public acceptance* and *societal acceptability* perspectives are increasingly problematic and challenged by perspectives that emphasise the need for *societal responsiveness*. Evidence from across the three case areas shows that whilst acceptance-based perspectives are dominant in both research and policy-practice, social scientists are beginning to better account for the social embeddedness of net zero infrastructures – recognising diverse publics and communities of relevance, and more fully accounting for public concerns and the justice implications of net zero.

Public Acceptance Perspective

A first perspective on the relations between publics and net zero infrastructures centers on understanding individual perceptions and gaining *public acceptance*. The key intention is to get individual, directly affected members of the public to accept decisions relating to specific infrastructure projects as prescribed by decision-makers.

Such understandings have had a lasting influence on how relations between publics and energy technologies are framed, since dominating academic research in the 1980s[20,21,22]. Contemporary policy and governance approaches to net zero also strongly align with this perspective, viewing the public as a barrier to tackling climate change. Indicatively, the UK Net Zero Research and Innovation Framework highlights that "*fast tracking carbon reduction requires gaining acceptance for and deploying at scale those technologies that are ready*"[9].

In this view, opposition to discrete net zero infrastructures is a problem that can be addressed through the provision of information to raise public awareness of climate change[23] and eliminate concerns or increase uptake of energy infrastructures, or through the provision of financial incentives and compensation aimed at getting individual members of the public to act more rationally and become more accepting[24]. For instance:

- Public barriers to wind turbine deployment are assumed to be overcome if affected communities develop and share an understanding of the wider social and environmental goods of wind energy[25]. Accordingly, there have been multiple information provision campaigns, and community benefit packages have been widely promoted to help overcome public resistance to wind farms, including from government[26].
- Work on greenhouse gas removal (GGR) is predominantly concerned with securing public acceptance[27], with emerging examples (e.g. the Drax Carbon Capture and Storage project[28] and HyNet North West[29]) evidencing the direction of significant efforts in developing comprehensive public communication protocols that go above-and-beyond statutory requirements to help position projects positively in public eyes.
- Work on smart home technologies sees publics being described as "*no-nonsense pragmatists who can make decisions based on the information*" provided to them[30]. Here, the provision of information on energy use through smart meters is expected to raise consumer awareness of unsustainable practices and encourage reductions, curtailment, or shifting in demand[31,32]. In line with a growing impetus to provide more and better information, there have also been efforts to increase the efficacy of information provision by combining smart feedback with tailored messaging tapping into social norms, and through different forms of tariff innovation encouraging demand responsiveness[33,34].

However, a *public acceptance* approach to accelerating net zero may exhibit significant shortcomings, with evidence highlighting how such tactics can undermine trust in seemingly unresponsive institutions and project developers and, ultimately, lead to implementation challenges. For example:

- Communities affected by wind turbine developments have protested against proposals on the grounds of overlooked social justice concerns, in spite of being sufficiently informed[35].
- There is growing public suspicion over the urgency framing of information provision on greenhouse gas removal (GGR), with publics raising concerns over such technologies serving as a justification for doing less on mitigation and adaptation[36].
- Smart home technologies have met widespread public resistance despite concerted efforts to communicate their benefits, with the delays in the smart meter rollout signaling how technocratic governance can result in higher costs, fewer social benefits, and sub-optimal energy savings[37,38].

Societal Acceptability Perspective

Critiques of the *public acceptance perspective* have brought about a second, *societal acceptability perspective*. Here the focus is on gaining broader societal acceptance of individual decisions or technologies relating to infrastructure developments through invited public engagement.

This second perspective is associated with a growing emphasis on the need to better account for a wider range of personal, socio-psychological, cultural, contextual, and spatial factors shaping public responses. This involves social science research and engagement practice focusing on eliciting public views and behaviours[39], public consultations or other deliberative activities[40,41], and community and 'upstream' engagement processes that have been championed to help account for broader value-choices, and public perspectives alongside those of experts[42,43].

Alongside policymaker claims that "*if people understand what is needed and why, if they have options and can be involved in decision-making processes, they will support the transition to Net Zero*"[11], *evidence from across all three exemplifying case areas* uncovers increasing moves to elicit public views and engage publics through invited deliberative processes. For example:

- Through deliberative interventions with selected mini-publics, public views have been elicited throughout the deployment of wind energy projects in order to support decision-making by addressing a perceived democratic-deficit in renewable energy deployment[44,45].
- The relations between publics and greenhouse gas removal (GGR) solutions are predominantly studied through survey-based research that is often coupled with information provision or invitation to formal deliberation processes, with researchers aiming to inform first and then consult, as awareness among the public at large of GGR is believed to be very low[46].
- We have witnessed moves towards more consultative approaches with diverse mini-publics – including, amongst others, through deliberative workshops, and citizen panels – focusing on uncovering and responding to consumer barriers in the interest of securing broader uptake of smart home technologies[47,48].

Growing interest in eliciting public values and invited public engagement is an encouraging development. However, the received wisdom that often underpins these drives also has its problems. Whilst public engagement is increasingly emphasised, this is often done for largely instrumental ends that focus on "*bringing the public with us*"[10]. While being open to public perspectives, the key intention of many invited participatory processes is gaining social acceptance of individual decisions or technologies relating to infrastructure developments through typically instrumental public engagement[49].

These attempts, while appearing to empower and respond to publics, still often take 'the public' as a barrier to be overcome for decision-makers and institutions. They are firmly rooted in top-down governance models and orchestrated by institutions to legitimise pre-defined infrastructural developments. Indeed, under current policy specifications, project developers adopt a narrow interpretation of engagement, with consultations at risk of becoming mere 'tick box' exercises, with little indication of how and if public concerns have been addressed, and limited evidence of participatory innovation[50]. Such problems can hold back low carbon transitions, certainly ones that are just, and point to the enduring dominance of a socially exclusive, technocratic model of decision-making.

Situated Societal Responsiveness Perspective

In response to the shortcomings of traditional perspectives on the relations between publics and infrastructural change, work in Science and Technology Studies (STS), related social science disciplines and nascent policy commitments articulate a *societal responsiveness perspective*.

This represents an ideological shift from ensuring acceptance[51], focusing instead on the 'socially embedded' nature of the relations between publics and net zero infrastructure[22]. It involves responding to diverse public concerns and actions around discrete infrastructure developments – including through employing qualitative social science research methods such as interviews, ethnography and mapping public engagement to uncover diverse uninvited publics, excluded publics and communities of relevance[18,49] to help address issues of energy injustice and power relations[52,53].

A nascent policy framing of 'just transitions' highlighting the need for those in power to exhibit greater *societal responsiveness* in planning and delivering net zero is reflective of this perspective. This implies a broad shift in emphasis away from 'mere acceptance' to one which emphasises the need for just transition governance that is deliberatively responsive to diverse public views, values and concerns[54], as well as to already existing public engagements with energy infrastructures and climate change.

Indicatively, the Scottish Government has argued that: "*It is crucial that we understand and respond to people's concerns, have an inclusive decision-making process and put people at the forefront of everything that we do*"[55]. Similarly, DEFRA's 2022 Review of Public Engagement[56] calls for "*more equitable and pluralistic approaches to participation… to address the diversity of publics*", and to work with "*community-based and other pre-existing engagements*".

Evidence of this emerging perspective can be found across our three case study areas:

- Research focusing on the conditions shaping public responses to wind energy recognises that public responses are co-constituted through a range of factors including place and value attachments. Such work conducts qualitative research of diverse publics by closely studying the relations between local communities and actors involved in wind projects, and focuses on the justice and fairness implications associated with wind turbine siting[57,58].

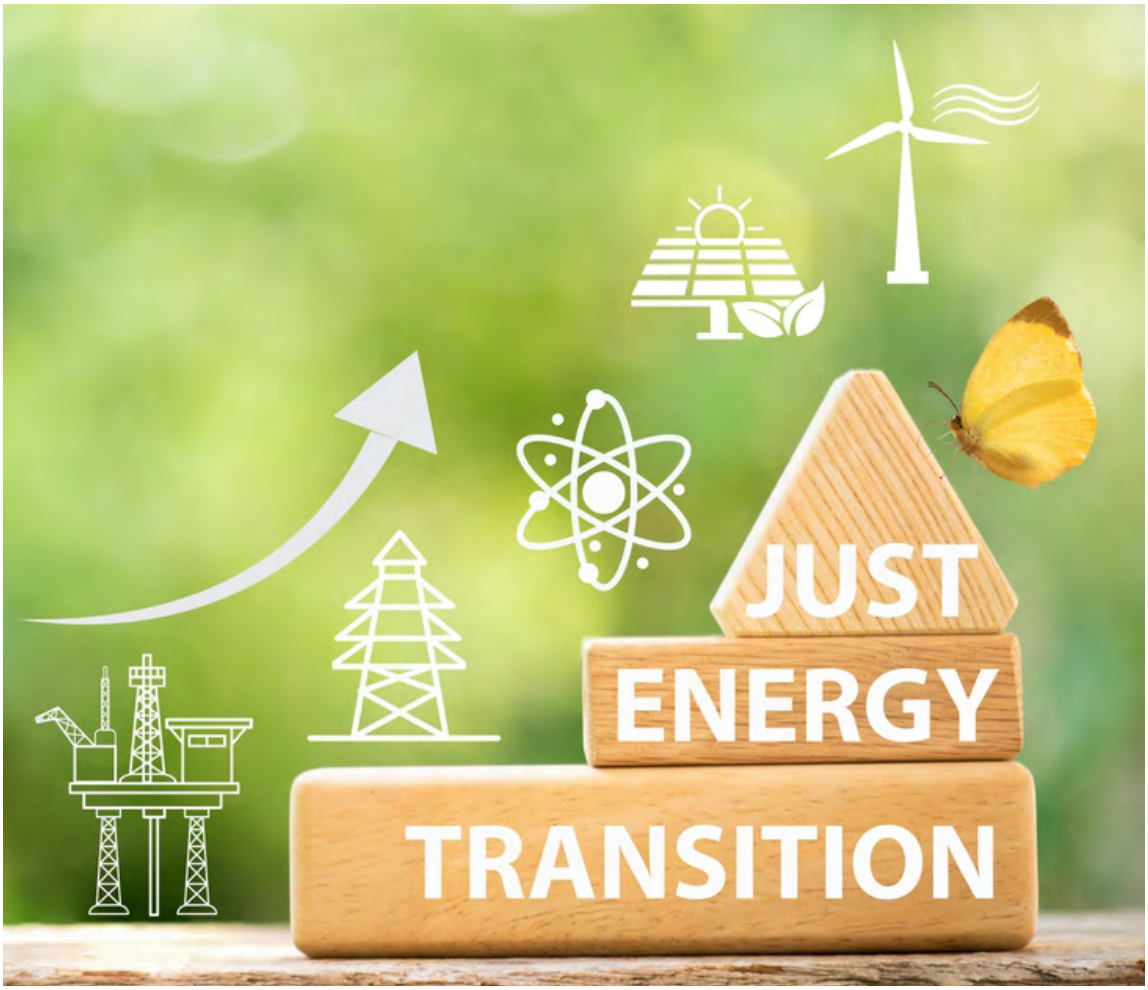
- Deliberative research has attended to the socio-culturally situated nature of greenhouse gas removal (GGR) approaches, demonstrating how distributive, procedural and recognition justice concerns are central to public responses[59].

- Social scientists have re-envisioned smart homes as complex meaning- and emotion-laden places where household members with different roles, everyday routines, responsibilities, and relationships must interact and negotiate their wants and needs while adopting and using smart home technologies[14,60].

Whilst valuable in focusing attention to the societal implications of net zero, significant shortcomings remain in how publics and their views are accounted for. First, despite nascent policy calls for more socially inclusive and responsive transition governance, underlying commitments to ensuring speedy delivery of net zero through securing public acceptance of a largely pre-defined transition pathway remain pervasive:

"The focus of the three strategic public engagement objectives is on increasing public understanding and acceptance of the ambitious policy response necessary for us to achieve our climate change commitments, and on enabling people in Scotland to actively participate in developing that policy"[55].

Second, studies in STS and related fields, and research conducted within UKERC's Public Engagement Observatory[18,49], point to the need to go even further in articulating 'beyond acceptance' perspectives – moving beyond an understanding of societal responsiveness in relation to discrete sociotechnical developments in isolation.



Systemic Societal Responsiveness Perspective

Given the interconnected and systemic nature of net zero, *systemic societal responsiveness* is also needed through distributed responsiveness to societal concerns and actions across wider systems. This is based on recent STS and social science research[49,61,62,63] that has developed more relational and systemic perspectives on public engagement with low carbon transitions.

This perspective opens up to the multiple, diverse, and plural ways in which publics are already engaging with energy and climate change, including through material participation, routine everyday engagements, grassroots innovations, and so on[61]. Furthermore, when publics engage with energy and net zero infrastructures, they do not only refer to specific technologies in particular instances. They also attend to other related net zero infrastructures and technologies as part of wider system transformations[64]. The ways that publics receive or respond to a discrete net zero infrastructure will thus be shaped to some extent by their engagements with other technologies and practices, whether net zero-related or otherwise.

Whole systems technical energy modelling currently forms the backbone of net zero policy[65,66]. However, despite recent calls highlighting the need for the UK government to develop a comprehensive public engagement strategy for net zero, a *systemic societal responsiveness perspective* is notably lacking in contemporary policy-practice. Instead, amongst the very few real-world applications of this perspective are the collaborative experiments of the UKERC Public Engagement Observatory which are actively exploring how novel approaches to mapping diverse forms of public engagement across the energy system can contribute to energy and climate-related decisions, innovations and participation in practice[63,67].

Whilst still emerging, social science evidence offers important additional insights associated with this fourth perspective on societal relations with net zero:

- First, a systemic perspective also accounts for important uninvited, bottom-up and distributed social innovations and community actions linked to wind energy that are ignored by traditional public acceptance-based approaches. Wind-based community energy schemes in particular demonstrate both how publics are already making positive contributions to advance sustainability, as well as how a lack of adequate institutional support and responsiveness to the needs of communities can undermine transition efforts[68].

- Second, this perspective frames GGR as a major political programme involving change across multiple levels and domains. Different interrelating concerns and sociotechnical systems have been documented with publics: responding to GGR in relation to previous experiences of polluting technologies; raising concerns around GGR as a form of climate change mitigation deterrence[59,69]; and stressing the need for GGR to be embedded in complex novel governance systems in order to work as intended[70,71].

- Third, research on smart home technologies draws attention to how public responses are fundamentally shaped by issues and objects that extend far beyond smart technologies themselves. Amongst others, changes in wider systems of practice, often unrelated to energy, shape use and engagement, as exemplified by broader trends in ICT in daily life[72,73]. Furthermore, we are encouraged to attend to how households are increasingly positioned as key system actors, with prosumerism, energy entrepreneurialism and peer-to-peer trading introducing new forms of household conduct and modes of 'governing the self' beyond the household[74].

Insights and Recommendations

Against a backdrop of renewed policy focus on ensuring public acceptance of net zero infrastructures, our review suggests that *societal responsiveness* is needed as well. Ensuring that net zero infrastructures are responsive to society requires attending to interrelated public responses across the energy system, taking a whole systems approach to public engagement, and developing more socially responsive decision-making.

Attending to Interrelated Public Responses Across the Energy System

Despite some work from across all three case areas pointing to the interrelated nature of public responses to net zero infrastructures, research and policy still focus on public responses to discrete technologies and infrastructures in isolation. Research on the relations between publics and net zero needs to develop whole systems thinking by attending to how public responses are interrelated across multiple different technologies, infrastructures, and associated social arrangements.

This necessitates new research that explores the interrelations of public responses across energy systems. For instance, this could involve attending to how responses to net zero infrastructures such as wind turbines and GGR technologies are shaped by a broader lack of trust in decision-making institutions, and not just by the specific parameters of infrastructures in situ. Further, with smart home solutions affecting multiple different everyday practices, there is a need to better attend to the lived experiences of the transition and to potential conflicts as people are being asked to become more sustainable across different domains, using different technologies.

This thinking should also be incorporated into policy and practice. Policy should no longer be developed by siloed working units focusing on specific infrastructures and technologies in isolation. Cross-departmental units should deal explicitly with the interrelatedness of the net zero challenge by drawing on evidence of diverse publics and their multiple different engagements with energy and net zero. Such interrelations can also become a feature of future information and communication campaigns, in place of focusing on discrete net zero technologies in isolation as is typically the case.

Taking a Whole Systems Approach to Public Engagement

Rather than inviting publics to engage and express their views on individual infrastructure developments in isolation, systemic approaches to public engagement are also needed. Such approaches evidence and intervene in the wider interrelating system of diverse public engagements that form around net zero infrastructures[75].

First, a whole systems approach to public engagement would involve designing new democratic innovations that include multiple diverse publics, and more openly-framed participatory practices that attend to the systemic nature of net zero[42,70]. Second, there is a need to map the wider system of diverse public engagements with energy and climate change and use this evidence to make net zero infrastructures more responsive to society, as pioneered by the work of UKERC's Public Engagement Observatory[18,19,63].

Given growing calls for a comprehensive public engagement strategy by the UK government[2,11], such approaches should feature more prominently in policy and practice. This means drawing on extensive mapping evidence to develop whole system plans and public engagement strategies, taking a more coordinated and joined-up approach to engagement across sectors, organisations, and different forms of public engagement, and engaging publics in whole systems net zero questions[19].

Developing More Socially Responsive Decision-making

Adequately accounting for the societal dimensions of net zero infrastructures also demands taking practical steps for decision-making to become more responsive to – or accepting of – publics on a whole systems level. In the context of imperatives to accelerate net zero, this should inform development of ongoing, distributed, and responsive systems of governing, where public values, concerns and actions are not seen as fixed but in flux and continually emerging. This move entails developing new processes and protocols to regularly engage with diverse publics and their engagements, including through using mappings of existing engagements as a starting point before new invited public engagement exercises are initiated.

More institutional responsiveness is not just about doing what publics say. It is about incorporating public concerns into planning and decision-making, and being open about where, how, and why public values and actions have been accounted for and acted on – as well as where and why they have not. There are already examples of such practical and balanced approaches that can be drawn on to bring societal responsiveness forward, including frameworks for responsive governance[76], Responsible Research and Innovation[77], participatory research methods[78,79], and experiments orchestrated by UKERC's Public Engagement Observatory where systemic mappings of public engagement are enabling net zero decisions, innovations and participation processes to be more responsive to society [19,67].

While such people-centered approaches can be challenging and time-consuming, they provide a much better alternative to acceptance-based approaches. Only when policymakers become fully aware of the multiplicity and diversity of public actions and views can they effectively respond to the social challenges of net zero.

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