



Unpacking the politics of Nature-based Solutions governance: Making space for transformative change

Caitlin Hafferty^{a,*}, Emmanuel Selasi Tomude^{a,b}, Audrey Wagner^c, Constance McDermott^a, Mark Hirons^a

^a Environmental Change Institute, School of Geography and the Environment, University of Oxford, OX1 3QY, UK

^b School of Geography, University of Nottingham, University Park, Nottingham, UK

^c Nature-based Solutions Initiative, Department of Biology, University of Oxford, OX1 3SZ, UK

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ABSTRACT

Nature-based Solutions (NbS) have gained global attention for their transformative potential to simultaneously address biodiversity loss, climate change, and human well-being. However, there are concerns that dominant framings reinforce vested interests, marginalise alternative perspectives, and lead to persistent patterns of inequality and injustice. While participatory governance of NbS is widely acclaimed to support more equitable and ‘just’ outcomes, it is unclear to what extent the necessary changes can occur within dominant framings and approaches. To address this gap, this paper foregrounds the messy, contested, and discontinuous politics of sustainability transformations to explore how different framings influence the transformative potential of NbS. Drawing from interviews and a survey with NbS practitioners and policy makers in the UK, we critically unpack the interplay between techno-scientific and market-oriented approaches, risk and uncertainty, and participatory governance processes in shaping transformative NbS. Our findings demonstrate that, despite numerous efforts to rethink and reframe NbS, there remains a need to make space for different conceptualisations, practices, and alternative approaches to transformation. We suggest that this requires transcending dominant techno-market framings that demand certainty and control over sustainability outcomes, and caution against “democracy washing” through NbS that perpetuates superficial participation and unequal power relations. These debates indicate that transformational NbS will require an explicit recognition of these power inequalities and a commitment to cultivate and open up - rather than control and close down - alternative perspectives, pathways, and possibilities that foster justice and well-being for both humans and nature.

1. Introduction

Nature-based Solutions (NbS) have gained international attention in policy, practice, and the private sector for their potential to deliver multiple sustainability goals by addressing climate change, biodiversity decline, inequality, and well-being issues (IPBES, 2019; IPCC, 2019a; 2019b; United Nations, 2019; WEF, 2020). In the UK, NbS are supported by agricultural and environmental policies, including the Environmental Land Management schemes (including Landscape Recovery, see DEFRA, 2024) and the Environment Bill DEFRA (2020), as well as initiatives promoting private investment in natural capital markets (e.g., the Natural Capital Market Framework; Crown Estate, 2024). These solutions encompass diverse interventions, such as habitat creation, restoration, protection, and sustainable food production (IUCN, 2020), aiming to

tackle climate impacts and broader societal issues while delivering ecosystem and socio-economic benefits (see Fig. 1 for a summary; also, NBSI, 2024). NbS are often seen as “open innovations” requiring active collaboration with local communities and other relevant groups, delivering what Raymond et al. (2017) describe as “co-benefits” that span social, environmental, and economic interests.

However, there are growing concerns that NbS can perpetuate inequalities and injustices. Research in environmental science and policy has highlighted how certain framings and practices can reinforce hegemony and human-nature dichotomies (Cooper et al., 2023; Melanidis and Hagerman, 2022; Rees and Doyon, 2023; Welden et al., 2021; Woroniecki et al., 2020). Melanidis and Hagerman (2022) caution that powerful actors with vested interests may uphold the status quo instead of fostering innovation and co-benefits, thereby perpetuating unequal

* Corresponding author.

E-mail address: caitlin.hafferty@ouce.ox.ac.uk (C. Hafferty).

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power dynamics and further excluding historically marginalised groups. [Hirons \(2021\)](#) highlights the significant implications that framings have for the governance of NbS in terms of shaping different definitions of the problem, determining the types of solutions that are considered appropriate and feasible, and influencing which actors and institutions are perceived as influential and authoritative in addressing sustainability challenges (also see [Bulkeley, 2012](#)). These trends reflect broader patterns in environmental science ([Turnhout, 2024](#)), where dominant norms restrict transformative change by promoting a model that seeks objective truth, overlooks the connections between science and society, and ultimately obstructs the necessary changes for human-ecological well-being ([Beck, 2011](#)).

Efforts to address inequalities in NbS governance emphasise participatory approaches, calling for NbS to be ‘with and for people’ ([Seddon et al., 2021](#) p. 1525) through engagement with diverse actors to integrate knowledge, foster empowerment, and co-develop actionable solutions ([Ferreira et al., 2020](#); [Frantzeskaki, 2019](#); [Hölscher et al., 2024](#); [King et al., 2023](#)). While participation is frequently positioned as a key driver of transformative change in the pursuit of sustainability agendas ([Davies and Laforteza, 2019](#); [Katsou et al., 2020](#); [Maes and Jacobs, 2017](#); [Palomo et al., 2021](#)), it often falls short of its promises and can paradoxically exacerbate the inequalities it aims to challenge and dismantle (e.g., [Cooke and Kothari, 2001](#); [Few et al., 2007](#); [Stirling, 2008, 2015](#); [Turnhout et al., 2020](#)). Decades of research highlights how participatory processes can be blind to issues of politics and power, reinforcing and ultimately legitimising the problems that they intend to solve, leading to participation notably being described as tyrannical ([Cooke and Kothari, 2001](#)). While participation is widely valued in NbS, insufficient attention to its inherent controversies can end up reinforcing unequal power relations that hinder transformative change.

NbS are widely championed for advancing multiple sustainability goals, fostering participation, and are ultimately expected to catalyse broader transformations ([Kiss et al., 2022](#); [Raymond et al., 2017](#); [Seddon et al., 2021](#); [Welden et al., 2021](#)). However, it is unclear whether these expectations are being met. There is limited empirical evidence that clarifies specifically what changes can occur within dominant framings that ultimately undermine transformation. By foregrounding the politics of sustainability transformations in the context of NbS in the UK, this paper aims to critically unpack whether current framings support or undermine transformative change, focusing on how framings privilege

certain knowledge systems, actors, and institutions, and exploring how risk and uncertainty exacerbates hegemony and the co-option of participation. We build on these debates to examine how dominant conditions shape NbS governance by “controlling” through top-down structures or embracing open-ended approaches that make space for participatory and democratic struggle. In doing so, we enrich current debates around how and why NbS can undermine transformative change, and how these issues can be overcome for more plural, equitable, and socially ‘just’ futures.

This paper is organised into six sections. [Section 2](#) examines how dominant framings shape the transformative potential of NbS governance and how these interplay with questions of politics, power, and participation. [Section 3](#) outlines the research methodology. [Section 4](#) presents the findings from interviews and a survey with NbS practitioners, policy makers, and actors from business and civil society. [Section 5](#) discusses the findings in the context of the broader politics of sustainability transformations, and finally, [Section 6](#) offers conclusions and suggestions for practitioners and policymakers.

2. Understanding the governance of NbS for transformative change: framings, risk, and participation

2.1. Framing different narratives of sustainability transformations

Different framings of sustainability transformation shape how problems are defined, which solutions are proposed, and the roles of actors and institutions in governing NbS ([Bulkeley, 2012](#); [Hirons, 2021](#); [Leach et al., 2010](#)). This affects who is considered authoritative in making decisions, whose interests are served, whose livelihoods are impacted, who benefits and who loses out ([Cooper et al., 2023](#); [Martin et al., 2023](#); [Tozer et al., 2020](#); [Tallent and Zabala, 2024](#)). These dynamics influence the transformative potential of NbS, where “transformation” involves challenging and destabilising power imbalances to achieve progressive social change through democratic struggle, characterised by ongoing efforts for ‘access by the least powerful, to the capacities for challenging power’ ([Stirling, 2014a](#) p. 10, [2014b](#)). [Patterson and Paterson \(2024\)](#) suggest that transformations happen ‘*through*, rather than *despite*’ messy and discontinuous political conflict (p.2, emphasis in original), which can be suppressed when controlled by some groups at the expense of the agency of others ([Stirling, 2014b](#),

Ecosystems	Intervention types	Climate change impacts	Biodiversity impacts	Socio-economic impacts
<ul style="list-style-type: none"> • Temperate forests • Temperate grasslands • Ponds & lakes • Montane/alpine • Temperate oceans • Peatland • Streams, rivers, riparian • Saltmarsh • Terrestrial production • Urban • Wetlands • Created wetland • Coastal 	<ul style="list-style-type: none"> • Created habitats (e.g., salt marshes, native woodland planting) • Food production (e.g., regenerative grazing, wet farming) • Management (e.g., deer population control) • Protection (e.g., from flooding or drought) • Restoration (e.g., peat bog re-wetting, native species reintroduction) 	<ul style="list-style-type: none"> • Enhanced flood resilience • Increased drought resistance • Sustainable food production • Improved soil health • Protection against coastal erosion • Increased coastal flood protection • Reduced storm surge impact • Improved water quality 	<ul style="list-style-type: none"> • Increased connectivity of wildlife habitats • Enhanced invertebrate biodiversity • Restoring native species populations • Improve habitat quality • Creation of new habitats • Creating wildlife corridors 	<ul style="list-style-type: none"> • Community engagement and volunteering • Job creation • Flood protection • Recreation opportunities • Community ownership • Sustainable food production • Access to nature • Mental health and well-being benefits

Fig. 1. Examples of Nature-based Solutions (NbS) projects delivering multiple climate, ecological, and socio-economic benefits: A summary of themes found in 36 UK case studies.

Source: case study map developed by the Nature-based Solutions Initiative; <https://nbshub.naturebasedsolutionsinitiative.org/case-studies/> (see [NbSI, 2024](#)).

2015).

Scoones et al. (2015) identify four overarching narratives, each including distinct framings with different implications for the politics of sustainability transformations: technocentric, market-oriented, state-led, and citizen-led. Technocentric framings emphasise technological innovation within existing governance frameworks to address sustainability issues (Strand et al., 2018), however, critics argue that this perspective often neglects the political, cultural, and socio-economic complexities enmeshed with technologies (e.g., Turnhout et al., 2014; Stanley, 2024). These framings often align with market-oriented approaches, which position markets as central to driving transformation through pricing mechanisms and creating markets for assets like carbon and biodiversity, including “natural capital” and “green finance” initiatives that seek to assign economic value to natural resources (DEFRA, 2023; OECD, 2021; UNEP, 2023). Together, technocentric and market-oriented framings interact to represent distinct meanings, politics, and imperatives such as “putting a price on nature” (Costanza et al., 1997). While these approaches are important for addressing sustainability challenges, their dominance can leverage the authority of technical and private actors (Melanidis and Hagerman, 2022), risk “green grabbing” that harms local livelihoods (Fairhead et al., 2014), and exacerbate socio-spatial inequalities by prioritising aspects of ecosystems that are valued financially or scientifically (McDermott, 2014; Stanley, 2024). Anguelovski et al. (2018 p.134-5) comment that such approaches have resulted in landscapes reshaped into ‘aesthetically controlled and “acceptable nature for some”’. State-led narratives focus on governments steering markets within stronger frameworks of social control (e.g., policy mechanisms and regulation), with associated framings emphasising state-backed research, innovation, finance, and regulation for greener economies (e.g., Crown Estate, 2024; UNEP, 2023). However, these approaches may concentrate power by emphasising top-down decision-making, neglecting local needs and leading to disconnected policies that do not reflect realities on the ground, and (further) exclude historically marginalised communities (Martin et al., 2023; Melanidis and Hagerman, 2022; Tozer et al., 2020). Citizen-led narratives tend to challenge dominant norms and assumptions, suggesting alternative framings of the problem and solutions needed, including advocating for bottom-up and grassroots action. This includes diverse approaches ranging from multi-institution partnerships to co-operatives and pooled resources, to entirely community owned and led initiatives (e.g., Doyle, 2023; McIntosh, 2023).

These framings often intersect to shape distinct understandings of knowledge, actors, and institutions in terms of their transformative potential. Each plays a crucial, yet different, role in the (often messy, contested, and uncertain) power dynamics, politics, and governance of NbS. The aim of this paper is to unpack these political dynamics, including the conflicts and trade-offs between different framings, rather than to suggest that one approach is inherently opposed to another. While techno-science, markets, the state, and citizens each play vital roles in transformation, problems arise when this is narrowly framed and there is an over-emphasis on one strategy at the expense of another. This can become even more problematic within framings that prioritise certainty, scalability, and fast-paced action, particularly within widespread declarations of a “climate and biodiversity crisis”.

2.2. Beyond techno-scientific fixes: the politics of risk and uncertainty

The urgency to address the climate crisis is widely acknowledged. However, there are concerns that an increasing focus on emergency politics can end up diverting attention and resources away from other political concerns, including a wider set of justice and well-being goals (Hulme, 2011, 2018, 2019). For example, sustainability targets often consist of a narrow and reductive set of indicators (Hulme, 2011) and the links between climate change and societal change is often sidelined in the pursuit of technological breakthroughs and new climate models (Devine-Wright et al., 2022). Solutions must place multiple goals at the

heart of decisions about climate and biodiversity to create the space for the negotiation of competing priorities, interests, and values that are essential for transformation to happen.

Uncertainties remain in understanding sustainability challenges and measuring progress (Hulme, 2018). Efforts to address these often focus on identifying and assessing risk more precisely through advanced technologies, however, as Leach et al. (2010) discuss, many of the uncertainties tied to environmental and socio-economic changes are difficult to quantify or mitigate, which complicates decision-making. As a result, the impact of decisions, like NbS interventions, is unpredictable, and the desirability and value of outcomes is often unclear, whether in terms of capital value or other measures. This uncertainty points to a more fundamental tension between dominant natural capital methodologies and advances in the understanding and complexity in socio-ecological systems (Wells et al., 2023). Top-down approaches to managing uncertainty often focus on techno-managerialist solutions that use quantitative assessments and probabilistic modelling (Mehta et al., 2019), narrowing the valuation of environments and overlooking lived experiences that are ‘diverse, context specific and draw on local knowledge systems and may differ from the dominant prescriptions made by some bureaucratic and scientific actors’ (ibid, p. 1529; also see Mehta and Srivastava, 2020; McDermott, 2014; Nightingale et al., 2020). Transforming complex systems inherently involves high stakes, both in terms of the investment needed and societal impacts of pursuing or delaying change (Wynne, 1992). For NbS to foster transformation, they must open up to, rather than narrow and distract from, questions about how sustainability transformations are co-produced, whose values and livelihoods are recognised, who decides, and who benefits.

While robust science is vital, transformative change requires more than evidence and measurement; it needs (re)framings that recognise the co-dependence of people and nature, and the co-construction of knowledge. In response, research has investigated decision-making approaches that embrace uncertainty and adaptability, moving away from traditional “predict and act” models (Haasnoot et al., 2024; Stanton and Roelich, 2021). This shift acknowledges that uncertainties should not always be eliminated, and NbS must be developed within this context. However, dominant framings that prioritise urgent action can marginalise ways of knowing that are focused on slower, everyday lives (Nightingale et al., 2020; Pickering et al., 2020). With increasing urgency to “save the planet”, participation and democracy are often viewed as obstacles to urgent change that need to be “put on hold” in times of crisis (see Stirling 2014a, 2014b; Willis, 2020). Such narratives often frame scepticism and critique as undesirable deviations from urgent goals, disagreements and trade-offs as something that should be mitigated against (Stirling, 2015), concealing deeper questions of power and politics. If dominant framings emphasise control and certainty, participatory processes may be seen as risky, and democracy as an “unaffordable luxury” (Stirling, 2015) in times of crisis. This becomes more problematic if, as Willis (2020 p.3) argues, the root of sustainability challenges is ‘too little, not too much, democracy’ (emphasis in original).

There is a tension between controlling sustainability transformations and embracing uncertainty to foster new possibilities. Attending to politics and power in transformations should involve pluralistic and creative responses that diversify and democratise knowledge, rather than framings that prioritise easily controlled options, precise assessments and top-down actions (Leach et al., 2010; Nightingale et al., 2020). Section 2.3 explores these issues in more detail, drawing from literature that emphasises the “culturing” rather than “controlling” of transformations.

2.3. From “controlling” to “culturing” transformations: the role of participatory collectives

Participation and democracy are central to understanding how transformations are either “controlled” through top-down approaches or

“cultured” by opening up to diverse knowledge types, embracing uncertainty, and considering how participatory collectives interact with wider political and institutional systems (Chilvers et al., 2018; Stirling, 2015). Although participatory governance is widely acclaimed in NbS for its benefits (e.g., Ferreira et al., 2020; Hafferty, 2022a; Hafferty, 2022b; Hafferty et al., 2024; Seddon et al., 2021; Raymond et al., 2017), proponents often do not appreciate how it can support or undermine transformative change, particularly when implemented within established frameworks that prioritise particular framings. Moreover, NbS proponents often seek to mitigate complexities, conflicts, and undesirable trade-offs through more clear messaging and best practices (e.g., Frantzeskaki, 2019; Seddon et al., 2021), which is problematic if transformations happen *through* rather than *despite* messy and discontinuous political conflict (Patterson and Paterson, 2024). As Nightingale and colleagues argue, within dominant framings ‘truly transformative change - founded on change in knowledge systems and the opening of deliberative space for defining futures - fails to gain traction’ (2020 p. 344).

Participatory processes have been widely critiqued for being dominated by a depoliticised discourse that prioritises rational, technoscientific arguments to promote generalisable ideas about what participation means and how it is practiced (Chilvers and Kearnes, 2020; Kiss et al., 2022; Turnhout et al., 2010, 2020). Dominant framings often render participation, and who and what is involved, as fixed and external factors in decision-making, often focusing on judging “success” against pre-established “best practices”, and viewing communities as homogenous entities with pre-existing knowledge that can be “tapped into” through participation (Chilvers, Kearnes, 2015, 2020). While best practice frameworks are important for impact, they risk depoliticising environmental challenges and overlook the power politics at play. Well-documented problems include integrating participation into decision-making processes with pre-set ideas of what counts as valid knowledge and reasonable action, often demarcated by scientific and market-based goals (Kiss et al., 2022; Melanidis and Hagerman, 2022); treating communities as homogenous entities and overlooking diverse views, interests, knowledge systems, and relationships to place (Chilvers and Kearnes, 2020); and focusing on mitigating conflict and achieving consensus among radically different, and often conflicting, ways of knowing (Klenk and Meehan, 2015). By overlooking the messy politics of how participation interacts with dominant framings of science and rationality, NbS can diminish and delimit, rather than open and empower, transformation by not engaging with, or explicitly challenging, the power structures that are inherent to participation. This has led to calls for a re-thinking and re-politicisation of participation that makes questions of politics and power explicit (Kiss et al., 2022; Stirling, 2008, 2015; Turnhout et al., 2020; Woroniecki et al., 2020).

Instead of procedural and fixed, participation should be understood as a dynamic process emerging through collective action and continuous co-construction. Chilvers and Longhurst (2016) describe participation as relational, emergent, and continuously evolving, analogous to broader ideas of “culturing” sustainability (Stirling, 2015). Participation is not merely a feature that is added onto existing decision-making processes; it is integral to collectives of people, systems, and ecologies, deeply intertwined with socio-material systems that shape environmental governance (Bulkeley and Mol, 2003) and broader sustainability transformations (Pickering et al., 2020; Stirling, 2015). This perspective offers valuable insights into the role of participation in shaping transformative NbS, however, research often over-emphasises the virtues of participation for more inclusive and equitable outcomes (e.g., Frantzeskaki, 2019; Raymond et al., 2017; Tallent and Zabala, 2024) and overlooks how it interacts with dominant framings to support or undermine the transformative potential of NbS.

3. Methods

3.1. Practitioner interviews

To examine how different framings shape the transformative potential of NbS, thirty interviews were conducted with UK practitioners involved in NbS strategy, design, and/or delivery (Table 1). The data collection was collaborative and co-designed with practitioners to ensure relevance to real-world applications (also see Hölscher et al., 2024). A semi-structured interview protocol with open-ended questions was developed, generating rich insights into practitioners’ perspectives and experiences of delivering NbS (for recent examples, see Roitsch et al., 2024; Tallent and Zabala, 2024). The interview questions were informed by a literature review and co-design workshops NbS practitioners, policymakers, and civil society actors (see NbSI, 2024). The protocol covered four areas: (i) organisational and project background; (ii) views on meeting multiple sustainability objectives; (iii) perspectives on the participatory governance; (iv) policy and finance support. Ethical approval was granted through the University of Oxford’s Central University Research Ethics Committee (approval number: SOGE1A2021–247_Amendment_01).

Participants were recruited using purposive, convenience, and snowball sampling methods (Creswell and Poth, 2016; Valerio et al., 2016), drawing initially on the NbSI case studies (NbSI, 2024) and the research team’s networks, and continuing until the interviews encompassed a variety of governance approaches, understandings, and practices of NbS. The interviewees – from a range of public, private, and third sector organisations (see Table 1) – held roles ranging from scientists, land managers, consultants, and advisors, to entrepreneurs and activists. Interviews were conducted online from February to August 2023, lasted 31–76 minutes, and totalled 30 hours and 38 minutes. Transcripts were analysed using NVivo 12 (QSR International, 2018).

A coding framework combining inductive and deductive approaches (Thornberg and Charmaz, 2014) was developed using an iterative grounded theory approach (Fereday and Muir-Cochrane, 2006; Maher et al., 2018). The initial framework was informed by the literature review and research questions (Siccama and Penna, 2008), with salient passages coded against this framework (Braun and Clarke, 2019) until data saturation was reached (Guest et al., 2020). Coding was completed by Hafferty and Tomude, with verification by Hiron and McDermott. The final coding framework revealed three themes which are presented in Sections 4.1–3. The findings are described qualitatively to capture the rich context and nuances of participants’ experiences, illustrated by quotations (see Pyett, 2003). The results are critically interpreted within the broader literature in Section 5, examining the circumstances, structures, and constraints shaping these views.

3.2. Survey

To situate the interview findings and explore broader themes, a survey was developed with twenty-three Likert and multi-selection questions and was distributed via Jisc Online Surveys (see [supplementary material](#)). It aimed to capture perspectives from a wider sample of

Table 1
Research data - interviews.

Organisation type	Number of participants
Private sector (e.g., limited company, partnerships, small-medium enterprises, joint venture, non-profit)	10
Public sector (e.g., local government, government department, non-departmental public body, research and education)	7
Third sector (e.g., charities / not-for-profit, voluntary and community-led organisations, social enterprises, cooperatives)	13

NbS practitioners to produce broad indicative themes to complement the in-depth qualitative data. As a result, the analysis was descriptive rather than inferential and the results do not contain any reference to statistical significance which would apply to a probabilistic random sample. Sampling errors were minimised (Assael and Keon, 1982) by recruiting survey participants through mailing lists, direct emails to project partners, and social media. The survey collected sixty-three responses (Table 2). Results were analysed in Microsoft Excel and are included in the next section to supplement the interview analysis.

4. Results

4.1. Techno-scientific and market-focused framings limit the space for pursuing multiple objectives

Most interviewees recognised the importance of implementing NbS holistically - 'it's about embedding nature and all these different things for social benefits' (#03, Public Sector) - aiming to deliver 'multiple benefits' (#09, Third Sector) for people, nature, and climate through NbS that 'need to all be tackled together' (#11, Private Sector). However, socio-economic dimensions were often deprioritised, with projects focusing on more easily measurable outcomes like carbon and biodiversity: '*our project is} focused very specifically on scientific research on carbon sequestration*' (#12, Third Sector). Several practitioners felt that '*the social element {is} just not considered enough*' in their NbS work (#23, Private Sector). This gap between aspirations and practice was reflected in the survey (Fig. 2), where biodiversity and climate objectives ranked above well-being, poverty, and equity concerns. The following sections explore why socio-economic outcomes were often not being considered or fully delivered, and how NbS practitioners were navigating this in practice.

Around one-third of survey participants reported insufficient guidance for achieving socio-economic outcomes, compared to only 14 % for ecological guidance (Fig. 3). While 52 % of respondents identified clear socio-economic objectives in their projects, 84 % reported clear ecological goals. Interviewees pointed to capacity constraints, such as limited expertise and staff, as well as systemic institutional bias towards quantifiable outcomes within a science-driven, market-oriented approach to NbS which '*really privileges the science*' over diverse perspectives and expertise (#05, Private Sector). The culture of environmental organisations played an important role in what knowledge was considered relevant and useful for solutions, with practitioners commenting that '*what is being prioritised is based on what we can use in nature-based solutions to sell natural capital, and we're not selling the social side, are we? [...] The social side of it hasn't been a priority.*' (#21, Private Sector). Even when socio-economic aspects were considered, they were often constrained by market approaches that commodify nature: '*{We're} trying to generate the maximum social benefits as we can within a sort of profitable framework... And the profit is coming from... well, we anticipate it coming from biodiversity increase and carbon*' (#02, Private Sector). The impact of this is further explored in Section 4.2.

Despite aspirations to integrate socio-economic and ecological goals, the focus on quantitative outcomes not only restricted the inclusion of socio-economic dimensions but changed the ways in which they were understood and addressed. Social benefits were frequently described as

Table 2
Research data - survey.

Organisation type	Number of participants
Private sector (e.g., limited company, partnerships, small-medium enterprises, joint venture, non-profit)	18
Public sector (e.g., local government, government department, education)	17
Third sector (e.g., charities / not-for-profit, voluntary and community organisations, social enterprises and cooperatives)	28

inherent by-products of NbS interventions targeting climate and biodiversity issues, with practitioners often assuming that '*ecosystem services might lend straight into social and economic benefit*' (#11, Private Sector), often with social benefits emerging as '*completely unexpected*' and '*spin-off*' outcomes from science-led biophysical interventions (#06, Third Sector). Survey respondents similarly emphasised the socio-economic goals that aligned with, and emerged from, ecological and climate outcomes, such as increased access to nature, event attendance, environmental education and awareness (Fig. 4). One interviewee commented that their NbS projects not only '*hadn't {been} done from a social aspect*', but were '*done partly transactionally*' (#04, Third Sector), with socio-economic benefits being included as direct, measurable outcomes from people's engagement with NbS initiatives.

The interviewees also described various ways that space could be created for integrating social dimensions alongside ecological and climate objectives. While most practitioners acknowledged socio-economic benefits were not fully accounted for or delivered satisfactorily, many emphasised the need for improvement: '*the key long-term objective would be to demonstrate much more socio-economic benefit coming from land management, including community ownership of varying degrees*' (#02, Private Sector). Challenges included ensuring that organisations delivering NbS balanced their priorities to keep social objectives '*at the core of what we're doing*' and integrated the whole way through projects, '*even right at the start when we might have different objectives*' (#11, Private Sector). As explored in Section 4.2, decentralised governance approaches, like multi-level partnership working, emerged as key to delivering more integrated NbS, involving '*community-led projects {working} with national partners, environmental charities, NGOs...*' (#27, Third Sector) in collaborative ways. '*Not taking a monopolistic approach*' (#27, Third Sector) was central to this, ensuring that projects were not being owned and/or led by a single actor with narrow objectives but genuinely embraced different knowledges, values, and priorities for land management.

4.2. Efforts to mitigate risk and uncertainty can reinforce the need for centralised control

Efforts to manage risk and uncertainty in NbS governance were evident throughout the interviews, with land use and ownership emerging as a central factor: '*Land is the key to everything when you come to nature recovery. Without access to land, you can forget it*' (#22, Public Sector). Land access and ownership was often cited as essential for the long-term resilience of NbS, however, opinions varied on centralised versus decentralised approaches: '*we're trying to balance the need for urgency and action to upscale, in terms of tackling climate crisis and biodiversity crisis, and how that wouldn't be achieved quickly enough just from communities doing it themselves in terms of community owned land*' (#11, Private Sector). The majority of interviewees did not see bottom-up and top-down approaches as inherently in tension, however, with many describing how these approaches could work simultaneously. For example, several practitioners had implemented a range of partnership, cooperative, shared ownership, and blended funding models, often with direct community benefits schemes (e.g., shared revenue, landownership, housing, jobs). Nevertheless, the practical limitations of securing land for project resilience, amidst growing pressure for meeting funded requirements and delivering outcomes within required timescales, encouraged the need for a centralised authority to ultimately steer decisions: '*Working collaboratively is all very well, but at the end of the day you need a body to take overall responsibility for it to either negotiate agreements with landowners or to buy the land*' (#22, Public Sector).

The decentralised and collaborative governance of NbS was often viewed as too high risk when land security, funding and finance mechanisms required a top-down approach. Several interviewees described how involving diverse, often conflicting, interests and priorities was a '*real high risk and nervous place to be signing money off*' from the perspective of NbS funders and investors (#04, Third Sector). One

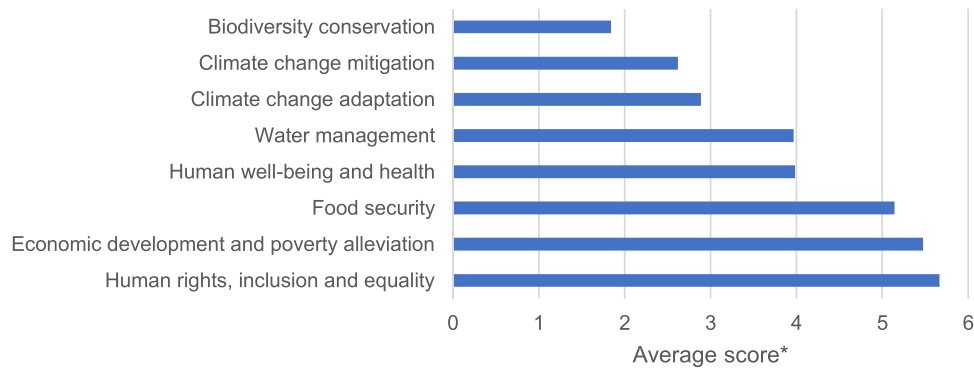


Fig. 2. Practitioners’ perspectives on the sustainability challenges prioritised in NbS (average score, N = 63). *The chart shows the mean score for the ranking of each sustainability challenge, with higher numbers indicating a lower ranking.

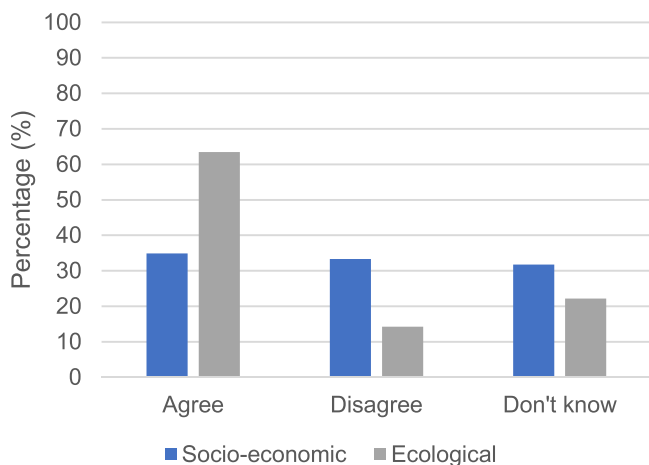


Fig. 3. Availability of adequate socio-economic and ecological guidance for NbS (% of respondents, N = 63).

practitioner described how their NbS project ‘deliberately went below the radar’ (#29, Public Sector) to minimise wider engagement until the initial stages of the project – which included acquiring land, securing financing, and completing baselining - were complete. The role of experts – such as in business, finance, land, and science - was frequently described as essential for ensuring stability and centralised decision-making in NbS governance: ‘We have a Board of Directors who we feel are very much experts in both business and nature recovery, land management, and generally {they} have the right priorities for rural prosperity at heart. Most of the decisions that we’re making, in majority, will be decided by the Board.’ (#07, Private Sector).

While some favoured more centralised and expert-led governance

structures, others advocated for models that diversified ownership and financing mechanisms: ‘if you’ve got community investors, you’ve got a range, you diversify, you’re less dependent on one particular source that dictates the terms’ (#26, Public Sector). Several practitioners emphasised the importance of financing NbS based on more flexible processes that did not rely on specific, quantifiable and measurable outcomes over particular time periods, allowing for the consideration of diverse aspects that are not as easily measured. For example, investment could be made on a ‘no regrets basis, where we feel that it’s obviously going to have a benefit, we can’t tell you exactly how much, but the investment is made on that basis’ (#23, Private Sector). Diverse benefits could also be encouraged by standards that require landowners to ‘demonstrate that what they’re doing, and what they’re going to do, is in the public interest’ (#27, Third Sector). One practitioner explained that their intention was to act as ‘accelerators’ for community benefit, with the ‘eventual idea that we look to transfer ownership of land into local communities through people buying plots of land’ (#11, Private Sector). However, the desire to mitigate risk through centralised, top-down, and often expert-led governance ultimately impacted who made decisions, who and what was included, who benefitted, and what these benefits looked like.

4.3. Invited engagement and nudge politics risk perpetuating fixed and procedural views of participation

Interviewees highlighted various nuances, conflicts, and trade-offs between science-driven, market-focused approaches to governance and bottom-up, community-led governance. These issues were not always in opposition but became problematic when one strategy dominated, limiting the inclusion of others. While the majority of practitioners saw participation as vital, their motivations and understandings varied. Throughout the interviews, participation was often practiced to raise awareness, gain support and align people with project goals. Participation was frequently understood and practiced as a way to

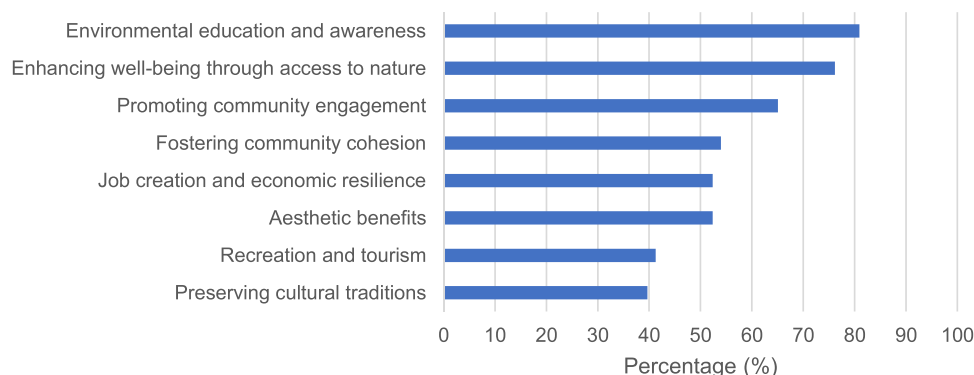


Fig. 4. Socio-economic objectives of NbS projects (% of respondents, N = 63).

'get people on board.' (#01, Private Sector), promote 'alignment with the mission' (#12, Third Sector), 'believe in and trust the organisation' (#12, Private Sector). Engagement was also seen as a way to change environmental views and behaviours, allowing practitioners to 'listen to people so you can gently nudge them in a correct way' (#25, Third Sector). In the survey, the most common engagement type conducted was information provision and awareness raising (50 participants, 79 %) (followed by collaboration, see Fig. 5), and the majority of interviewees emphasised the value of engaging through communicating through on-site signage, open days and educational events, increased public access, and so forth. Generating support, raising awareness and educating were the top two reported main benefits from engaging (71 % and 70 % respectively; see Fig. 6).

However, several interviewees highlighted the problematic and contradictory nature of viewing participation as a means to gain support, raise awareness, or even persuade people. Instead of imposing top-down ideas and aiming to align people with pre-existing goals, the participatory governance of NbS should involve 'understanding the specific needs in communities before going down the route of trying to design what the nature-based solutions might be' (#04, Third Sector). This involves not only incorporating specific types of expertise (e.g., scientific, business, finance), but being open to embracing more diverse forms of expertise and treating people as 'creative and intelligent to be able to come up with their ideas' (#05, Private Sector). Rather than as an instrument to align people with pre-existing ideas and goals, participation can be an ongoing and open-ended process that 'builds the space for cultural exchange' (#27, Third Sector) where communities of place have genuine agency, can veto aspects of land-use management, and receive benefits defined on their terms.

The principles of participation often did not translate into practice due to capacity constraints, including lack of funding and time: '{Engagement} to us means developing management with the community, supporting the community's objectives, {but} it has tended to be informing and getting feedback about ideas and plans. In principle, it is a much more collaborative process.' (#02, Private Sector). Limited resources were also the most reported risk for delivering engagement among survey participants (66 %; see Fig. 7). Beyond inviting people into pre-defined decision-making spaces, many interviewees advocated for systemic shifts in the ownership, financing, and management of NbS that allowed for genuine community agency to deliver tangible benefits from the bottom-up.

5. Discussion

5.1. Unpacking and nuancing NbS for transformative change: why we need to open up the debate

Our analysis identified three themes that reveal how current framings of NbS shape political and power dynamics that have the potential to support, or undermine, transformative change. This section explores these themes in the context of the literature, foregrounding the messy politics of transformation in NbS to nuance and unpack the interplay between the prioritisation of techno-market approaches, perceptions of

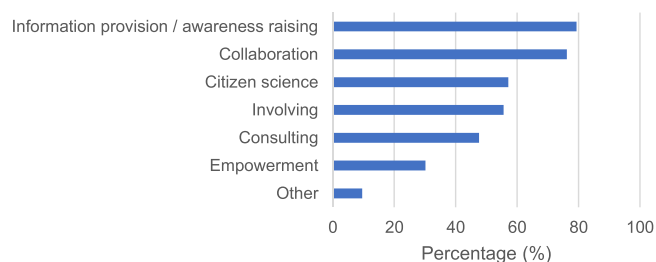


Fig. 5. Type of engagement conducted in NbS projects (% of respondents, N = 63).

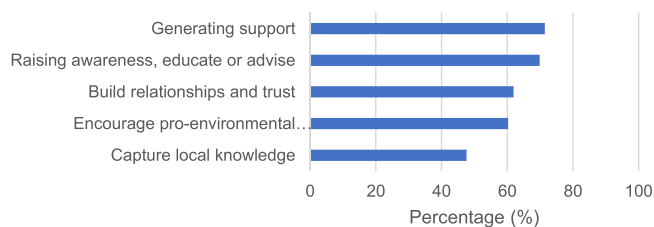


Fig. 6. The main perceived benefits from engagement in NbS governance (% of respondents, N = 63).

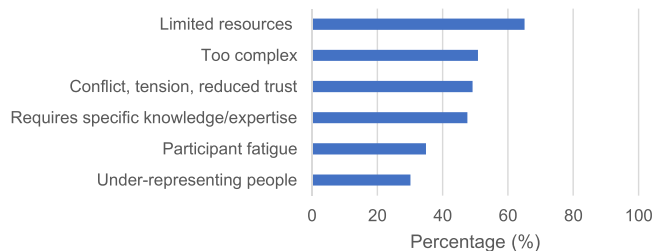


Fig. 7. The main perceived risks for engagement in NbS governance (% of respondents, N = 63).

risk and uncertainty, understandings and practices of participation. Taken together, the findings can enrich current debates around NbS that explicitly identify and challenge power imbalances for outcomes that are more plural, equitable, and socially 'just'. Rather than setting these different framings in opposition to one another, or dismissing the need for science, markets, and mechanisms of control, our findings demonstrate how their domination can narrow, simplify, and obscure alternative knowledges and approaches.

The findings highlighted a disparity between the practitioners' recognition of the importance of integrated approaches to NbS that deliver multiple benefits, and the limited extent to which social dimensions were considered and fully delivered in practice. While NbS are increasingly framed as 'with and for people' (Seddon et al., 2021 p. 152; also Chausson et al., 2024; Welden et al., 2021), the dominance of techno-scientific and market-oriented framings often undermines holistic approaches from the outset. This creates an irony where, despite good intentions for the inclusive reframing of NbS, entrenched power imbalances prioritise certain objectives and approaches over others unless these issues are explicitly exposed and addressed (e.g., Turnhout, 2024). The focus on measurable, predictable outcomes to qualify for funding sidelines less tangible social aspects, which are often treated as unintended consequences or inherent "goods" from NbS interventions rather than deeply intertwined with landscapes and ecosystems through long histories of co-existence between people and nature (Mehta et al., 2019; Welden et al., 2021). As embedded in Scoones et al.'s (2015) analysis of the politics of sustainability transformations, the over-emphasis on measurable outcomes in NbS demonstrates how dominant framings, like the financialisation of nature, can further narrow valuations of landscapes and, at the same time, promote simplistic and instrumental understandings of social dimensions. This can lead to what McDermott (2014 p.18) describes as 'displaced decision-making about controversial issues', which includes the equity implications of natural capital markets, and all non-carbon and biodiversity environmental and social values. Prioritising measurable evidence to justify the value of nature and ecosystems, particularly for financing NbS, risks fundamentally closing down meaningful opportunities to embrace bottom-up knowledge systems and alternative, participatory forms of governance.

Beyond calls for reframing NbS to be more plural or inclusive, the results indicated that achieving transformative change requires more explicit attention on systemic shifts that address power imbalances and

problematise the domination of specific knowledge types, interests, and values. Transformative NbS must consider proactive community rights and empowerment, agency to veto land-use decisions, tangible community benefit schemes, decentralised landownership, and cooperative finance structures (e.g., see Doyle, 2023; Martin et al., 2023; McIntosh, 2023). It is also important to recognise the potential trade-offs between equity and community-led goals, and objectives for biodiversity and carbon (McDermott et al., 2023). However, instead of pitting democracy and conservation imperatives against one another - as implied by some of our interviewees and also in several recent studies, e.g., Martin et al. (2023) - NbS proponents can build on understandings of different pathways to sustainability transformations as not mutually exclusive but as strategically combined to serve specific purposes and objectives (Scoones et al., 2015). Recognising the limited likelihood of short-term radical change, while staying committed to longer-term transformative shifts, means understanding that various routes to sustainable outcomes can coexist. It also requires acknowledging that conflict between different pathways is inevitable, and that contestation and democratic debate around multiple priorities is essential for transformation, rather than an obstacle that needs to be overcome or mitigated against (Patterson and Paterson, 2024; Stirling, 2015; Willis, 2020). Governance approaches for NbS must create the space and time for a wide range of actors to enact their own priorities without the need for consensus and to promote meaningful dialogue, learning, and shifting power dynamics between different actors.

5.2. It is important that NbS embrace (rather than try to control) risk and uncertainty

The findings revealed a central tension in NbS between embracing complexity as an opportunity for creative and innovative responses to sustainability challenges, or as a risk that needs controlling in times of crisis. The literature suggests that NbS can be “controlled” (Stirling, 2015) to ensure positive (often carbon and biodiversity) outcomes and mitigate negative impacts, undesirable trade-offs and complexities (also see Mehta and Srivastava, 2020; Nightingale et al., 2020; Scoones and Stirling, 2020). In reality, as Section 5.1 considers, attempts to measure and control NbS often obscure issues and relationships that cannot be quantified. As discussed below, the tendency to reduce uncertainty often promotes centralised governance by “expert” authorities.

Centralised approaches to landownership emerged from the interviews as archetypal mechanisms for exercising control and ensuring precise, measurable, and verifiable conditions for financing and scalability. Decentralised and participatory approaches were often perceived as too risky, introducing undesirable levels of complexity through navigating trade-offs, contested priorities, and diverse knowledge types. As Chausson et al. (2023) suggest, transformative shifts away from hegemony require a critical re-thinking and re-structuring of market mechanisms and policies that value landscapes holistically, incorporating diverse benefits and values grounded in justice, rather than focusing narrowly on efficiency, upscaling, increasingly precise measurement, and commodifying nature. This could involve transferring land assets to communities of place (e.g., McIntosh, 2023) and mechanisms to bring land into a local common pool resource, strengthening local democracy and community power over land-use decisions (Doyle, 2023).

If dominant framings prioritise more centralised governance systems to finance and upscale NbS, they may unintentionally exacerbate power imbalances and injustices through legitimising and reinforcing top-down strategies for controlling uncertainty (Nightingale et al., 2020; Pickering et al., 2020). If it is increasingly assumed, as suggested by many interviewees, that ‘the better and more established the link between a land use change and the beneficial impact on ecosystem services and sustainability is, the higher the likelihood of project success’ (Blignaut, 2019 p. 3), then any uncertainty around delivering these benefits is seen as unnecessary or undesirable complication to project

success and long-term resilience. This is problematic because, as Walter and Wansleben (2020) argue, financing mechanisms not only result in the ‘transformation of uncertainty into risk’ to rationally calculate new knowledge about what these risks might be (and how to avoid them), but also reinforces the ‘assumption of a fundamentally static and continuous world that does not undergo any fundamental substantive changes’ (ibid, p. 34). Such assumptions are at odds with more transformative approaches that embrace, rather than seek to control, the inevitable complexity and uncertainty that arises from continuous democratic struggle, contested interests, and the diverse co-construction of knowledge (see Turnhout, 2024; Turnhout et al., 2020; Scoones et al., 2015; Welden et al., 2021).

An overemphasis on controlling uncertainty often leads to gathering more data through increasingly precise measurements and technological advances, as seen in many NbS projects described by interviewees. Nightingale et al. (2020) caution that this perpetuates a “technical trap” focused on identifying threats and responding to impacts to create change. As a result, NbS can succumb to addressing sustainability issues through primarily techno-scientific measures and top-down management systems, despite their widely acknowledged limitations and implications (McDermott, 2014; Nightingale et al., 2020; Stanley, 2024). These problems stem from wider technocentric framings that do not challenge existing political systems and power imbalances (Turnhout et al., 2020) and marginalise the experiences, interests, and lived realities of local communities (Mehta and Srivastava, 2020). Conceptually, the prioritisation of centralised finance and land ownership arrangements in NbS reinforces static realities and understandings of society and the environment as separate (e.g., Welden et al., 2021). This is not only ontologically incorrect because society is not discrete from nature (Walter and Wansleben, 2020) but also overlooks the emergent and continuously co-constructed nature of societies and environments (Jasanoff, 2013). As discussed in Section 5.3, this has profound implications for the ways in which participation is understood and practised, obscuring co-constructivist views (Chilvers, Kearnes, 2015, 2020) through an over-emphasis on fixed, procedural understandings and “best practices”.

Our findings highlighted practical ways for NbS to embrace risk and uncertainty rather than merely control it. Practitioners proposed “no regrets” investments that acknowledge the unpredictability of strategies designed to deliver multiple benefits. This aligns with Decision-making under Deep Uncertainty (DMDU) methods (Stanton and Roelich, 2021; Wells et al., 2023), like Dynamic Adaptive Pathways Planning (DAPP) (Haasnoot et al., 2024), which have emerged to address the limitations of traditional predictive approaches to addressing environmental challenges by emphasising adaptability across future scenarios. DMDU and DAPP guide adaptive plans with flexible, near-term actions that avoid investing too much too early, or locking in resources, often using participatory processes that integrate both qualitative and quantitative data (e.g., Vizinho et al., 2021). While NbS decision-making often prioritises scientific over local knowledge, adaptive approaches can evolve strategies in light of emerging uncertainties (Stanton and Roelich, 2021), asserting that uncertainty cannot always be reduced or eliminated but is fundamental to more creative, dynamic and resilient pathways to sustainability transformation (Leach et al., 2010).

5.3. Proponents of NbS must avoid perpetuating “democracy washing”

More than two decades after Cooke and Kothari’s (2001) seminal work on the tyranny of participation, our analysis reveals how dominant framings within NbS perpetuate the normative assumption of participation as an inherent “good” that can be leveraged for multiple benefits. Participation was also frequently understood and implemented by the interviewees and survey participants as an instrument to increase community and public support for existing goals, rather than to embrace different understandings of the problem and solutions needed. Within dominant NbS framings that prioritise certainty and control,

participation becomes a tool to help stabilise and maintain, rather than challenge and unsettle, existing interests and power imbalances.

Dominant conditions in NbS can perpetuate what [Chilvers, Kearnes \(2015; 2020\)](#) describe as “residual realist” views of participation that prioritise fixed and procedural views of participation (also see [Chilvers and Longhurst, 2016](#)). These views are problematic because they treat participation and “communities” (or “publics”) as singular, external entities with pre-given characteristics ([Brown, 2009](#)) and demarcate the limits of participation and establish specific characteristics of what “good” looks like (e.g., representative, inclusive) through frameworks and standards of best practice (see [Newig et al., 2023; Raymond et al., 2017](#)). NbS focusing on aligning external actors, like local communities or broader members of the public, to pre-determined project goals also risks exacerbating the widely acknowledged undemocratic implications of participation, where opportunities for contestation and struggle for power are overridden by a focus on consensus and representative politics ([Kiss et al., 2022; Rees and Doyon, 2023; Stirling, 2008, 2015; Turnhout et al., 2020; Woroniecki et al., 2020](#)).

In viewing participation – and who and what is involved – in terms of specific, discrete, or invited activities, such perspectives fail to recognise the evolving multiplicity and multivalence of participation. This can undermine transformation and reinforce static understandings of people as separate to NbS ([Welden et al., 2021](#)), rather than as active protagonists in their production and our knowledge of them. Instead, [Chilvers, Kearnes \(2015\), \(2020\)](#) argue for a (re)conceptualisation of participation as continuously (co-)constructed through performance with wider systems, institutions, and socio-material practices (also see [Turnhout et al., 2010](#)). It is important that NbS create space for these diverse forms of participation, which often have different framings of problems and solutions, to encourage transformations through discontinuous political struggle rather than structured management and control.

The current assumptions about participation within NbS risks “democracy washing”, akin to greenwashing, but focused on manipulating participatory democratic principles for superficial purposes ([Cooke and Kothari, 2001; Few et al., 2007](#); also see [McIntosh, 2023](#) p. 31, on “community washing”). Democracy washing involves projecting an illusion of democratic engagement while undermining genuine participatory processes by concealing deeper questions of power and equity. While this may not always be intentional, NbS proponents must be cautious about key assumptions, norms, and practices being naïve to, or concealing, these issues. Alongside growing calls for the reframing of NbS ([Chausson et al., 2024; Welden et al., 2021](#)) to be delivered *with and for people* ([Seddon et al., 2021](#)), it is vital that NbS proponents advocate for an urgent critical reassessment of participation that highlights the need for vigilance in assessing the authenticity of participatory processes, holds institutions accountable, and explicitly challenges the power imbalances that undermine genuine participation and empowerment.

6. Conclusion and suggestions for practice

NbS is a powerful concept that aims to deliver co-benefits, integrate diverse knowledge types, and leverage participatory governance to support broader sustainability transformations. However, despite numerous efforts to rethink and reframe NbS, dominant framings can end up narrowing and obscuring, rather than opening up and embracing, the messy and conflicted democratic struggles that are essential for transformation to happen. Drawing from interviews with practitioners, policy makers, private and civil actors in the UK, this paper has highlighted three themes that demonstrate how these issues unfold. First, many NbS projects prioritise techno-scientific and market-driven objectives that favour measurable and verifiable evidence, often privileging the role of scientific, financial, and business expertise over other actors and knowledge systems. This not only fails to challenge existing hierarchies between different actors and knowledge systems,

and so reinforce power imbalances between what “counts” as legitimate knowledge and authoritative actors in NbS, but also exacerbates narrow valuations of landscapes and simplistic understandings of social dimensions as by-products from ecosystem services. Second, these dominant framings risk heightening existing patterns of concentrated land ownership and financing mechanisms in NbS, particularly through the prioritisation of centralised governance systems to secure measurable, verifiable, and predictable outcomes and mitigate risk and uncertainty. Finally, despite good intentions for promoting the participatory governance of NbS, participation itself can become a tool to stabilise and maintain, rather than challenge and unsettle, existing interests and power imbalances. This risks “democracy washing” where participation exacerbates the very inequalities that NbS claims to help dismantle. This suggests that the current way in which NbS are understood and imbalanced can not only undermine transformative change, but ends up obscuring and diverting attention away from more pertinent questions about politics, power, and democracy. Transformative NbS must explicitly address these issues and foster a shift away from framings and approaches that privilege certainty towards more open-ended framings that embrace conflict, uncertainty, and continuous democratic struggle.

These arguments do not undermine the importance of robust science, technology, or private finance, nor do they imply that science, technology and finance are necessarily fundamentally at odds with participatory, bottom-up governance. Instead, this paper has unpacked the complex power dynamics and issues that arise when transformations are narrowly framed, leading to an over-emphasis on one approach at the expense of another. Furthermore, although radical transformative shifts are needed, this is unlikely to happen in the short term, and environmental organisations often face lack of capacity and institutional biases that hinder their ability to deliver on multiple sustainability goals ([Hafferty, 2022a; 2022b](#)). In recognition of these issues, we also offer pragmatic governance guidance for NbS practitioners on the Nature-based Solutions Initiative Knowledge Hub (see [Hafferty et al., 2023; NbSI, 2024](#); also see [Davis et al., 2023](#)).

This study also has limitations that highlight areas for further research. Notably, while our UK-based findings are arguably relevant further afield, it was out of scope of the study to provide a robust comparison between the results of NbS implemented in a UK context against international case studies. Future studies could compare NbS projects between the UK and other developed countries, as well as against developing nations. The research also focused only on practitioners and decision-makers implementing NbS projects, rather than the beneficiaries and/or affected groups (e.g., local and Indigenous communities). Further studies would benefit from capturing and integrating the voices of those who are seldom heard, harder-to-reach, or frequently left behind and marginalised within dominant NbS initiatives.

To achieve genuine transformation, there are hopeful ways that NbS can move towards more adaptive and open-ended approaches that explicitly recognise the implications of dominant framings for closing down, rather than opening up, diverse pathways to sustainability that nurture human-nature relationships. This must ultimately involve making a commitment to cultivate and create space for – rather than control and close down – alternative perspectives, pathways, and possibilities for justice and well-being.

CRedit authorship contribution statement

Caitlin Hafferty: Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Emmanuel Selasi Tomude:** Writing – review & editing, Validation, Formal analysis, Data curation. **Audrey Wagner:** Writing – review & editing, Methodology. **Constance McDermott:** Supervision, Funding acquisition. **Mark Hiron:** Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known conflict of interests that could have influenced this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.envsci.2024.103979.

Data availability

The data that has been used is confidential.

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