



Just nature recovery: A framework for centring multispecies and multi-dimensional justice in land management

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ABSTRACT

A rising interest in nature recovery has expanded the focus of conservation beyond protected areas to encompass a range of terrestrial and marine areas, from forests, fields, and farms, to cities, coasts and oceans. These expansions create new practical and theoretical contestations regarding how, why, and for whom nature recovery projects should be pursued. Such contestations are particularly pronounced in Scotland, a country with a long history of struggles over land rights, widespread loss of natural habitats, and highly unequal land ownership patterns. This paper examines how different framings of justice, and different approaches to nature recovery, interact to either entrench or redress past and present injustices in a range of Scottish examples. We argue that multispecies conceptions of justice that eschew human-centric framings provide a normative basis for recovering nature, while multi-dimensional framings of justice as distributive, procedural and recognitional help specify a range of requirements for social change. Both frames highlight injustices in current trajectories and the need for alternative approaches to deliver a just transition in nature recovery. We outline a three-step process for further research on justice issues and for developing policy recommendations. This entails 1) historicising contexts, 2) considering both multispecies and multi-dimensional understandings of justice, and 3) uncovering alternative nature recovery strategies that might more explicitly foreground justice considerations.

1. Introduction

There is growing excitement in environmental science, discourse, and policy about recovering nature across a wide diversity of landscapes (Fischer et al., 2021). This goal has been pursued through a range of discursive and policy strategies, including rewilding, ecosystem restoration and agroecological approaches (Bastin et al., 2019; Bullock et al., 2022; Griscom et al., 2017). For some scholars and practitioners, restoring human modified landscapes, including farms, fields, timberlands and cities, can provide ‘nature-based solutions’ to a range of socio-ecological problems (Hafferty et al., 2025; Seddon et al., 2019). Scientific research has contributed to this social and political momentum by highlighting the importance of more extensive and diverse natural habitats for realising climate and biodiversity goals (Bossio et al., 2020; Chausson et al., 2020; Cook-Patton et al., 2020; Seddon et al., 2020). As the nature recovery agenda thus expands, so does the diversity of people and livelihoods affected, in ways that intersect with long-standing contestations over land and resource rights. Alongside the

growing momentum for nature recovery, there have been sustained and significant calls for a ‘just transition’ in environmental policy, especially in regards to the climate (Macfarlane and Brett, 2022; Newell and Mulvaney, 2013; Stevis and Felli, 2020). These calls highlight the need to incorporate justice considerations into nature recovery strategies in ways that recognize social as well as environmental diversity, and the underlying drivers of land use conflict (Bulkeley and Walker, 2005; Neyret et al., 2023).

This paper builds on environmental justice literatures to consider how conceptions of justice can be integrated across a range of nature recovery projects. Specifically, we consider the complexities and difficulties of delivering an intersectional just transition in the growing efforts to recover nature in Scotland.

Our analysis is guided by two overlapping but distinct frames: ‘multispecies justice’ (MSJ) and ‘multi-dimensional justice’ (MDJ). MSJ is an emerging field which breaks away from anthropocentric and overtly legal framings of justice, whilst departing from animal rights-centric accounts of nonhuman justice (Singer, 2017). It is closely

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associated with modes of citizen or community-based research geared towards exposing environmental injustices (Kirksey and Chao, 2023). In another register, MSJ arises in legal anthropology and legal studies where researchers have examined attempts to legislate for the personhood of nonhumans (e.g., rivers) and to enshrine into law Indigenous cosmologies that have long recognised this personhood. Building on these foundational works, this paper pushes work on MSJ in a novel direction, developing the framework in relation to nature recovery.

MDJ expands ideas of justice to encompass its distributive, procedural and recognitional dimensions, and it encourages reflection on questions related to the ‘target’ of justice: who counts, what counts, and who decides what counts are central considerations (McDermott et al., 2013; Martin et al., 2016). MDJ provides a relatively systematic framework for unpacking the power dynamics behind environmental governance, and highlights how these dynamics shape inequalities in access to, and benefits from, land and natural resources. There is scope for synergy, nuances, and convergences between MSJ and MDJ.

This paper proceeds as follows. Section 2 examines the relevance of MSJ and MDJ theory to nature recovery and presents a schematic for integrating MSJ into MDJ. Section 3 introduces Scotland as a case study and historicizes Scottish land use. Section 4 applies a combined MSJ-MDJ lens to interrogate different approaches to nature recovery in Scotland. Section 5 draws on these findings to highlight alternative policy responses that might better foreground justice considerations. Section 6 concludes by summarizing our findings and considers how this analysis might apply across different cases.

2. Situating justice in nature recovery

MSJ calls for a reconfiguration of liberal conceptions of justice, “broadening conceptions of the subject of justice and the means and processes of recognition” (Celermajer et al., 2021, 119). Drawing from the concept of “ecological vulnerability,” MSJ promotes “a theory of justice that positions the autonomous self within a larger relational framework of existence” (Kirksey and Chao, 2023, 5). In doing so, it becomes possible “to recognize how unequal vulnerabilities impact humans as well as species and ecosystems” (Kirksey and Chao, 2023, 5). MSJ is not a prioritisation of nonhuman lives over human lives. Rather, it advances justice according to the principle that the worlds created by governance interventions, such as nature recovery projects, are necessarily shared among many species.

Similarly, the MDJ framework, and the closely related concept of multi-dimensional equity (McDermott et al., 2013), provides an analytic to interrogate how nature recovery interventions across a range of scales differentially shape diverse, but ultimately interwoven, dimensions of justice. In particular, MDJ foregrounds questions of procedural justice regarding who should define and mediate justice in the first place, recognitional justice regarding whose knowledge and priorities are recognized and respected in decision-making processes (potentially including non-human species), and distributive justice regarding who should bear the costs of interventions and reap their benefits (McDermott et al., 2013).

Interrogating distributive justice means asking how the ecological, economic, social, and political benefits of nature recovery are shared among different groups, including communities living near or on land included in nature recovery projects. Given the histories of violence and displacement within nature conservation schemes, especially in post-colonial and neo-colonial settings (Büscher and Fletcher, 2020), it is important to consider who is allowed to access and create livelihoods on recovering land, and how race, gender, class, wealth, and species distinctions affect beneficiaries. Addressing how land rights were introduced, stolen or obscured is critical, as is examining whether communities are forced to create “green sacrifice zones”, in which land is removed from local or collective management and ‘spared’ for nature recovery (Edstedt and Carton, 2018; Zografos and Robbins, 2020).

Procedural justice considers the fairness of land use decision-making

(Smith and McDonough, 2001; Stirling, 2008). It often centres on procedural and fixed participatory approaches where fairness is tied to leveraging more informed, inclusive and deliberative democratic decisions and outcomes (Fiorino, 1990; Raymond et al., 2017). Tensions often arise between democratic ideals and the realities of participatory processes, with a large body of research exploring how participation can both advance and constrain equitable, inclusive, and just outcomes (Kiss et al., 2022). Various typologies, frameworks and methodologies exist for procedural forms of participation (e.g., see Hafferty et al., 2024), ranging from top-down approaches where key decisions are made at higher levels, to bottom-up processes of co-creation and more emancipatory self-mobilised forms of governance. More broadly, Chilvers et al. (2024) provide an overview of different forms of participation in engagements with nature and biodiversity in the UK, from discrete one-off events led by organisations to more diverse and emergent approaches. Critiques of procedural forms of participation are well-documented, recognising that the outcomes of participatory interventions can be paradoxical and end up reinforcing the very issues of fairness or inclusion that they sought to address (Turnhout et al., 2020). This has led to critiques of ‘democracy washing’ in nature recovery in the UK, and in Scotland specifically (McIntosh, 2023).

Recognitional justice considers how separate groups of people (as well as potentially non-human species), and their identities, cultural practices, and knowledges, are accommodated for and respected in governance processes (Reed et al., 2018). People have different understandings of what nature is, how it should look, how it should be known, how it should be measured, and who should benefit from it. These are questions of profound political importance. Yet discursive appeals to ‘nature’ are routinely used to obscure political decisions through a rhetoric that morally equates natural with ‘right’ and ‘normal’, thus suggesting that a particular attempt to restore or conserve nature is naturally the right thing to do (Sullivan, 2017). For example, restoring a prehistoric baseline (Deary, 2015) or wilderness devoid of humans has historically functioned to exclude local, poor, peasant, Black, Indigenous and people of colour communities from land and resources across myriad geographical contexts (Braun, 2002). Recognitional justice requires highlighting the (often obscured) colonial, gendered and racist histories of oppression, violence and displacement that have created contemporary political conditions, and foregrounding these histories in practice (Mohai et al., 2009; Pellow, 2016; Chao, Bolender and Kirksey, 2023).

In nature recovery projects, technocratic forms of knowledge, especially neoclassical economics, are routinely privileged over other, often local or situated, knowledges of a recovering landscape (Pritchard et al., 2022). Ecologies can be measured in standardized ways that make their processes and properties quantifiable and their governance scalable (Scott, 1998), and technical advances in measurement apparatus can enable detailed assessments of ecological progress, which may reward nature recovery efforts by potentially encouraging further investment. Measurement techniques can be put to work in nature recovery in ways that support market-orientated forms of governance whilst obscuring or ignoring other social and ecological dynamics (Sullivan, 2017; 2018; Robertson, 2006, 2012; Turnhout et al., 2014; Stanley, 2024). These measurement regimes can have sometimes perverse or even damaging social and ecological impacts, such as encouraging large-scale tree planting for carbon maximisation (Markusson, 2022), including afforestation projects on inappropriate landscapes such as deserts (Elkin, 2022). Diversifying the range of knowledges and insights beyond natural capital-centric framings can help realise resilient and healthy ecologies which are valued not simply for their carbon value.

3. Historicising justice, land use and nature recovery in Scotland

Scotland is an insightful case study for analysing how MSJ and MDJ can be considered simultaneously in nature recovery efforts. It is a

nation with a complex environmental history and contested culture of nature, with competing visions of what nature is, how it should look, and who should benefit from it (Lorimer, 2000; Smout, 2006; Mackenzie, 2013). In recent years, Scotland has stepped up its strategies for nature recovery and nature-based carbon sequestration. It has pledged to achieve net zero emissions by 2040 and was the first European country to sign up to the Bonn Challenge, the IUCN's pledge to restore 500 million hectares of land by 2030 (Sharma et al., 2023). Historicizing the context of these developments is important for highlighting how different justice claims have been advanced or obscured, and lays the foundations for understanding and identifying pathways towards change.

In Scotland, historicizing justice in nature recovery requires situating policies and practices within historical and existing patterns of highly concentrated landownership and unequal distributions of wealth. Scottish patterns of private land ownership are among the most concentrated in Europe (McMorran et al., 2022). According to historian Andy Wightman, in 2024, just 433 landowners own half of Scotland's rural land (Wightman, 2024). The early roots of this inequality can be traced back centuries to a range of drivers including feudalism, the enclosure of rural land and forced evictions of traditional farming communities, and Britain's foreign colonial expansion (MacKinnon and Mackillop, 2020).

Across much of rural Scotland, in the late-eighteenth and early nineteenth centuries, diverse farming systems were replaced by large-scale sheep farming, which "was judged the most 'rational' economic option" by landlords (Devine, 2018, 134). When the price of wool fell in the mid-nineteenth century, sheep were replaced by deer on many estates, as 'deerstalking' became an increasingly fashionable activity for British social elites. Thus, having been cleared of human and ecological communities deemed unprofitable or undesirable, Scotland's characteristic empty moorlands became celebrated and symbolic of a wild Scottish nature (Lorimer, 2000).

Woodland covered the majority of Scotland several thousand years ago, after the icecaps retreated and the climate warmed. The majority of native woodland was cleared by agricultural settlers over the following millennia, with woodland cover eventually falling to just 5 % by 1900 (Smout, 2006). Now, while 19 % of Scotland is covered in trees, most of these are conifer plantations grown for timber production, consisting mainly of non-native species such as Sitka spruce (Oosthoek, 2013; Forest Research, 2022). Large expanses of Scotland's hillsides and moorland are almost completely treeless and do not support a diverse range of biodiversity (Warner et al., 2022). Empirical studies have demonstrated that the overpopulation of deer—historically initiated and continually enabled by the establishment of hunting estates — is the major ecological dynamic suppressing the recovery of a more biodiverse nature (Fuller and Gill, 2001; Rainey and Holmes, 2023). Despite the ecological impacts, deerstalking, along with grouse shooting, remain major land uses across rural Scotland, especially in the Scottish Highlands, the sparsely-populated mountainous region covering much of Scotland's North-Western third.

The histories of concentrated wealth, class stratification, and violence that led to the creation of Scotland's fetishised 'wilderness' landscapes, and the extensive labour and finance that contribute to their maintenance, have largely been obscured by land-owning actors who continue to benefit from them (Lorimer, 2000; Deary, 2015; Wightman, 2010). While many Scottish estates have been owned by the same families for generations, large agribusiness firms and other corporate investors have further contributed to the contemporary concentration of Scottish land ownership (McMorran et al., 2022). Scotland's relative lack of regulation surrounding international investment and landownership, coupled with tax exemptions and area-based subsidies for forestry and agriculture which place no limits on the total quantity of benefits a single landowner can receive, makes Scottish land particularly attractive to large-scale investors.

In Scotland, core mechanisms to meet nature recovery targets include state-based peatland and woodland carbon markets, whilst a biodiversity credit market is currently under development (Sharma

et al., 2023). The Scottish government also runs a Forestry Grant Scheme that provides government grants to cover costs associated with tree planting. Through these and other incentive programmes, large areas of private land, which are often treeless and widely considered to be ecologically degraded, are being repurposed for nature recovery. Additionally, natural capital projects in Scotland are developing new techniques for measuring and verifying "investable" nature (Stanley, 2024). The effects of these markets for carbon and other forms of natural capital, combined with subsidies for tree planting, have contributed to dramatic spikes in land value (Hollingdale, 2022).

When considered with these historical, economic and political factors in mind, the contemporary appetite for nature recovery, particularly when underpinned by market-based approaches, can be understood as a contingent outcome of a very specific cultural and environmental history. The following analysis applies a combined MSJ and MDJ lens to analyse the justice dimensions of these trends, with the use of several empirical examples.

4. Justice in Scottish Nature Recovery – a multispecies, multi-dimensional analysis

4.1. Multispecies justice on a Scottish estate?

A MSJ approach highlights the histories of violence and oppression that have created ecological conditions in which only a largely privileged set of humans (and entangled or adjacent nonhumans) flourish, at the expense of others. It thus draws attention to the ways in which specific forms of rural land management can lead to simplified, disconnected or impoverished ecologies, from which only certain humans and nonhuman species stand to gain. In the Scottish context, calls for nature recovery have centred around the creation of wild native woodland, whose regeneration has been repressed due to centuries of deforestation and overgrazing (Smout, 2006; Oosthoek, 2013). However, as our theoretical exploration above has highlighted, simply realising a specific type of landscape or ecological community – such as creating biodiverse or wild native woodland – is not, in itself, equivalent to realising MSJ. The multi-dimensional and intersectional politics in which these novel ecologies are situated must also be interrogated, to consider who benefits, human and nonhuman, from these dynamics. This interrogation is fraught and, in Scotland, necessarily linked to complex histories of class and wealth.

Glenfeshie Estate in the Cairngorms National Park provides a fascinating case through which to consider the myriad dimensions of pursuing MSJ in nature recovery. At Glenfeshie, deer populations expanded in the nineteenth and twentieth centuries due to the eradication of natural predators and the favouring of deerstalking for recreational hunting. The growing herd suppressed the natural regeneration of the estate's ancient Caledonian pinewood, which has a historical lineage recorded back to at least the seventeenth century (Steven and Carlisle, 1959). As part of a landscape-scale rewilding project at Glenfeshie, deer have been extensively culled since the early 2000s. Following the cull, native woodland has regenerated widely, providing habitat for vulnerable species such as capercaillie and setting an alternative future trajectory for the estate's ecology (Painting, 2021).

Although the Glenfeshie project is a flagship of nature recovery and is widely enjoyed by nature lovers, birdwatchers and hikers, a single landowner holds authority on how the land should, and will, look. The estate itself is managed by Wildland, a company owned by one of Scotland's largest and richest landowners. Glenfeshie provides an example of where the flourishing of multispecies ecologies can come through concentrated land ownership and the concentration of financial capital in elite hands. MSJ problematises a politically narrow assumption that nature's conservation or recovery is an inherently 'good' or just outcome, without making sweeping statements about any forms of land management or control being necessarily bad or unjust.

4.2. Distributive justice

The concept of distributive justice under the MDJ framework helps highlight these inequalities of land and resource access, as well as how they vary across different types of interventions. Amongst the key questions of distributive justice are ‘who benefits from nature recovery?’, ‘who is gaining financially?’ and ‘who is paying?’ Where nature recovery is increasingly financed through carbon markets, the recipients of income are the private landowners on whose land trees are growing. Given the concentrated nature of land ownership in Scotland, those with the most land stand to receive a disproportionate income from carbon credits (Hollingdale, 2022). Meanwhile, the state Forestry Grant Scheme uses public (taxpayer) money to fund nature recovery projects from which private individuals or companies can generate carbon income (Sharma et al., 2023). The favourable economic conditions for private landowners have encouraged a rise of so-called ‘green lairds’, private landlords looking to purchase land to profit from nature recovery interventions. This has also increased demand for plantable land, from which natural capital income can be generated, leading to the recent drastic rises in land prices noted above. This further financially excludes community groups from purchasing and owning land, and therefore accessing carbon income (Hollingdale, 2022).

However, how particular governance approaches, such as area-based subsidies or market mechanisms, are implemented, and by whom, may also have a major effect on distributional outcomes. The NGO Trees for Life, for example, have created a ‘community carbon share’, in which the charity donates one-third of its carbon credit income to the local community living near a carbon-funded nature recovery project (Scottish Land Commission, 2024). Similarly, Wild Heart Forest, a reforestation project in the Scottish Borders managed by the NGO Borders Forest Trust, generates revenue through selling ‘high integrity’ carbon credits, which warrant a premium because they promise ecological and community regeneration alongside carbon sequestration. The proceeds are reinvested into maintaining the organisation, who consult other small-scale native woodland creation projects in Southern Scotland, offering free advice, site surveys, woodland design, and support to access funding for native tree planting schemes.

These more community-based approaches indicate that there are a range of distributional outcomes associated with market-based approaches to nature recovery. Understanding the circumstances which might lead to different outcomes and at what scale (currently the community carbon share model is relatively rare) is foundational for exploring how regulatory and legislative frameworks might serve to steer markets to operate in more or less just ways.

4.3. Recognition justice

Delivering recognition justice requires foregrounding how different groups of people, and their identities, cultural practices, and knowledges, are accommodated for and respected in governance processes. In Scotland, the rise of natural capital markets has fuelled growing interest and investment in natural capital verification technologies such as drone-mounted sensors and remote sensing techniques. There are concerns that such technologies might lead to a ‘lock-in’ of natural capital-centric models of delivering and evaluating the success of nature recovery schemes (Gabrys et al., 2022). There are also fears that relying on privately marketed, high-tech measurement techniques might implicitly encourage natural capital to be “known not grown” (Stanley, 2024), a situation in which more natural capital is measured and sold without an increase in carbon sequestration or biodiversity uplift necessarily occurring.

At the same time, technologies for measuring and mapping ecology can be used to examine the health and resilience of ecosystems, the drivers of forest decline, and the socio-ecological barriers to forest recovery (Rainey and Holmes, 2023). One example is Trees for Life’s Caledonian Pinewoods Recovery Project. It provides ecological data

which highlights the importance of expanding ancient woodland through natural regeneration, in which endemic and symbiotic communities of plant, fungi, mushroom and animal species, which have often co-evolved in a specific ecological provenance over centuries, can expand together (Stanley, 2023).

Reviving and respecting Indigenous and local knowledge that was largely lost through centuries of rural outmigration is also an element of recognition justice. For example, Scottish historian-activist Col Gordon’s research centres the Gaelic term *Dùthchas* in conversations about Scottish land governance (Gordon, 2023). *Dùthchas* is a word almost untranslatable into English, that captures the feeling of belonging and interconnectedness between land, place, and care for Gaelic speakers, as well as the responsibilities to care for land (Raeburn and Cumming, 2024). In areas such as the Hebrides and Highlands, it is important to consider the ways in which nature recovery involves embracing situated practices associated with *Dùthchas*, such as old grazing techniques, or rejecting them in favour of more top-down and technocratic understandings of how nature recovery should be delivered.

Whilst nature markets, and the technologies which are being leveraged to support their implementation, have important implications for distributive and recognition justice, it is questions of procedural justice that are critical to understanding how the relationship between governance and technological approaches result in different justice outcomes.

4.4. Procedural justice

Questions of procedural justice address who is involved in decision-making, who is excluded, and how. In Scotland, much of this discussion revolves around communities of ‘place’ and communities of ‘interest’, and what constitutes an appropriate balance of voice in decision-making processes (Hoffman, 2013). A key factor affecting participation is the transparency of decision-making processes. For example, in March 2023, NatureScot, Scotland’s conservation agency, signed a memorandum of understanding with Hampden, a private bank, and Palladium and Lombard Odier, two investment firms, to receive up to £2 billion in loans to expand forestry and peatland restoration (NatureScot, 2023). The loanes aim to sell the carbon credits generated from the nature restoration projects. The agreement was signed with detailed clauses that require secrecy on the project’s finances, which make external examination and critique of the project difficult. In its justification for this model, NatureScot suggested there is no alternative to engaging private finance. According to Brendan Turvey, NatureScot’s low carbon manager,

“We’ve no option but to embrace new financial models to meet these [climate and reforestation] targets. There’s not enough public money, full stop, to deliver all the things we need to do to get to net zero... We need to act now if these are to help us get to net zero by 2045.” (quoted in Carrell, 2023)

The project has been widely critiqued by community and conservation groups, including Community Land Scotland, a membership organisation for community land groups, for its secrecy, its reliance on disputed economic calculations as justification, and its uneven distribution of benefits (Hollingdale, 2023).

There is no inherent link between nature recovery and carbon financing. Yet when private investment is presented as the only means available for scaling up nature recovery with the urgency required, procedural justice considerations of how, why, and by whom nature recovery should be done tend to be sidelined.

In sum, the application of both MSJ and MSD lenses highlights a number of core justice challenges for nature recovery. While there are no fixed justice outcomes associated with any particular approach to nature recovery, different approaches are likely to deliver different configurations of justice and injustice. In thinking through questions of justice in nature recovery, it is important to articulate different approaches and to reflect on their potential to deliver different forms of justice and

injustice.

5. Recognising and considering alternative approaches

The previous discussion identified how market-based approaches to nature recovery, in particular, have created challenges for achieving justice in Scotland's nature recovery goals. Articulating these issues in terms of the multiple dimensions and understandings of justice not only helps to parse out the nature of these challenges, but also helps point the way to alternative policy approaches. This is particularly important given the increasingly widespread view that 'there is no alternative' to market-based natural capital approaches to nature recovery (Karlsson and Karhunen, 2024). For the purposes of illustration, we briefly introduce three potential alternatives that speak to the different MSJ and MDJ justice challenges discussed above.

5.1. Reconsidering the role of regulation

In the contemporary Highland ecosystem, deer populations flourish at the expense of wider biodiversity and ecosystem functionality. Deerstalking remains an elite activity overwhelmingly reserved for a privileged few humans, and deer numbers are controlled by private landlords on whose estates deer roam (Lorimer, 2000; Wightman, 2010). Increasing the state-mandated deer cull, in which deer numbers are limited to a carrying capacity that supports the natural regeneration of native woodland, could lead to widespread forest resurgence. Shifting ecological conditions through government policy interventions would potentially allow for forests to recover (to an extent) independently of natural capital finance. Critical social scientists, economists and ecologists might work collaboratively to consider how such a policy could be developed in ways that might enable multispecies flourishing and which are attentive to the livelihoods of human communities who rely on deerstalking (for discussion see Painting, 2021).

5.2. Alternative financial mechanisms

There are various alternative financial mechanisms which could potentially allow for a more equal distribution of benefits than large-scale privatization and nature credit markets. For example, the conservation charity The John Muir Trust are calling for a carbon land tax (John Muir Trust, 2021). Instead of only offering incentives to large landowners with extensive degraded land (a "carrot"), a carbon land tax could force landowners to make radical changes in how land is managed ("a stick"). For example, land which emits large amounts of carbon, such as degraded peatland, could be taxed. Whilst this intervention would not necessarily lead to a more equal distribution of financial benefits amongst humans on a local level, it might encourage more widespread action on nature recovery and offer incentives for achieving MSJ. The idea is growing support: the Scottish Green Party has backed calls for a local carbon or land tax levy (Scottish Greens, 2023). No doubt, a carbon land tax, and other alternative financial interventions, would have several logistical and procedural difficulties. Nonetheless, we see this as an opportunity for further academic research, especially for interdisciplinary collaborations between economists and ecologists.

5.3. Prioritising community decision-making

The third alternative involves deepening the prioritisation of community-led decision-making. Handing over decision-making power to local communities can contribute to positive environmental as well as socio-economic outcomes (Newig et al., 2023). Currently, however, community groups own only about 2.7 % of Scottish land (Scottish Government, 2023), a similar distribution of land ownership to England and the rest of the UK (Shrubsole, 2019). Whilst grants are available for community land buyouts from the Scottish Government for up to £ 1000, 000 via the Scottish Land Fund, individual estates often cost more than

this amount, leaving community groups unable to compete with private companies and landlords (Hollingdale, 2022). Further empirical research might investigate novel ways to finance community buyouts, foster cooperatives, and support more multi-level governance of natural resources. There are well-known challenges in community ownership models, but there is also much room for further research to inform their design (Mackenzie, 2009; 2010, 2013). Debates on Scottish land distribution and nature recovery would be well served by more robust evaluations of the ways in which community ownership reconfigures patterns of justice and injustice across dimensions.

6. Conclusion

Nature recovery is rapidly moving up the policy agenda. Alongside this growth in interest and enthusiasm, and the expansion of nature recovery efforts across human-modified landscapes, there are growing concerns that nature recovery will overlook and exacerbate long-standing concerns related to justice. The growing public appetite for nature recovery, and the immediacy of the problems which nature recovery projects can address, should not obscure the need for a just transition. Here we offer a framework for academics, policy makers and practitioners to incorporate justice considerations more substantively into their work. The framework builds on and augments existing work by 1) emphasising the importance of historicising the context, 2) combining perspectives from the emerging literature on multispecies and multi-dimensional justice and, 3) highlighting the role of engaging with different ways of pursuing nature recovery.

Social justice considerations must be integrated with insights from ecological science, and vice versa. The climate and biodiversity crises cannot be navigated solely through technological breakthroughs and establishing new mechanisms for nature's financialisation. When ecologies are ostensibly 'recovered' in ways that do not consider a diversity of scientific and situated knowledges, projects might reproduce or further entrench problematic dynamics, including an uneven distribution of beneficiaries. Simultaneously, ecologies themselves can become streamlined to suit technocentric and economic priorities, or state interests (Robertson et al., 2023). Alongside technological and scientific innovations, transformative outcomes demand radical shifts towards more emergent, open-ended and situated ways of recovering our shared more-than-human world that do not necessarily require fixed, determinable, and measurable outcomes (Hafferty et al., 2025). If multi-dimensional and multispecies justice is to be embedded in nature recovery, then understanding and tackling these issues cannot be achieved solely by teams of natural scientists, data scientists and engineers; they must work with a range of disciplines to find solutions that achieve wider socio-ecological goals.

CRedit authorship contribution statement

Eric Mensah Kumeh: Writing – review & editing. **Caitlin Hafferty:** Conceptualization, Investigation, Writing – review & editing. **Theo Stanley:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Writing – original draft, Writing – review & editing. **Lea May Anderson:** Writing – review & editing. **Constance L. McDermott:** Conceptualization, Supervision, Writing – review & editing. **Mark Hiron:** Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing, Data curation. **Jonathon Turnbull:** Conceptualization, Writing – review & editing. **Jamie Lorimer:** Conceptualization, Investigation, Supervision, Writing – review & editing.

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Data availability

No data was used for the research described in the article.

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