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Received: 5 January 2021 | Accepted: 29 September 2021

DOI: 10.1002/pan3.10276

PEOPLE AND NATURE | BRITISH ECOLOGICAL SOCIETY

RESEARCH ARTICLE

Mainstreaming the Environment: Exploring pathways and narratives to improve policy and decision-making

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Funding information
Natural Environment Research Council, Grant/Award Number: NE/R00398X/1

Handling Editor: Marc Tadaki

Abstract

1. Mainstreaming is an interdisciplinary and transdisciplinary endeavour of normalising an idea from one policy domain into the decision-making and routine activities of other policy domains necessary for effective delivery over the long term.
2. The desire to mainstream springs from an increasing acceptance of the need for interdisciplinary and transdisciplinary approaches to tackle key societal challenges such as climate change and biodiversity decline. Here, traditional policy and disciplinary silos are broken down to pursue and deliver more holistic interventions.
3. This paper offers an additionality perspective to mainstreaming based on four questions. What is mainstreaming and what additionality does it offer for environmental policy and practice? What theoretical insights emerge from the mainstreaming and associated literatures? How can mainstreaming processes and outcomes be conceptualised and assessed? How can we improve future environmental mainstreaming pathways?
4. Building from literatures focussed on mainstreaming and policy integration, we construct a framework and supporting narrative focussing on the lifecycle dynamics of mainstreaming pathways; a significant research gap. Their nonlinear progress is captured using theoretical adaptations of diffusion of innovation and sustainability, moving from initial innovation through to persuasion and to acceptance pathways, with progress dependent on the interplay and impacts of hooks and barriers and the degree of collaboration and system change pursued.
5. Our narrative is further illuminated using natural capital and ecosystem services which reveal that while some progress has been made primarily through weaker mainstreaming pathways, current efforts are still focussed on 'persuading' stakeholders of the environment's value, rather than on initial framing and governance arrangements to maximise future impact.
6. We conclude that the framing and development of natural capital and ecosystem services primarily in the environment and economic sectors has limited mainstreaming activity to wider audiences due to the lack of interdisciplinary and transdisciplinary approaches being pursued from the outset, including a more

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publicly and professionally accessible vocabulary and collaborative governance and decision-making structures.
7. We contend that our lifecycle narrative, with a focus on multiple pathways, hooks, barriers and collaboration makes a useful contribution to understanding mainstreaming dynamics and characteristics from which improved interventions can be developed.

KEYWORDS
behaviour change, environment, interdisciplinarity, lifecycle, mainstreaming pathways, policy integration, transdisciplinarity

1 | INTRODUCTION

> Why are we not reducing our emissions? Why are they, in fact, still increasing? Are we knowingly causing a mass extinction? Are we evil? No, of course not. People keep doing what they do because the vast majority doesn't have a clue about the consequences of our everyday life. And they don't know the rapid changes required.
>
> Greta Thunberg Extinction Rebellion Rally, London, October 31, 2018.

The above quote from Thunberg highlights both the challenge and opportunity for mainstreaming climate change. While the scientific evidence for human-generated climate change is unassailable, we need greater understanding of the consequences of our inaction concomitant with the prioritisation of rapid actions across all sectors. Resistance is fuelled, in part, by a prevailing economic growth model that does not take climate change into account within cost–benefit assessments, but also by a lack of understanding of impacts of everyday policy decisions at household, agency and government levels (Benson et al., 2014). According to Dalal-Clayton and Bass (2009, p. 11), this can be addressed by a mainstreaming process with includes '*… the informed inclusion of relevant environmental and climate change concerns into the decisions of institutions that drive national, local and sectoral development policy, plans, rules, investment and action*'.

While the widespread global reaction of authorities and agencies declaring a climate emergency represents a positive and strong political statement of problem recognition, corresponding actions are more elusive and ad hoc. Thunberg (2018) further laments that '*some people say that I should study to become a climate scientist so that I can solve the climate crisis. But the climate crisis has already been solved. We already have all the facts and solutions. All we have to do is to wake up and change*'.

It is the process by which we '*wake up and change*' that represents the core mainstreaming challenge for this paper. According to Benson et al. (2014), the goal of environmental mainstreaming is to equip policymakers and planners with better evidence and tools to improve the efficacy and equity of policy and decision-making. While better tools might help, they still have to be fit for purpose and usable. As Cowling et al. (2008, p. 9483) suggest on their environmental mainstreaming work, this '*… is achieved primarily through behaviour change*', which focuses attention on how effectively the science is translated and communicated to publics through knowledge exchange; its political and public acceptability; and people's willingness to change behaviours.

This link between embedding the environment in built environment policy and securing necessary behaviour change is crucial to mainstreaming success (Benson et al., 2014). The UK National Ecosystem Assessment (2011) and its follow on programme UK NEAFO (2014) sought to do this by mainstreaming the ecosystem science into built environment practice (Scott et al., 2018). However, this came up against barriers with built environment professionals not fully understanding or accepting the concept of ecosystem services due to its complexity and conflicting priorities from government for economic growth; findings echoed in the international literature (Hannon, 2005; Penn, 2003). Ultimately, they did not have sufficient motivation or capacity to achieve Dalal-Clayton and Bass' (2009) goals, except within ad-hoc innovator projects where working outside the established orthodoxy was key (Scott et al., 2018).

Furthermore, mainstreaming inertia is exacerbated by a silo mentality where different sectors develop their own paradigms and vocabularies to identify, diagnose and treat problems separately, hindering cross-fertilisation (Leach et al., 2019; Scott et al., 2013). Hence, concepts such as ecosystem services evolve within an environmental silo without other key sectors being involved from the outset. This makes mainstreaming more difficult given the unequal levels of understanding and application across different sectors. Benson et al. (2014) expose a government-led fallacy that proposes ministries of environment as the best agency to lead on environmental mainstreaming. They found that environmental actions across national policies, sector plans, and budgeting processes gain more traction and success if led by, or collaborated with, more influential ministries of planning and/or finance.

Calls for more joined-up working are hardly new, as highlighted by the World Conservation Strategy in 1980, which recognised that

the '*separation of conservation from development together with narrow sectoral approaches to living resource management are at the root of current resource problems. Many of the priority requirements demand a cross-sectoral, interdisciplinary approach*' (IUCN, 1980, Ch.8.6). This fuelled a strong response spawning the growth of policy integration literature which provides an important strand of mainstreaming work and ideas (Lafferty & Hovden, 2003; Persson & Runhaar, 2018; Runhaar et al., 2020). The synergies between mainstreaming and policy integration literatures are still quite weak and relatively unexplored as, according to Runhaar et al. (2020), mainstreaming does not yet have the same definitional and conceptual maturity. This paper seeks to address this deficit to better capture mainstreaming character and dynamics.

Indeed, 'mainstreaming' is often claimed uncritically in the literature perhaps reflecting a failure to make explicit what is being mainstreamed; for what purpose and what success involved (Benson et al., 2014; Cowling, 2005; Runhaar et al., 2020). Indeed, mainstreaming is not a panacea. For example, Mommaas and Janssen (2008, p. 27) suggest the single-minded pursuit of such approaches can often result in compromise and lowest common denominator solutions leading to conservatism and risk-aversion (Vigar, 2009). Looking at environment and climate mainstreaming thus far, progress has been disappointing in both global and national contexts, exemplified by ongoing rapid environmental decline (IPBES, 2019; IPCC, 2019a, 2019b), raising key questions as to whether mainstreaming interventions in practice actually deliver better outcomes given the resource requirements (Candel, 2021; Russel et al., 2018). This context provides core ammunition for this paper which is predicated upon four core questions.

1. What is mainstreaming and what additionality does it offer for environmental policy and practice?
2. What theoretical insights emerge from the mainstreaming and associated literatures?
3. How can mainstreaming processes and outcomes be conceptualised and assessed?
4. How can we improve future environmental mainstreaming pathways?

2 | WHAT IS MAINSTREAMING AND WHAT ADDITIONALITY DOES IT OFFER FOR POLICY AND PRACTICE?

Mainstreaming is a process, approach and outcome (Scott et al., 2018). According to Karlsson-Vinkhuyzen et al. (2017, p. 145), mainstreaming '*involves taking a specific objective of one issue domain and declaring that this objective should be integrated into other issue domains where it is not (yet) sufficiently addressed*'. This definition synergises with ideas and theory advanced in the environmental policy integration (EPI) literature where, according to Persson and Runhaar (2018), it refers to the incorporation of environmental concerns within sectoral policies outside environmental policy domains.

Mainstreaming is commonly encountered in diverse fields; human rights (e.g. Lee, 1993), feminism (e.g. Daly, 2005), gender (e.g. Walby, 2005), inclusion (e.g. Scruggs & Mastropieri, 1996), disability rights (e.g. Priestley & Roulstone, 2009), poverty eradication (e.g. de Coninck, 2009), disasters risk reduction studies (e.g. Overseas Development Institute, 2019), education (e.g. Lindsay, 2007) and environment (e.g. Cowling et al., 2008; Nunan et al., 2012).

The goal of mainstreaming is to enable more holistic responses and joined-up interventions to a given policy priority that is being resisted or challenged in other policy sectors which is vital to overcome for its successful operation (Benson et al., 2014; Cowling et al., 2008). Yet, all too often problems are identified, diagnosed and treated in separate policy and disciplinary silos (Leach et al., 2019). By breaking down silos, mainstreaming processes can help the realisation of mutual benefits, reduce duplication and disintegration in policy, and promote innovation and long-term resilience (Adger et al., 2005; Runhaar et al., 2014). However, Cowling et al. (2008, p. 9484) recognise this is a tricky, uncertain and time-consuming process requiring inclusive and cooperative governance frameworks that champion adaptive management strategies and effective knowledge exchange. More insights from key environmental mainstreaming and policy integration literature are captured in Box 1.

3 | WHAT THEORETICAL INSIGHTS AND LESSONS CAN BE GLEANED FROM RESEARCH LITERATURE ON ENVIRONMENTAL MAINSTREAMING AND POLICY INTEGRATION?

Box 1 summarises key environmental mainstreaming and policy integration papers where the synergies between the two literatures are evident. Box 1 reveals the prevalence for authors to develop their own bespoke frameworks or typologies for assessing the degree of policy integration or mainstreaming rather than building on, or accepting one core framework. Furthermore, many of these frameworks involve summative assessments at one moment in time rather than any systematic exploration of their changing dynamics over time and how these may have fractured or metamorphosed into different initiatives or concepts or even failed. There is also a focus on individual case studies rather than any cumulative assessment of how well they have contributed to an environmental mainstreaming goal, although Cowling et al.'s (2008) framework provides a notable exception. Another key factor in all contributions is the focus on governance and collaboration. However, there is significantly less attention on potential delivery mechanisms or tools to achieve mainstreaming goals, albeit with some useful contributions on policy drivers, mechanisms by Candel (2021).

BOX 1 Capturing mainstreaming and policy integration ideas from different disciplinary lenses

Author and contribution	Framework developed	Comments
Lafferty and Hovden (2003) **Environmental policy integration: towards an analytical framework**. Provides conceptual definition of Environmental Policy Integration with an associated framework	**Vertical Policy Integration**: indicates extent to which a particular governmental sector has adopted/ implemented environmental objectives in the objectives that the governmental body pursues. **Horizontal policy integration:** the extent to which a central authority has developed a cross-sectoral strategy for EPI	Environmental objectives have a 'principled priority' over other objectives. Ideas of different scales of policy integration reflecting both governmental enabling and agency delivery
Russel et al. (2018) **Understanding policy integration in the EU—Insights from a multi-level lens**. Framework to evaluate integration of climate adaptation in the European Commission using institutionalism	Institutions affect the integration of cross-cutting initiatives within sectoral decision-making at three different scales: - **micro** (individual), **meso** (organisational) **macro** (wider societal goals and values)	Key finding that institutional factors internal to the policy system in terms of problem framing, organisational structure and incentives at the meso and micro levels are important influencers in the success of policy integration initiatives
Candel (2021). **The expediency of policy integration** Develops processual framework for understanding of policy integration	Policy frame: framing and bounding of policy challenge **Subsystem involvement**: range of networks/actors dealing with the challenge **Goals:** the range of sectoral policies involved and coherence **Instruments**: range of instruments used to improve coordination and address challenge	Policy integration should consider disintegration and integration but 'shades' of grey between sectoral policymaking and policy integration. Questions of how integrative approaches emerge on the agenda; who drives these and how; who are the ultimate winners and losers moving away from a dominant technocratic approach
Runhaar et al. (2020) **Policy Integration**. Provides a meta-analysis of scientific, empirical research including barriers and enablers for policy integration	**Barriers:** policy implementation gap; conflicting interests; governance structures routines and practices; lack of knowledge and guidance **Enablers**: cooperation with private actors; political commitment; framing of issue; social learning	Finds discrepancy between the adoption of EPI in terms of objectives and commitments and its actual delivery. Limited number of cases where environmental objectives given priority in non-environmental policies. Institutional architecture and design of processes matters
Benson et al. (2014) **Environment and climate mainstreaming: challenges and successes** Focuses on the Poverty and Environmental initiative of UNEP examining mainstreaming of environment and climate change into development policy and budgeting	**Challenges**: Institutions and leadership; funding; implementation; monitoring and evaluation **Successes**: Government; Collaboration and Transdisciplinary activity; UN regional partnerships	Environment ministries are not best suited to deliver on environment due to influence. Using economic and financial data (hooks) presented in the language of planners/economists shows how environmental management can meet wider development goals of agencies
Karlsson-Vinkhuyzen et al. (2017) **Mainstreaming biodiversity in economic sectors: An analytical framework**. Typology developed using expert review/consultation to identify three key dimensions and ten sub-dimensions of governance that are important for economic sectors	**Institutional:** horizontal interactions; vertical interactions; policy and norms **Motivational: i**nterests, values; framing and leadership **Means**: Knowledge Time and Resources	Importance of multiple governance frameworks as a critical driver of mainstreaming. Role in understanding the way barriers and levers operate using the framework to go beyond traditional mainstreaming models. Mainstreaming strategies run the risk of watering down biodiversity if there is sufficient nature protection policies and political support

BOX 1 (Continued)

Author and contribution	Framework developed	Comments
Cowling et al., 2008 **An operational model for mainstreaming ecosystem services for implementation**. Develops model to mainstream ecosystem services via social ecological system thinking within a policy cycle	**Assessment phase;** Planning phase; Management phase **Stakeholder collaboration**: informed involved empowered **Spatial scale**: Regional to Local **System state**: Vulnerable to Resilient. Multi-dimensional model positioning mainstreaming at the Planning—Management interface	Operational model to mainstream ecosystem services based on socio ecological system thinking using pathways to resilience across assessment, engagement, scale and system state. Highlight needs for transdisciplinary research in ecosystem services based on user needs and priorities for practice from the outset. Such upfront investment will empower stakeholders to implement effective on-the-ground management that will achieve resilience
Scott et al. (2018) **Mainstreaming Ecosystem Science in spatial planning practice: Exploiting a hybrid opportunity space** Develops a mainstreaming typology for assessing mainstreaming activity via diffusion of innovation model	**Retrofit:** mainstream processes are done retrospectively on policy or plan to avoid conflict **Incremental:** mainstream processes are delivered adding to existing policy approaches but requiring no fundamental change **Ecosystem Approach** led: More fundamental mainstreaming using a social ecological systems perspective	Role of hooks and bridges set within different stages of a policy cycle. Hooks are mechanisms that are core to particular sector that can be used to translate the environmental concepts that are being used to mainstream. Bridges have the same idea but relate to concepts that are used and understood across multiple publics. Mode reflects capacity and capability with ability to move between stages
Runhaar et al. (2018) **Mainstreaming climate adaptation: taking stock about what works from empirical research worldwide** Focuses on what makes mainstreaming effective through a meta-analysis of climate adaptation mainstreaming literature	**Programmatic mainstreaming**: via projects & programmes **Managerial mainstreaming**; related to sectors and departments **Intra- and inter-organisational mainstreaming**: relates to collaboration and networking **Regulatory mainstreaming**: via statutory planning and regulatory instruments **Directed mainstreaming**: re-focus via higher level support	Key findings that analysis and operationalisation of mainstreaming is diverse, limited and inconsistent. The implementation gap for mainstreaming relates to a lack of a sustained political commitment for mainstreaming from higher levels, and the lack of effective cooperation and coordination between key stakeholders

We have used Box 1 content to identify additional themes to help the reader understand mainstreaming identity and functions which are subsequently unpacked further expanding Box 1 content.

- Building and securing collaboration across multiple disciplines and policy sectors (Benson et al., 2014; Cowling et al., 2008; Runhaar et al., 2018; Scott et al., 2018)
- Managing change (Benson et al., 2014; Cowling et al., 2008; Russel et al., 2018; Scott et al., 2018)
- Delivering policy integration (Candel, 2021; Lafferty & Hovden, 2003; Runhaar et al., 2020; Russel et al., 2018)
- Understanding the impact of governance and institutional actors (Benson et al., 2014; Cowling et al., 2008; Karlsson-Vinkhuyzen et al., 2017; Russel et al., 2018).
- Achieving behaviour change (Benson et al., 2014; Cowling et al., 2008; Karlsson-Vinkhuyzen et al., 2017; Scott et al., 2018)
- Understanding hooks and barriers (Cowling et al., 2008; Karlsson-Vinkhuyzen et al., 2017; Russel et al., 2018; Scott et al., 2018)

3.1 | Building and securing collaboration across multiple disciplines and policy sectors

Effective collaboration and stakeholder engagement is a necessary but often overlooked component in mainstreaming processes (Cowling et al., 2008; Runhaar et al., 2018). It builds trust and confidence that interventions will be fair and transparent (De Vente et al., 2016); assists knowledge transfer and social learning; and enables new concepts to be better understood, enhancing the rate

of diffusion (Scott et al., 2018). Additionally, when practised as a two-way process, it creates common language, agreed terms of reference, and shared understanding of issues and solutions (Benson et al., 2014).

However, there are varying degrees to which engagement can, and is allowed to, occur. Often there is concern that engagement is a politically motivated and controlled process enabling only powerful and influential voices to be heard and acted upon (Karlsson-Vinkhuyzen et al., 2017; Runhaar et al., 2018). Rather than seeing engagement as a panacea, understanding its limitations is key to understanding why certain change is resisted (Konisky & Beierle, 2011). Understanding and questioning key stakeholders' complex psychosocial circuits that connect their values, beliefs, identity, motivations and lived experiences significantly influences mainstreaming potential (Pérez & Simon, 2017).

In particular, mainstreaming processes can be built upon interdisciplinary and transdisciplinary work ideally at the outset of any process (Cowling et al., 2008; Jahn et al., 2012). Through transdisciplinary work, all actors should have equal access and ability to put ideas forward to address challenges (Bunders et al., 2010) to then produce additional levels of working and insight building a resilient legacy component beyond the initial project work (Cowling et al., 2008; Jahn et al., 2012).

3.2 | Managing change

Any new concept or idea needs to have sufficient credibility to persuade people to agree with it and deliver it as part of policy or decision-making. It is here that the theory of diffusion of innovation can help us to better understand mainstreaming as a journey proceeding in pathways through a wider policy ecosystem (Rogers, 2003). According to Rogers (2003), as new ideas are invented they progress through five key stages: knowledge/evidence generation, persuasion, decision (adoption/rejection), implementation and confirmation. Progress is never linear, however, and can be reversed leading to failure. Here, the effectiveness of the communication channels, receptiveness of key gatekeepers and stakeholders and the nature of the knowledge/innovation itself, all become key drivers.

Kuhn's (1962) ideas on conceptual change help us better understand the dynamics of a contested change process. Where there is no consensus on a particular subject, competing schools of thought develop, each with their respective champions until there is sufficient traction for an overriding paradigm. Once established, any change is managed incrementally usually within the existing paradigm. However, at some stage, more tenacious problems or anomalies may be exposed which challenge the existing paradigm resulting in more significant change, perhaps leading to a new paradigm; but all dependent on the viability of any alternatives presented. Here, agenda setting offers useful insights into how change processes can be catalysed through the act of challenge. For example, work on gender mainstreaming by Jahan (1995) reveals how women's influence in society is weakened based on conventional differentiation by class, race and nation which hinders a stronger influence via a single powerful political constituency. The emergence of the #MeToo campaign provides a transformative example to achieve 'empowerment through empathy' for assault survivors which spawned a global reawakening movement for women (Rodino-Colocino, 2018). Similarly, the re-energisation of Black Lives Matters through a 'racial capitalism' agenda has helped mobilise a global campaign (Isaar, 2020).

3.3 | Policy integration

Policy integration provides a complementary theoretical lens to view mainstreaming. Its research focus has been on institutional and governance concerns to help improve the way environmental concerns can be embedded within sectoral policies outside environmental policy domains (Lafferty & Hovden, 2003; Russel et al., 2018). This body of work has exposed useful insight on barriers and levers for EPI through their different typologies (e.g. Candel, 2021; Lafferty & Hovden, 2003; Russel et al., 2018), but they tend not to assess the degree of implementation or impact which makes it unclear how successful they have been.

Conceptual development has been significant with EPI frameworks highlighting working across both vertical (across scales; global to national to regional to local) and horizontal considerations (across sectors; Lafferty & Hovden, 2003; Watson et al., 2008). The concept of principled environmental prioritisation has also been successfully advanced and supported here (Lafferty & Hovden, 2003), highlighting the need to go beyond integration in comparison to other objectives. There is also a more critical literature on the weaknesses of policy integration as a desirable goal in itself, with a concern that perhaps too much focus has been on government-led models for EPI at the expense of more fundamental questions of how integrative approaches first emerge on the agenda; at what scale; who drives these forward; what strategies are employed with what result and who are the ultimate winners and losers (Candel, 2021; Russel et al., 2018). This focusses attention on values, behaviour(s) and politics with the need for EPI to deliver something additional to what was there before (Humphrys, 2015).

3.4 | Understanding impact of governance and institutional actors

Governance brings into focus the dynamics of power relationships and conflict management (Jordan & Schout, 2006). Russel et al. (2018) identify how these operate across different levels from individual agency to societal values, stressing the need to study the interactions between levels as much as the levels themselves. Lafferty and Hovden (2003) highlight the need to understand both the extent to which a governing body has adopted environmental policy within its portfolio of objectives and priorities as well as the extent to which it is integrated across other policy sectors at

other scales (see also Briassoulis, 2017). Here leadership (Jordan & Lenschow, 2008), knowledge flows (McKenzie et al., 2014) and scale (Turnpenny et al., 2014) become key factors in enabling desired policy and behaviour change (Kingston & Caballero, 2009). Parsons (1990, p. 333) states that structural change is key as it is '*concerned with the process by which existing value systems change and new elements come in*'. Indeed, the formation of new institutional structures, management procedures and partnerships are often enabled and strengthened by legislation and regulation (Petersen & Huntley, 2005). However, regulation can also fail; dependent on how it is conceived, delivered and enforced, set within overall public acceptability. Indeed, work in the UKNEAFO (2014) found that it was the bundling of regulatory, incentive and participatory tools that had most impact and that relying on one component alone was dangerous while Kingston and Caballero (2009, p. 171) highlight how institutional change '*becomes fundamentally not about changing rules, but about changing expectations*'. Hence, adaptive capacity, social learning and participatory action feature as 'softer' but significant mechanisms for building stronger mainstreaming pathways in what are complex and uncertain environments experiencing both gradual and rapid change simultaneously (Candel, 2021; French & Lowe, 2018; Pahl-Wostl, 2009).

3.5 | Behaviour change

Policymakers have long sought to understand and influence people's behaviour and actions. Principal among the policy armoury has been the use of law and regulation, (dis)incentives and guidance (Scott et al., 2014). However, due to their perceived bureaucracy and impacts on business, attention has focused on behavioural approaches as part of a wider mix of policy options and interventions (Forestry Research, 2012). Here, Cowling et al. (2008) highlight the potential value of social marketing strategies where existing behaviours are taken as read and then barriers to change are identified with bespoke incentives then designed to tackle them. The concept of leverage points can be adapted to a mainstreaming framework, distinguishing between shallow and deep sustainability interventions (Abson et al., 2017; Chan et al., 2020; Meadows, 2009). Shallow interventions, such as taxes, are relatively easy to employ, though they will only achieve minor system changes without necessarily generating long-term behaviour change. Whereas deeper interventions are more value-based and demand more upfront investment, given their emphasis on collaborative working, co-production and knowledge exchange. But, they deliver greater resilience and potential for system change by promoting long-term behaviour change and stronger mainstreaming.

3.6 | Understanding hooks and barriers

The twin concepts of hooks (enablers) and barriers (restrictions) provide important insights into mainstreaming success. Here, Runhaar et al. (2020) make a significant contribution through a meta-analysis of barriers and enablers. For enablers (hooks), it was important to frame the environmental challenge inclusively, dealing with issues of jargon (see also Fish & Saratsi, 2015). Collaboration and engagement with private actors and stakeholders, usually within partnerships, was crucial in going beyond traditional reliance on top-down regulation and legislation in demonstrating wider buy-in, as was securing sufficient political commitment (Runhaar et al., 2018). Scott et al. (2018) agree, citing the need for effective leadership at both elected members and chief officer levels to catalyse and manage change. The final hook was about successful evaluation; learning from past endeavours including mistakes.

For barriers, the major issue was the disconnection between the desire and ambition of policy and its delivery in practice; and the policy implementation gap (Runhaar et al., 2020). This is exacerbated by the weak wording of much environmental policy enabling conflicting interests to readily trump environmental interests (Hislop et al., 2019; McWilliam et al., 2015). This reflects the efficacy of governance frameworks and available tools to deliver on the environment as well as associated routines and practices (Lockwood et al., 2010). Here the way environmental agencies work with other agencies can become important, the extent to they operate in silos or collaborate (Benson et al., 2014). For example, Briassoulis (2017) highlights the way that the EU Commission, despite deepening the integration of policy, has created structures with over specialisation of functions and competencies. Furthermore, the role of individual gatekeepers and micropolitics can be really important drivers (see Mcareavey, 2006). A further barrier relates to lack of knowledge and guidance which becomes significant when people are having to focus on multiple priorities. Thus, any perceived extra burdens can be easily dismissed (Cowling et al., 2008).

From a purely environmental perspective, there are bespoke barriers which limit mainstreaming potential. Perhaps the most significant is that the environment does not easily generate direct financial revenue through taxes and donations, with benefits of investments not easy to capture or to transfer (Hanley& Barbier, 2009). So natural capital values are simply estimates of net value. While these have led to the growth of payments for ecosystem services schemes, particularly in water catchments and carbon trading (e.g. Reed et al., 2017), cutting resources for environmental planning, management and delivery is still widespread. Furthermore, conventional accounting methods treat the environment as a liability ignoring the wider benefits to society because benefits (including health, flood risk regulation, biodiversity, etc.) are not readily accounted for, while the associated costs for long-term environmental management can be accounted more easily (Horwood, 2011). Recently, the Dasgupta Review has advanced the case for such valuations and we are beginning to see the emergence of a whole new suite of green investment and finance mechanisms for funding nature (Dasgupta Review, 2021: HM Treasury 2020).

4 | TOWARDS A MAINSTREAMING FRAMEWORK

In developing our mainstreaming framework, we support Cowell and Lennon (2014) who champion using methodological approaches that better integrate competing theories and ideas rather than producing more complexity and competition through creeping theoretical incrementalism. Thus, we do not develop new theory or frameworks; rather we draw from Box 1 and wider literatures to present a complementary framework that also addresses identified weaknesses. As most assessment frameworks are linear and summative, we focus our attention on the temporal and dynamic aspects of mainstreaming (Figure 1).

Figure 1 charts three hypothetical mainstreaming pathways across two different axes. On the *x*-axes, the degree of diffusion and change over time is captured through core stages of innovation, persuasion and adoption (Scott, 2020). On the *y*-axis is the degree of system change desired, progressing from shallow (incremental change) to deep (transformational change; Abson et al., 2017; Chan et al., 2020; Meadows, 2009). The colour gradient in the mainstreaming pathways from red to blue represents the degree of collaboration, reflecting the importance of interdisciplinary and where possible transdisciplinary collaboration across multiple science and policy sectors (Cowling et al., 2008). Here it is important to recognise that high levels of collaboration can support both shallow and deep system change, but, in general, greater mainstreaming outcomes can be attributed to a higher degree of collaboration.

Theoretically, optimal mainstreaming is achieved in Path 1, but it is dangerous to view this without reference to the wider context within which mainstreaming proceeds. Here, the direction and progress of mainstreaming pathways will be affected by the potency of hooks/enablers (e.g. regulation, incentives and public engagement) and barriers (gatekeeper inertia, political actions, lack of guidance).[1] Success is dependent on the capacity and capability of the entire policy ecosystem to accept or resist change as well as the transformative nature of the change itself (Rogers, 2003; Scott, 2020). The success of mainstreaming is also crucially shaped by the different strategies pursued within the innovation–persuasion–adoption stages and it is here that feedback loops through social learning and reflexivity become particularly significant (Scott et al., 2018). Figure 1 also highlights that progress is messy and nonlinear in the different pathways.

Morever, the pathways depicted here are theoretical and illustrative. So, within any assessment process, a narrative should be produced and justified that charts the pathway progress and potency of key hooks and barriers. This retrospective 'snakes and ladders' perspective helps evaluation and development of future strategies by building a picture of progress over time. Ideally, this picture becomes more meaningful with more assessors improving triangulation.

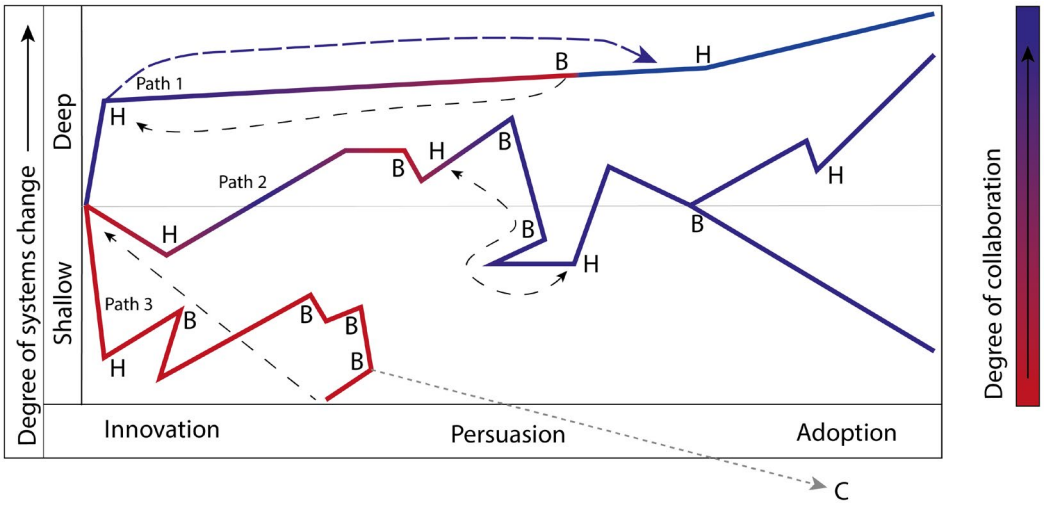

FIGURE 1 Mainstreaming framework: three different mainstreaming pathways. Mainstreaming Path 1 shows strong collaboration from the start with a significant hook (H) involving multiple audiences with potential to design and deliver deeper system change. Because there has been early participation to develop shared values, progress through the persuasion phase is less problematic. In adoption, there may still be barriers (B) necessitating further innovation through feedback learning and evaluation loops (dashed arrow). Hence, because of the learning aspect barriers should not always be seen as negative in their overall impact. Mainstreaming Path 2 starts with more shallow system change, but tries to pursue deeper pathways and collaboration via different hooks and barriers, each with differing degrees of impact. Eventually, the mainstreaming pathways split in response to a barrier, highlighting that pursuing deep and shallow interventions simultaneously with high levels of collaboration can lead to successful outcomes. Mainstreaming Path 3 follows a shallow mainstreaming pathway with limited collaboration, never really reaching sufficient traction or translating outside of the initial policy sector and, therefore, stalling in the persuasion phase. Consequently, it is subjected to multiple internal and external policy pushbacks with the cumulative impact of barriers being particularly problematic. Comment: The dotted line to C highlights the possibility of breaching tipping points which changes the entire policy ecosystem into crisis, which is the ultimate risk from Kuhn's (1962) change model

Our focus on the dynamics of mainstreaming pathways enables change to be captured from merger, fragmentation or stalling in response to new conceptual developments or other policy drivers. Understanding the interdependencies here becomes very important and suggests that there may well be more than one pathway to model as, for example, in environmental mainstreaming (Figure 1 description). This adds significant complexity to previous assessment frameworks (Box 1). Figure 1 is now unpacked across the different diffusion phases, as a nonlinear measure of time, supported by environmental examples building on the path descriptions above.

4.1 | The innovation phase

In the innovation phase, a new concept or idea is introduced, normally in one policy domain, but by no means should it be necessarily so. Indeed, there is strong evidence that by pursuing an explicitly collaborative approach, encompassing transdisciplinary activity from the start, greater traction can be built to overcome traditional barriers (Path 1: Cowling et al., 2008; Scott et al., 2018). In environmental mainstreaming, we saw the science-led introduction of ecosystem services in environmental policy to transform the way the environment was viewed and valued (MEA, 2003). Initially, such change was challenged by some (e.g. O'Neill, 2001; Spash, 2008), but it generated enough traction due to supporting evidence, sector champions and peer review publications. For example, the legacy of the Millennium Ecosystem Assessment led to global ecosystem assessments (e.g. TEEB, 2010; UKNEA, 2011), thus securing sufficient traction amongst key environmental scientists and agencies to advance. In this innovation phase, ecosystem service processes were generally seeking shallow/incremental system change with relatively limited collaboration outside the environment sector.

In this stage, any new concept may stall or, indeed, fail. Key is the evidence provided and the perceived impact of the changes. Concepts can be enabled through legislative or policy hooks but also failure can occur due to key barriers. However, failure can lead to adapted ideas in successive innovation phases as long as there is sufficient social learning, evaluation and feedback involved.

4.2 | The persuasion phase

The persuasion stage involves designing and developing processes that enable the concept or idea to become accepted within other key policy sectors that are deemed crucial for its successful delivery and impact (Scott & Hislop, 2020). It is here that increased collaboration should become evident. The experience of the UK National Ecosystem Assessment (2011) is illuminating here. This scientific document was well received in the environmental policy arena and, indeed, informed a subsequent environmental white paper. However, a follow-on project UKNEAFO (2014) was deemed necessary to help mainstream the science into wider built environment policy, helping persuade others to embed ecosystem services thinking into policies, plans and decision-making tools (Scott et al., 2014). This echoed Cowling et al.'s (2008) ambitions, with success being contingent on the ability to break down internal and external barriers to change and exploit relevant policy hooks in these other sectors. Gatekeepers, complexity of the knowledge itself, who is behind the idea/knowledge, the absence/presence of competing ideas, the effectiveness of language and communication, the presence of sector champions, perceived cost and resource implications and overall public desirability, all became active considerations in shaping progress (Runhaar et al., 2020). Scott et al. (2018) note here the crucial importance of being able to 'translate' any new policy idea into the language and priorities of different key sectors using their hooks to gain initial traction and credibility to build enough support to advance through the persuasion stage towards adoption. This is where some mainstreaming efforts stall or commonly break down when relying on the vocabulary from the initial policy domain for communication and collaboration. Only if, and when, sufficient momentum is established, the policy or objective might then become tested and debated in some current policy and decision-making systems; perhaps as a pilot seeking evidence of positive impact and additionality. The decision whether to pursue deep or shallow system change is important here depending on what is pragmatic and also politically acceptable. Often, there is an initial reluctance to pursue deep transformational change as incremental change is often preferred politically in the first instance. However, progress is never linear and experiences gained from these 'pioneer' attempts add more social learning, generating feedback loops into the mainstreaming process and knowledge itself as opportunities and barriers emerge. Thus achieving successful shallow outcomes based on pragmatic assessment of what is politically acceptable might then provide the impetus for deeper efforts. However, if deeper efforts had been pursued from the start the barriers may have been too strong for any success. Alternatively, as path 2 (Figure 1) shows, two pathways can be pursued simultaneously.

Consequently, progress through the persuasion phase is highly unpredictable and messy, but for the best chances of success it is likely that several mainstreaming pathways should be pursued to gain acceptance across the other policy domains. This is important and reflects the need to depict mainstreaming as a series of interlinked pathways rather than just one. Using the example of ecosystem services in the UK, the persuasion phase has been in existence from 2003 to the present day, arguably, with selected examples and champions that have tried to mainstream, to some extent, ecosystem services in the planning system (Scott et al., 2018; UKNEAFO, 2014). However, it has waned significantly due to governmental resistance to the term itself and also due to a lack of familiarity across the built environment professions. Indeed, a separate breakaway pathway in natural capital has been evident since 2015 which seemingly has actually captured more government traction. The establishment of the Natural Capital Committee further reduced the explicit currency of ecosystem services in popular usage. But new pathways in green infrastructure and nature-based solutions have also emerged complicating an already crowded environmental policy ecosystem. Such

growth could be a boost for all mainstreaming pathways but also, if poorly understood, could cumulatively weaken mainstreaming (unpacked further in Figure 2).

In some instances, a hook or key agent or system shock might help, such as improved media coverage, political support, unexpected event and/or strong leadership (Candel, 2021; Jordan & Lenschow, 2008; Scott et al., 2018). Indeed, this can be transformational as in the case of Blue Planet or Black Lives Matter which sparked a range of government and agency responses globally (BBC, 2017; Isaar, 2020; New York Times, 2020). However, they should not be seen as isolated magic bullets as the context of past efforts and failures is important to understand too (Isaar, 2020). Furthermore, the ongoing challenge, for sure, is maintaining the change in actual behaviours and values for the long term. It is here that many mainstreaming efforts stay stuck in the persuasion phase and/or shallow mainstreaming unable to get the necessary traction towards adoption across other policy sectors.

4.3 | The adoption phase

The adoption phase is where the concept or idea has gained sufficient traction and acceptance in the persuasion phase to become normalised in policy and decision-making. This may be due to successful pilots and wider political support and also new legislation and policy instruments. It is not a final end point as it still can come under future challenge and, indeed, get trumped by a new policy paradigm or tipping point (Kuhn, 1962). Figure 1 highlights a range of mainstreaming outcomes within the shallow and deep system change, and the degree of collaboration. The ideal outcome would involve transformational long-term change with alignment across multiple policy domains, with consequent changes in values and behaviours (Path 1). Decisions to implement the policy become more widespread via regulatory and/or incentive packages with associated guidance maximising knowledge and communication flows. This is likely to have generated significant behaviour change conforming to deep mainstreaming/policy prioritisation, as identified by Lafferty and Hovden (2003), Cowling et al. (2008) and Humphrys (2015).

There is also a shallower pathway in the adoption phase (e.g. Path 2) which revolves around the use of market-based incentives/disincentives. Here, the policy has largely been built into existing systems incrementally, but with little overall system change, reflecting the capacity and capability of the governance framework to change and the extent of competing ideas. This outcome is achieved through strong collaboration, highlighting that collaboration is a core component of mainstreaming but does not necessarily lead to deep system change. Here, more substantive change can take place only after a period of shallower change and collaboration. Thus, the framework can be seen as a series of 'Russian doll' cycles progressing through successive stages. Indeed, this may be a way forward for the environmental sector perhaps within a new innovation phase. For example, using ecosystem services in the UK, there has been only limited and shallower adoption through payments for ecosystem services schemes and its use in evidence bases. More recently, major breakthroughs have occurred with a finalised statutory local development plan in the South Downs which has a core ecosystem services policy that may act as a catalyst for other statutory development plans to follow suit (Scott, 2020). Additionally, ecosystem service concepts form a major part of natural capital approaches, which are also starting to become more mainstream. This highlights how one mainstreaming agenda may morph into or feed into another concept that is deemed more suitable or appealing to a wider audience—in this case, where natural capital takes over the dominant narrative while still including ecosystem services. This begs a key question of whether natural capital would have gained such traction without earlier attempts and problems encountered with mainstreaming of ecosystem services? This question is now addressed in the following section using our proposed framework.

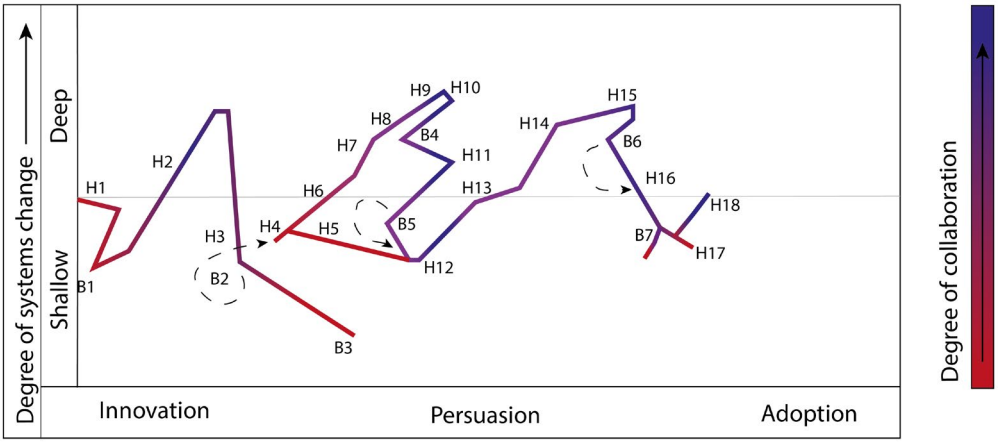

FIGURE 2 Environmental mainstreaming focussed on a natural capital and ecosystem service pathway. This charts only natural capital (NC) and ecosystem services (ES) pathways and the impact of selected hooks and barriers. B, Barriers; H, Hooks

5 | ILLUSTRATING THE MODEL: MAINSTREAMING NATURAL CAPITAL

We now build on the example of ecosystem services above, to look at the emerging natural capital approach within a UK perspective (Defra, 2020). This has been defined with reference to policy and decision-making as thinking of '*nature as an asset, or set of assets that benefit people*' (Defra, 2020, p. 5). We have mapped this using our framework in Figure 2 and Table 1 which show the pathway(s) undertaken in response to selected hooks (H) and barriers (B). The line itself reflects an agreed direction of travel between the authors (covering academic and practice interests) based around a shared narrative. However, the hooks and barriers do not apply at a single moment in time; rather they are used to depict upward or downward trends, justified by literature (Table 1). This list is not meant to be exhaustive; rather it is illustrative of the pathway taken in the establishment, evolution and development of natural capital (NC) concepts, remembering that this forms only one strand in the environmental mainstreaming narrative.

Figure 2 highlights that while there has been significant progress to date through the persuasion phase, this is not yet a mainstreaming success story as adoption has not yet really been achieved. For the most part, efforts are continually being made to persuade key stakeholders in a 'groundhog day' persuasion phase with mainstreaming limited to ad-hoc pilots and exemplars. We argue that this reflects the legacy from the limited initial collaboration with only a few sectors and disciplines (environmental and economic) involved. The chart shows some fluctuation with both shallow and deep system change objectives being pursued in response to certain hooks and barriers. Here we see an interesting tension between the theory of ecosystem services and natural capital and the need for deep, transformational system change, but the reality may be that such change is not politically acceptable which is why we see ongoing declines in practice reinfrocing a policy-delivery gap (Table 1).

6 | DISCUSSION AND CONCLUSIONS

6.1 | How can we secure better mainstreaming outcomes using this framework?

This paper has presented a mainstreaming framework based on capturing the lifecycle dynamics of mainstreaming pathways addressing a research and policy gap (Box 1). Our multifunctional framework with supporting narrative, documenting progress across key stages of innovation, persuasion and adoption measured against desired system change, degree of collaboration and responses to hooks and barriers, provides additional insights into mainstreaming processes that can help us design and plan more effective responses (Figures 1 and 2).

We argue that one of the core problems with the environmental mainstreaming journey thus far has been its evolution and scientific advancement without sufficient upfront collaboration with those sectors (e.g. business and built environment) necessary for policy delivery and impact outside the environment sector resulting in ongoing difficulties in getting it understood and accepted (see Dalal-Clayton & Bass, 2009; Runhaar et al., 2018). Thus, the environmental 'silo' may well act as its own barrier to mainstreaming. Indeed, across the mainstreaming and policy integration literatures, we find a consistent message that transformative or deeper mainstreaming outcomes are rarely evidenced (Dalal-Clayton & Bass, 2009). This prompts an interesting discussion as to whether more mainstreaming success might occur with stronger collaboration from the outset when pursuing deep system change incorporating interdisciplinary and transdisciplinary research (Figure 1: path 1). Benson et al.'s (2014) argument for the development of environmental policy in government departments with stronger influence on budgets and resources may also catalyse transdisciplinary processes. Key questions arise as to how we might shift towards such a culture within our current mainstreaming pathways deeply embedded in the persuasion phase.

Reflecting back on the framing and subsequent communication of ecosystem services and natural capital concepts, environmental mainstreaming may have been weakened through the growth of a technocratic and elitist environmental vocabulary requiring significant 'translation' to identify 'hooks' for engagement within other policy sectors. However, as Figure 2 shows, the current shift from ecosystem services to natural capital in policy usage in the UK context has helped mainstreaming through the learning and feedback loops of ecosystem services feeding into the natural capital narrative and approach. The Dasgupta Review (2021) further highlights its potential value but still talks about the need for persuasion in a spatial planning context; '*… spatial planning informed by natural capital offers huge opportunities to conserve and restore Nature*' (Dasgutpa Review, 2021, p. 461). This point offers a key lesson of not proceeding to a persuasion phase when the message and collaborative governance models are not sufficiently aligned (Cowling et al., 2008).

So turning attention back to Figure 1, we can characterise the environmental mainstreaming journey thus far as proceeding along path 2 lines, but we need to shift more towards a path 1 trajectory. First, this requires much stronger collaborative approaches championing interdisciplinary and transdisciplinary research endeavours, thus changing knowledge flows (Jahn et al., 2012; McKenzie et al., 2014). Engagement needs to be based around those sectors who are crucial for the development and delivery of environmental outcomes but to do this requires active translation of environmental concepts into those sectors' priorities. Furthermore, we need to shift away from the sole focus on ecosystem services, green infrastructure or natural capital to show how they integrate to deliver better outcomes (Scott et al., 2020). However, this mode of working across professions and disciplines to transcend boundaries, synthesise disciplinary perspectives, epistemologies, methodologies, cultures and values, including social and natural scientists, stakeholders and non-scientists, is challenging and risky (Jahn et al., 2012).

Second, we need to take better stock of the contribution to environmental mainstreaming through different pathways in ecosystem

TABLE 1 Corresponding hooks and barriers examples for natural capital (NC) and ecosystem services (ES) mainstreaming journey

H/B	Description example	Reference justification
Innovation phase		
H1	NC as a synonym for land alongside other forms of productive capital. Naturkapital used to refer to all natural resources and forces, such as water, light and air, which furnish productive services and artificial capital	See Missemer (2018), for history
B1	Industrial growth and technological development led to excessive use of resources	Mayumi (1991)
H2	In response to continued unsustainable use of natural resources and waste disposal, modern-day environmentalist movement started culminating	Carson (2013), Meadows et al. (1972) and Bruntland Commission (1987)
H3/B2	National Policy documents and guidance to protect nature for intrinsic value. BUT these were often trumped by industry and public opposition grew as development and economy in conflict with environment	
H4	Utilitarian framing of nature to reach wider audience and raise support for conservation, ES as a concept first described	Ehrlich and Ehrlich (1981)
H5	Reintroduction of NC into modern economics	Pearce (1988)
B3/H6	Difficulty to operationalise international initiatives e.g. Sustainable Development and Ecosystem Approach. The timing of these challenges galvanised reintroduction of ES and NC	Waylen et al. (2014)
Persuasion phase		
H7	ES and NC expanded in the academic literature, initially with ES dominance	e.g. Costanza et al. (1991)
H8	Neoclassical economics critiqued for excluding value of nature. Monetary figures of ES and NC major impact in science and policymaking	Costanza et al. (1997)
H9	Human dependency on ES, and role of biodiversity in human well-being highlighted	MEA (2003) and UKNEA (2011)
H10	ES concept transcends academia to reach Governmental policy as well as non-profit, private and financial sectors. ES used increasingly in economic decision-making through PES and Market-Based Instruments	e.g. Corbera et al. (2007) and Pagiola (2008)
B4	Critics argue a move from original emphasis of ES to raise public interest for conservation, towards increased emphasis on how to monetise ES as commodities in potential markets	Spash (2008) and Redford and Adams (2009)
H11	National Ecosystem Assessments highlighted how ES were critical for human well-being, creation of shared vision and conceptual framework	UKNEA (2011)
B5	ES heavily critiqued in the academic and political realms	e.g. Dempsey and Robertson (2012) and Norgaard (2010)
H12	Natural Environment White Paper recognises value of NC in policymaking. Cross-governmental Natural Capital Committee (NCC) established	NCC (2013)
H13	Numerous methods and tools developed to aid the valuation of nature, and international endorsement to integrate NC and NC accounting more effectively into decision-making into business and the financial sector	UKNEAFO (2014)
H14	NCC elevate concept of NC to the core of the UK's 25 Year Environment Plan (25YEP). Defra developed four 'Pioneer' projects to test delivery of the 25YEP. The Pioneers some of the first projects to test the use NC in a decision-making context, showing examples of good practice where interdisciplinary steering groups alongside stakeholder's integral to process	Defra (2018)

TABLE 1 (Continued)

H/B	Description example	Reference justification
H15	NC now on the agenda for multiple departments and strategies. NC as a common and connecting language/method/tool across the different departments is significant, and recognised in National Planning Policy Framework	e.g. NPPF (2019)
B6	NC met with continued barriers in relation public opinion who object to the concept because of possibility of neoliberal capitalist approach and fears the NC approach will reduce nature to a commodity. These barriers can significantly halt mainstreaming into adoption phases but rightly question motives	e.g. Sullivan (2017)
H16	Feedback from barriers such as B6 motivate researchers to include non-monetary NC values	Hooper et al. (2019)
Adoption phase		
H17	Individual sectoral approaches to NC accounting such as water, energy and forests, however, with limited collaboration or cross-sectoral approaches due to policy (mis)alignment	see e.g. Bass et al. (2017)
B7	Though there is the emergence of policy drivers, there still remains institutional barriers in relation to the practicality of applying the NC approach for the benefit of the environment, and the necessity for change in status quo and governance arrangements to adopt the approach in a fair, inclusive and transparent manner	NCC (2020)
H18	A small number of NC plans have been developed by diverse local groups and are, in few sporadic areas, feeding into local decision-making	e.g. UNESCO Biosphere (2020) and SDNPA (2019)

services, green infrastructure, nature-based solutions and natural capital, understanding their individual and cumulative impacts and responses to particular hooks and barriers. However, much current work still takes place in silos hindering a more strategic approach (Leach et al., 2019). Feeding this into a wider collaborative governance approach offers a new more integrated pathway that may lead into adoption (Figure 1: Cowling et al., 2008).

6.2 | Towards a re-construction of mainstreaming

From this discussion, we now advance our own contribution to a goal-based definition of mainstreaming as an '*interdisciplinary and transdisciplinary process of transmorphing and normalising a concept, objective, policy or plan within the decision-making and routine activities of multiple policy domains necessary for effective delivery and impact; and in so doing building sufficient capacity and resilience to improve operational processes and outcomes enabling beneficial societal impacts for the long term*'. This definition has three parts which distinguish it from others in the literature. The first reflects the importance of interdisciplinary and transdisciplinary working from the outset involving the contribution of necessary players who can design and deliver the desired change and integration. The second reflects the need to translate and adapt core concepts so that they can be understood in the context of other sectors priorities. The third part highlights the process component based on building resilience and societal benefit for the long term to prevent superficial changes. Thus, mainstreaming is a process requiring effective leadership and governance to manage it (Jordan & Lenschow, 2008; Russel et al., 2018). Our tripartite definition hopefully improves the maturity of mainstreaming as a concept to improve both process and outcomes addressing Runhaar et al. (2020) concerns.

6.3 | A future research agenda for mainstreaming

Our framework represents a first step in capturing the dynamics of mainstreaming and what contributes to success and failure. Consequently, there is a need for more work looking at the evolution and lifecycle of single or multiple environmental mainstreaming pathways as they experience success, diverge, fragment or fail with respect to social learning and capacity building as lessons are learnt and new knowledges and approaches implemented (McKenzie et al., 2014; Pahl-Wostl, 2009). We need to move beyond simply assessing individual agencies or programmes to also focus on the interactions and interdependencies between individuals, agencies and government, and the degree of system change achieved (Brianssoulis, 2017; Russel et al., 2018). Hitherto, mainstreaming has been advanced within a discourse couched implicitly as if there is a single minded variant or pathway, rather than as part of a complex map of different pathways with both complementary and conflicting strands that intersect, merge or dissolve according to the socio-political context of the environment itself.

We have also identified important synergies between mainstreaming and policy integration literatures (Box 1) which, in our view, need further scrutiny and exploration, moving beyond

Runhaars et al.'s (2018) exploratory work. The mainstreaming and policy integration literatures, up until this point, have largely been pursued in their own respective 'silos' and there is surely more fertile ground from further cultivation and exploitation of their respective contributions based on the components used in Box 1.

From our examination of the environmental mainstreaming journey, a prerequisite for effective mainstreaming is the stronger championing of interdisciplinary and transdisciplinary agendas as early as possible. At whatever stage, the development of a shared common language and vocabulary and shared conceptual lens helps progress through the persuasion stages towards adoption. However, in the environmental mainstreaming pathways, we have found significant barriers occurring through the complexity and growth of the terms employed and also competing and conflicting ideas particularly in spatial planning and landscape design (Figure 2: Runhaar et al., 2020). Thus, as research now shifts towards interdisciplinary and transdisciplinary approaches in large grant calls, there are increasing opportunities to understand the impacts of such work on mainstreaming goals.

We need now more than ever to recognise the current faults and challenges to mainstreaming endeavour, as shown in our framework, in order to overcome them. We also need to be clear what outcomes we are seeking when mainstreaming becomes the goal. Here, the ancient Japanese tradition of fixing broken pottery with golden joinery provides a powerful metaphor for the best way forward; only when we illuminate the cracks, can we build something stronger.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the support and critical feedback of four referees and associate editor whose feedback improved greatly the focus and content of the paper. Ideas within the paper work are also derived from work funded under NERC grant NE/R00398X/1 Mainstreaming Green Infrastructure and a Northumbria University PhD scholarship.

CONFLICT OF INTERESTS

The authors have no conflict of interest to declare.

AUTHORS' CONTRIBUTIONS

A.S. worked with R.H. to shape the first submission but led paper and conceptual thinking for major revisions which included reframed introduction, literature review, new conceptual diagrams and discussion; A.S. also worked with all authors to produce and agree the natural capital pathway Figure 2. R.H. led the first submission and initial framework and was the key partner for the revisions process. Worked with all authors to produce the natural capital pathway Figure 2. H.E. helped review and comment on paper from an environmental science perspective. Worked with all authors to produce and agree the natural capital pathway, Figure 2. A.L. provided practice perspectives to paper from a marine policy background. Helped improve the natural capital worked example and also reviewed paper resubmissions. Worked with all authors to produce and agree the natural capital pathway, Figure 2.

DATA AVAILABILITY STATEMENT

The manuscript does not include any data.

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ENDNOTE

[1] Work here includes Candel (2013), Karlsson-Vinkhuyzen et al. (2017), Russel et al. (2018), Scott et al. (2018) and Runhaar et al. (2020).

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How to cite this article: Scott, A., Holtby, R., East, H., & Lannin, A. (2022). Mainstreaming the Environment: Exploring pathways and narratives to improve policy and decision-making. *People and Nature*, 4, 201–217. https://doi.org/10.1002/pan3.10276