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Valuing plurality: Environmental humanities approaches to ecosystem services and Nature's Contributions to People

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ABSTRACT

Ecosystem services and Nature's Contributions to People frameworks allow policymakers and other stakeholders to understand and value the different benefits received by society from processes in the natural environment. However, they face challenges when assessing cultural and/or non-quantifiable services and contributions, and their linked benefits. They can also fall short when incorporating plural conceptions of value and their knowledge frameworks, including those of Indigenous People and/or local communities. Finally, with regard to future ecosystem management, they tend to rely on linear rather than speculative, idealistic assessments of future human-ecosystem interactions. In this Perspective article, we show how these challenges can be met by developing a cross-disciplinary dialogue with the field of environmental humanities. We demonstrate that incorporating environmental humanities principles and methods can improve ecosystem services and Nature's Contributions to People frameworks by making cultural and intangible services/contributions and their benefits amenable to more inclusive assessment, based on a relational, ecocentric (re-)evaluation of human-nature relationships. The environmental humanities encourage the use of both Indigenous Knowledges and grassroots knowledges and offer non-linear ways of thinking about future ecosystem management, for example using speculative imaginaries. In exchange, dialogue with ecosystem services and Nature's Contributions to People frameworks offers a further pathway to impact for the environmental humanities. We conclude by recommending multiple instruments that put the dialogue between ecosystem services, Nature's Contributions to People, and the environmental humanities into practice.

1. Introduction

Ecosystem services (ES) frameworks offer a functional approach to ecosystem assessment by untangling the complex web of dependencies connecting society to the natural world. Early iterations, including the Millennium Assessment (MA) and The Economics of Ecosystems and Biodiversity (TEEB), have been subject to criticism. The MA has been argued to display internal inconsistencies, while TEEB is said to have a narrow economic focus (Wallace, 2007; Raffaelli and White, 2013; Silvertown, 2015). The Common International Classification of Ecosystem Services (CICES) aims to be more exact and wider in scope, moving beyond strict economic valuations to include benefits derived from 'cultural' ecosystem services (CES), for example recreation, education, aesthetic value, or religious experience (Haines-Young and Potschin, 2018). Meanwhile, the Nature's Contributions to People (NCP) framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) was designed to reflect a greater plurality of values associated with the natural environment, including those that cannot be expressed in financial terms and/or do not fit within a Western framework of reference (Díaz et al., 2018; Balvanera et al.,

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2022).

Cultural/intangible services and their associated benefits play an important role in fostering a sense of attachment to and stewardship of the natural environment (Daniel et al., 2012; Mace, 2014; Ryfield et al., 2019). Yet, they can also constitute barriers to (or modifiers of) future landscape development, for example when place attachment and/or cultural heritage are perceived to be under threat by proposed interventions (Devine-Wright and Howes, 2010). Currently, there are several challenges to CES valuation. To begin with, the rich, qualitative character of cultural value assessments makes these services hard to define, and contrasts with quantitative methods normally used in the field (Hattam et al., 2014; Fish et al., 2016; Hirons et al., 2016). The difficulty is compounded by the focus of frameworks such as the MA, TEEB, and CICES on instrumental values, reducing ES assessments to utilitarian exercises based on mitigating human need (Lele et al., 2013; Silvertown, 2015; Hirons et al., 2016).

The utilitarian and anthropocentric approach to ecosystem valuation has been purposeful in explicating the human dependence on particular ecosystems, in order to raise awareness and ultimately encourage good environmental stewardship (Daily, 1997; Everard, 2022). However, it limits the capacity of ES frameworks to reckon with questions of plurality (Fish et al., 2016). Considering the future management of ecosystems and services, there is also an overreliance of ES modelling on causal and/or linear constructions, leaving little space to imagine alternative, possibly more sustainable human-ecosystem interactions that are embedded in the cultural value(s) of the local environment (Fish et al., 2016). This focus on "what will be" (i.e., a responsive approach driven by changes in ecosystem indicators) rather than "what could be" (an idealistic approach that contributes to a healthier planet and a more just society) negatively impacts both current and future human-nature relationships, limiting the scope of possibility by locking in existing patterns of interaction (Barra, 2023).

It is worth noting that IPBES already addresses the problem of plurality by highlighting the multiple values of nature throughout the NCP framework, for example in its recent plural valuation report (Balvanera et al., 2022). At least in theory, this makes it possible to fully integrate cultural and/or intangible contributions and their benefits into ecosystem assessments (Díaz et al., 2018; Balvanera et al., 2022). The NCP framework does not treat 'culture' as a separate category for assessment, and has incorporated other forms of environmental knowledge, such as Indigenous Knowledges and grassroots knowledges into the valuation process (Balvanera et al., 2022). However, IPBES still needs to identify a clear pathway to achieving the equal synthesis of values across disciplines, worldviews, knowledge systems, and socio-economic differences (Löfmarck and Lidskog, 2017). Furthermore, like its predecessors the NCP framework does not currently encourage non-linear thinking (i.e., the use of idealistic rather than responsive approaches to ES modelling) to establish sustainable futures (e.g, Ferrier et al., 2016).

In this Perspective article, we argue for increased interdisciplinary collaboration between ES and NCP frameworks and the environmental humanities (EH), a multifaceted field that critically examines the relationship between society and nature, often using philosophical and speculative methods. The EH can promote a greater understanding of cultural and/or non-quantifiable services and their benefits in frameworks such as the MA, TEEB, and CICES, effecting a shift away from the focus on instrumental values. It also facilitates the synthesis of different kinds of values and knowledge systems (including those of Indigenous People and/or local communities) in both ES and NCP assessments, and encourages creative ways of thinking about the future of human-ecosystem relationships. In turn, dialogue with ES and NCP frameworks creates a further pathway to impact for the EH.

2. Strengths and challenges of ES and NCP frameworks

The MA, TEEB, and CICES diagrammatically map 'services' provided by the natural environment that render benefit to society. These services can be provisioning, regulating, cultural, or supporting, reaching human beneficiaries through a downward flow or cascade (Potschin and Haines-Young, 2016). CICES further identifies a feedback loop that allows society to investigate, and where necessary alleviate, potential pressures on ecosystems that may otherwise negatively impact on services (Potschin and Haines-Young, 2016). The cascade model allows framework users to ascertain the value of different ecosystems to society while also demonstrating the impact human activities can have on the natural environment. As a result, assessments can offer a strong (economic) argument for ecosystem intervention or conservation (Daily, 1997; Everard, 2022); and help direct focus when considering potential developments, plans, or programmes (e.g., Chichilnisky and Heal, 1998). An additional strength of all three frameworks is their proven ability to transcend disciplinary and sectoral boundaries, which is evident from the uptake they have experienced in different branches of government, industry, and society.

Yet the categorical and utilitarian nature of these frameworks can also cause problems, especially in the context of CES valuation. A lack of clarity over what constitutes a cultural value indicator, and by extension, how to measure a cultural impact or connection, makes it difficult to integrate cultural services and benefits into the overall ES assessment (Hattam et al., 2014; Haines-Young, 2016). Many of the cultural benefits obtained from ES cannot be given a monetary or utilitarian value at all, for example spiritual connection or the experience of a sense of place (Cooper et al., 2016; Ryfield et al., 2019). This has led to a skewed focus in CES valuations, which have tended towards the study of services and benefits that are in-situ and measurable within the existing ES framework, and away from those that are ex-situ, qualitative, and related to ecosystem settings (e.g., aesthetic values associated with the landscape) rather than processes (e.g., increased tourism) (Cooper et al., 2016; Balvanera et al., 2022).

Furthermore, the shift in focus towards CES in the MA, TEEB, and CICES has only partially mitigated their tendency towards quantification. For example, it has been argued that valuation does not equate to monetisation, and that the former can help elucidate the relative importance of different ecosystems without the need to action assigned values through exploitation (Potschin et al., 2016; Schröter and Van Oudenhoven, 2016; Everard, 2022). However, such a considered approach rarely translates to actual practice, where many CES and their benefits continue to be mapped using direct and indirect economic indicators, including tourism impact and willingness-to-pay (Nahuelhual et al., 2013; Mononen et al., 2016).

Quantification is also a feature of the cascade model itself, which encourages instrumental value assessments by fostering the illusion that the flow of benefits rendered by services to people is unilateral (Raffaelli and White, 2013; Unks et al., 2021). Despite the cascade feedback loop, there is a risk that stakeholders will only be motivated to carry out recuperative efforts from a position of self-interest (Lele et al., 2013). This constitutes a narrow anthropocentric and liberal economic perspective on human-nature relationships, with little space left for alternative, non-market-oriented contributions to the value appraisal process (Silvertown, 2015). At the same time, Mace (2014) has signalled that nature conservation goals are shifting from an attitude of "nature

for people" (i.e., as a resource vault) towards "people and nature" (as equals). The latter perspective underpins the NCP framework developed by IPBES, which is a more deliberative-qualitative approach to ecosystem assessment on the basis of a systemic yet diverse understanding of the relationship between people and the planet. IPBES challenges the narrow economic focus of preceding (ES) frameworks by suggesting a pluralistic view of the values associated with service-s/contributions and benefits, that incorporates the perspectives of diverse groups including Indigenous Peoples and local communities (Díaz et al., 2018; Balvanera et al., 2022).[1]

Notwithstanding the conceptual strength and inclusivity of the NCP framework, challenges remain when it comes to its effective implementation. The recent IPBES plural valuation report offers an extensive assessment of values associated with human-nature relationships in cultures around the world, but there is a disjunction between this value pluralism and the value stratification that occurs when using existing instruments for ecosystem assessment (e.g., choice experiments, cost-benefit analyses, and similar tools; see Balvanera et al., 2022). These instruments tend to be embedded in Western scientific frameworks of reference, and generally do not align with alternative conceptions of value and knowledge systems that may be less instrumental and more holistic in character (Bullock et al., 2018; Gould et al., 2019; Cabana et al., 2020; Tynan, 2021; Loos et al., 2023). Therefore, a key question is whether valuations rooted in Indigenous and/or grassroots perspectives should be kept separate from Western scientific assessments of service-s/contributions and benefits, to maintain their integrity; or that they should be fully incorporated, at the risk of being overridden by an instrumental perspective. The MA, TEEB, CICES, and NCP frameworks all require instruments that can bridge these gaps where possible, i.e. by synthesising and/or recognising different values during ecosystem assessments with minimal bias. This process is known as co-valuation (see Balvanera et al., 2022).

Finally, to inform present and future ecosystem management, both ES and NCP frameworks rely on causal and/or linear constructions to determine the most likely future trajectory of human-nature relationships, for example by studying interaction effects (e.g., Martin et al., 2018). Other approaches include exploratory modelling following set plausibility criteria, with possible inputs from scientific experts on key ecosystem indicators, and consultation with Indigenous People and/or local communities to ensure the inclusion of key cultural values (Ferrier et al., 2016). These evidence-based approaches are commendable, but may limit the scope for exploring more sustainable, albeit currently less likely pathways for human-nature interaction on the basis of idealistic, non-linear and/or speculative processes.

In order to overcome existing challenges in ES frameworks, a new perspective is required on questions of cultural intangibility and attendant non-instrumental (or non-quantified) approaches to the assessment of services/contributions and benefits. Moreover, both ES and NCP frameworks would profit from a clear pathway to the effective integration of plural values, helping them to achieve their own stated goals of inclusive valuation (e.g., Balvanera et al., 2022). They would also benefit from the introduction of idealistic and non-linear and/or speculative thinking to ecosystem modelling. We suggest that these transformations can be achieved through enhanced cross-disciplinary practices and methodologies developed on the basis of dialogue with the field of EH.

3. Non-anthropocentric reassessment of human-nature relationships in the EH

The EH are a growing field of interdisciplinary research that examines the relationship between human culture and society and the non-human environment. Contributors to the field work in a large number of disciplines, for example ecocriticism (a branch of literary theory), environmental archaeology, science and technology studies, environmental philosophy, ecofeminism, environmental anthropology, traditional and Indigenous ecology, religious studies, Black studies, gender studies, and more. Three of the authors of this article have origins in ecocriticism and we identify this as our "situated perspective" (i.e., our onto-epistemological point of departure) within the multifaceted field of EH (Haraway, 1988). Ecocriticism focuses on the role of language, narrative, and art in understanding and addressing current environmental challenges (Clark, 2019). This can be particularly useful for assessing sensitive and characteristically qualitative CES. By acknowledging that ecocriticism's theoretical foundations and methodological approaches are inherently bound up with the broader field of the EH, the subfield allows us to hone in on certain key theoretical and methodological offerings and challenges of the EH that merit further dialogue with the ES and NCP literature.

A key aim of the EH as a whole is to engage 'fundamental questions of meaning, value, responsibility and purpose' when it comes to assessing how human/nature interactions affect processes of climate change, ecological degradation, habitat loss, and extinction (Bird Rose et al., 2012). Authors in the EH have identified links between the exploitation of natural ecosystems and patterns of social injustice, including discrimination on the basis of race, gender, sexuality, physical ability or socioeconomic status (Plumwood, 1993; Nixon, 2011; Caputi, 2020). Against this, they champion paradigms for human existence that respect principles of social and species justice, promote ecosystem regeneration, and generally seek to reduce negative human influence(s) on the environment (Kimmerer, 2013; Alaimo, 2016; Haraway, 2016; Caputi, 2020). Key methods for the analysis of human-nature relationships that are used in the EH include cultural criticism, historicisation, and speculative imagination (e.g., through fiction, film, performance, visual art, and sound recordings).

The EH present an ethical, non-anthropocentric, values-driven and philosophically-nuanced view of human-nature relationships. Notably, many authors discard a dichotomous, Cartesian understanding of the world as divided between mind and matter, arguing instead that there is no real distinction between (human) 'culture' and (non-human) 'nature' (Latour, 1993b; Haraway, 2016). This is because human and non-human lifeworlds interlink at all levels, including the biological, material, (geo) physical, social, cultural, economic, and spiritual (Latour, 1993b, 2017; Chakrabarty, 2009; Hodder, 2012). As there are no separate realms of nature and culture, it is necessary to acknowledge the power wielded by entities that are non-human, yet wield considerable influence over the way humans live. This challenges anthropocentric modes of thinking; the world does not revolve exclusively around human beings, nor are they able to exercise full control over different courses of events (Latour, 1993b, 2017; Alaimo, 2016; Haraway, 2016; Tsing, 2017). To understand how society and the natural world interact, we must adopt a relational conception of value, displaying care and attributing agency to entities other than human beings (Latour, 1993b, 2017; Kimmerer, 2013; Haraway, 2016).

Dichotomous conceptions of the world emphasise difference between humanity and nature and indirectly rationalise the suppression of women, children, ethnic and socioeconomic groups, and those living in the Global South (Plumwood, 1993; Nixon, 2011; Moore, 2016; Caputi, 2020). Meanwhile, relational concepts of human-nature relationships are non-dichotomous and inclusive, aiming at social and economic

[1] The IPBES NCP framework uses the term "IPLC" (Indigenous People and Local Communities) to denote non-Western and/or non-scientific knowledge frameworks (Balvanera et al., 2022). We avoid this and similar terms (e.g., "ILK" or Indigenous and Local Knowledge, Díaz et al., 2015) due to concerns about the ontological and epistemological conflation of very different types of knowledge and culture that may also carry significant (post-)colonial and imperialist implications (see criticism by Calí Tzay et al., 2023). Rather, we recognise a multitude of alternative conceptions of value and their attendant knowledges that are held by Indigenous People and/or local communities (among others), each within their own unique context.

justice, restoration, and symbiosis (Haraway, 2016; Hikuroa, 2016; Fox et al., 2017; Caputi, 2020). Many have a grassroots, traditional or Indigenous character and can work in tandem with dominant cultural registers (e.g., Western scientific knowledge) to emphasise the value of the natural world while recognising the rights of minorities (Kimmerer, 2013; Haraway, 2016; Hikuroa, 2016; Fox et. al., 2017). For example, Kimmerer (2013) combines insights from her academic training as a botanist with Indigenous Knowledge and valuation practices, drawing on the rigour of the Western scientific method while also emphasising the importance of active care, listening, and reciprocity in specific, historically subjugated Indigenous human-nature paradigms.

There have been calls for a more 'policy-engaged and actionable' use of theory developed in the EH, extending beyond established modes of inquiry (Hartman, 2020). On this basis, EH scholars are already engaging with ES and NCP frameworks and assessments. For example, Castree (2021) argues that the EH focus on factors such as cultural norms and values, political dispositions, social perspectives, artistic expression, and spiritual beliefs can enhance the political relevance and social uptake of global environmental assessments, including those carried out by IPBES. He emphasises the unique capacity of the humanities and social sciences to 'politicize global environmental change in a balanced, mature, well justified, and transparent way' (Castree, 2021). The EH can help reframe environmental problems, for example by disrupting human-nature dichotomies, or by using participatory and/or arts-based methods, to meaningfully engage different community stakeholders and knowledge systems (Simeone, 2018; Vadrot et al., 2018; Bentz and O'Brien, 2019; O'Connor and Perdibon, 2021). In this vein, scholars such as Bentz and O'Brien (2019) have developed arts-based youth workshops to incite creative problem-solving, critical thinking, and transformative social action in relation to climate issues. Such action- and policy-focused, inter- and transdisciplinary EH work enhances the potential for collaboration with ES and NCP frameworks.

Yet, there are fundamental tensions between the EH and ES and NCP frameworks that should not be understated. In line with its ethical and value-explicit approach, work in the EH is explicitly framed within politicised parameters (e.g., Haraway, 2016; Caputi, 2020). As such, authors in the EH have critiqued the ES research framework itself, for instance with regard to researcher positionality, engagement, and impact (Haraway, 1988; Allen et al., 2018; Bresnihan and Milner, 2023). While we do not wish to minimise or resolve such tensions between ES and NCP frameworks and the EH, we argue that the necessity of a more thoroughly politicised, ethical, and plural transformation of human-environmental interactions demands an increased dialogue between the two fields. Initiating this dialogue answers calls from both the humanities and the environmental sciences for greater cross-disciplinary collaboration in the face of a changing global climate (Sörlin, 2012, 2013; Díaz et al., 2018; Balvanera et al., 2022). Notably, the EH provide the critical perspective needed to remediate gaps that remain in the conceptualisation and implementation of ES and NCP frameworks. In turn, the encounter broadens the scope of EH inquiry, and provides it with an established means to have policy impact on people and the planet.

4. Value in reciprocity: expanding ES and NCP assessments using EH principles

The EH enable a rigorous understanding of intangible ES and their diverse associated values, which also applies in the context of the NCP framework. This is enabled by indicators that are wholly appropriate to the field, for example ethical urgency, inclusiveness, and critical depth; traits that have been highlighted in ongoing dialogue between the EH and public policy (Castree, 2021; O'Connor and Perdibon, 2021). They are 'conceptual resources' (Castree, 2021; O'Connor and Perdibon, 2021) that are as intangible as CES themselves, yet vital for steering decision-making towards socially inclusive, practical, and responsible positive environmental change. In this section, we review the multiple ways in which these conceptual resources or principles may enhance ES assessments.

To begin with, viewing nature and culture as a single sphere of influence effectively normalises cultural services/contributions and their benefits during ecosystem assessment, (re-)placing them on the same footing as their more tangible counterparts (e.g., food provisioning and nutrient cycling). Consequently, it becomes possible to fully incorporate CES into MA, TEEB, and CICES assessments without detractions due to their idiosyncratic character. The IPBES NCP framework has already made progress towards this aim, although it continues to suffer from a lack of dedicated instruments for value synthesis. It also needs to better acknowledge that relational ways of knowing (a cornerstone of many Indigenous cultures) often lead to preferences for *relational* values of nature rather than instrumental ones (Loos et al., 2023). In these cases, valuation should not focus on the derivative acquisition of (largely economic) benefits by society from the natural environment, but rather constitute a relational exercise seeking to identify sustainable patterns of human-ecosystem interaction (as recognised in the NCP framework by Díaz et al., 2019; Balvanera et al., 2022).

This constitutes a radical challenge to instrumental conceptions of ES and NCP: rather than pandering to privileged groups of people (or people in general), value is found in reciprocity (Kimmerer, 2013; Fish et al., 2016; Hirons et al., 2016; Raymond et al., 2018; Unks et al., 2021). It is the quality of a relationship, whether between humans and nature, or between groups of humans (for example through governance, cultural exchange, trade, or even research collaborations), that is valued (Gould et al., 2019; Tynan, 2021; Loos et al., 2023). To provide some examples, Kimmerer (2013) highlights the dependence of certain plants on traditional harvesting practices for their continued flourishing; and describes the valuable contribution humans can make to the restoration of watersheds and wetlands, (re)creating resilient ecosystems that benefit all involved. Fox et al. (2017) examine ideologies and practices of river restoration in various Indigenous nations, where rivers are conceived of and treated as familial relatives instead of resources, to elucidate how ecological restoration also extends to social, cultural, and intellectual restoration. In this way, the appreciation of relational value in the EH offers a way for ES and NCP frameworks to progress beyond the instrumentalisation of nature, towards mutualism (Haraway, 2016).

Incorporating mutualism into decision-making necessitates deliberative or creative approaches with stakeholders at the local scale. This is time- and resource-intensive, yet necessary to provide assessments of environmental value that are socially and culturally responsible (Bullock et al., 2018; Gould et al., 2019; Loos et al., 2023). As Gould et al. (2019) argue, relational and social values are often the most cherished, yet difficult to capture within an anthropocentric and instrumental framework. To capture these values in actionable ways demands renegotiating what constitutes a valid or desired research or policy outcome. Greater merit needs to be granted to research outcomes like strengthened relationships, mutually-beneficial collaborations, cultural exchanges, and transformative psychological, intellectual, or emotional experiences (Edwards et al., 2016; Fox et al., 2017; Bentz and O'Brien, 2019; Tynan, 2021). Recognition of such outcomes can also reconcile the tensions between an EH orientation towards the social and political long-term (aiming at wholesale societal transformation) and the ES reality of operating in the short-term (effecting incremental changes within measurable spatial and temporal contexts). This is because strengthened relationships and/or transformative ephemeral experiences constitute viable short-term research outcomes that can build towards longer-term political transformation. As Tynan (2021) argues, forcing relational ways of knowing into strict deadlines or protocols for written academic outputs can cause distortions, exploitations, or incomplete assessments of human-nature relationships and cultures. Instead, an ethical, attentive, and iterative approach is needed, that extends principles of relationality to prioritise process- and relationship-building in research design and impact.

It is worth noting at this stage that many authors in the EH anchor

their work in Indigenous and grassroots knowledge systems (e.g., Kimmerer, 2013; Coulthard, 2014; Haraway, 2016; Estes, 2019; Caputi, 2020; Tynan, 2021). Although suggestions have been made in both CICES and the NCP framework for the integration of multiple Indigenous and grassroots knowledges (Díaz et al., 2015; Haines-Young and Potschin, 2018; Balvanera et al., 2022), this has never occurred at the foundational level, where the frameworks continue to depend on Western scientific vantage points (Löfmarck and Lidskog, 2017; Balvanera et al., 2022). This is confirmed by common use of the term "IPLC" to designate groups of individuals that are unique because they are non-Western or non-urban, and that appear by default to exclude the assessors themselves, who take a neutral position. As noted, the term also effectively conflates widely varied ontological and epistemological vantage points by drawing together a multitude of Indigenous Peoples and grassroots groups (Calí Tzay et al., 2023). Yet the Western scientific worldview is an interpretative framework like all others, and should not be allowed to claim precedence on the basis of objectivity (Latour, 1993a, 2018). The challenge is to engage with different frames of reference (than the Western scientific one) on a level footing and to introduce alternative conceptions of value, while retaining the applied and functional emphasis of existing approaches to ES and NCP assessment (Löfmarck and Lidskog, 2017; Reid et al., 2020; Balvanera et al., 2022).

The EH offer speculative approaches to help achieve this goal, giving further impetus to practices of co-valuation. For example, a dominant trend in the field is to analyse the creative genres of ecological poetry, visual art, drama, film, or fiction, which have the capacity to dramatise multiple, often conflicting values and value systems (Boast, 2020; Henry, 2022).[2] Moreover, the field can apply arts-based methods to co-produce creative works with community stakeholders and groups; such methods provide a space to negotiate complex emotions, values, and thoughts surrounding human-nature interactions while at the same time raising multiple voices in a nonhierarchical fashion and activating citizen engagement (Edwards et al., 2016; Pearson et al., 2018; Bentz and O'Brien, 2019; Tarlo and Tucker, 2019). As well as producing artistic pieces for analysis, arts-based methods produce ephemeral experiences and exchanges which can transform mindsets and relationships towards more radical and long-term political transformation for environmental justice (Pearson et al., 2018; Bentz and O'Brien, 2019). They also remove the barrier for entry to creative production. These narrative- and arts-based methods and their attendant critical methodologies do not necessarily present the most likely trajectory of human-ecosystem interaction(s), but rather aim to challenge the status quo by identifying alternative, idealistic pathways to a more sustainable future (e.g., Haraway, 2016). Such narratives can work in tandem with more strictly linear, indicator-driven modelling (already common to ES and NCP frameworks, e.g, Ferrier et al., 2016) to present a full range of possible futures capable of informing both idealistic and pragmatic approaches to policy development for ecosystem management.

5. Recommended instruments

To conclude, we review two already-existing and widely used instruments for ES and NCP assessment, demonstrating their alignment with EH principles while encouraging the practical implementation of the dialogue developed in this Perspective article.

5.1. Participatory mapping

Participatory mapping comprises a group of methods for data collection and visualisation in which information is overlaid on, integrated into, or used as building blocks for a map of a given area or topic (Emmel, 2008). Members of the public contribute directly to these maps by offering anecdotes, images, soundbites and other media, many of which communicate experiences or engagements that are not registered in (or even disagree with) formal maps (e.g., Peluso, 1995). Participatory mapping enables grassroots participation in ecosystem assessments by involving communities in the production of knowledge about their own local environment(s) (Gould et al., 2019). It achieves this without input prioritisation (e.g., a bias towards quantifiable elements). Another strength is the ready (visual) format of maps for public engagement and dissemination (Cope et al., 2018).

Participatory mapping outputs have been used in educational settings, community research, and to inform public policy. For example, StoryMaps created for the Irish Research Council-funded project *The Cultural Value of Coastlines* (2016–19) included CES associated with the Dublin Bay coastline on an equal footing with other types of ES; resulting in an openly-accessible spatial display of relational benefits linked to recreation, relaxation, and a sense of place (www.culturalvalueofcoastlines.com; see also Ryfield et al., 2019; Cabana et al., 2020).

5.2. Scenarios

Scenarios are narrative representations of future human-ecosystem relationships. These narratives can be data-driven or more speculative in nature. In their latter form, they promote integration between ES and NCP frameworks and the EH by introducing non-linear ways of thinking about future ecosystem management, while still being co-informed by science (e.g., Merrie et al., 2018). Notably, non-linear scenario development has the potential to incorporate plural values and relational epistemologies into ecosystem modelling, taking an intentional rather than a probabilistic approach to the future trajectory of human-ecosystem interactions (Haraway, 2016; Merrie et al., 2018). Scenarios can be developed in conjunction with local communities using participatory processes (Oteros-Rozas et al., 2015). To ensure the validity of scenarios, their development can be tracked using policy documentation, academic literature, and expert contributions (see Merrie et al., 2018).

Henry (2019) provides multiple examples of community-led scenario developments that aim at inclusive, sustainable futures characterised by socio-ecological healing. He cites the AMD&ART Park in Vintondale, Pennsylvania, and John Sabraw's toxic-art initiative in southern Ohio, both of which emerged from extensive dialogues between artists, scientists, and local communities in declining (and heavily polluted) mining towns in Northern Appalachia in the United States (Henry, 2019). Addressing the adverse hydrological and cultural legacies of coal mining, these public artworks combined physical water treatment processes with narratives of cultural, social, and ecological transition away from a past of unsustainable coal extraction and towards a healthier future characterised by human-nature relationality (Henry, 2019). Such scenarios articulate desired rather than probabilistic futures and can be used as blueprints for policy and decision-making.

6. Conclusion

Discussing the challenges of CES integration, Fish et al. observe that '[w]hether energies should be directed towards constructing culture so that it remains consistent with existing methods [in ES assessment], or towards elaborating its exceptional position by way of entirely different models of knowledge production, is the epistemological conundrum that has driven recent academic discourse in this area' (2016; inset added). We argue that these options are not mutually exclusive. Cultural and intangible services, plural conceptions of value and knowledge, and future imaginaries must be treated as valid inputs alongside quantifiable elements of ES and NCP assessments. However, innovative methods for knowledge production are required to achieve this integration. Dialogue

[2] It should be noted that ecological art can (and often does) still perpetuate dominant Western frameworks, but EH scholars who draw from areas such as postcolonial, indigenous, or feminist studies often seek to centre alternative cultural frameworks (Nixon, 2011; Caputi, 2020).

with the EH suggests that forthcoming assessments must be able to provide the necessary context (i.e., onto-epistemological vantage points) as well as an interpretation of the plural values of different service-s/contributions and benefits to key stakeholders and decision-makers. They should also be capable of synthesising incommensurate values and realities (Löfmarck and Lidskog, 2017; Balvanera et al., 2022). Multiple tools already exist that enable the integration of the EH into ES and NCP frameworks, providing the practical means to achieve more inclusive assessments.

CRediT authorship contribution statement

Tomas Buitendijk: Writing – review & editing, Writing – original draft, Conceptualization. **Ashley Cahillane:** Writing – review & editing, Writing – original draft, Conceptualization. **John Brannigan:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Tasman Crowe:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. Tomas Buitendijk (TB), Ashley Cahillane (AC), John Brannigan (JB) and Tasman Crowe (TC) conceived the ideas for this article; TB and AC led the writing of the article. All authors contributed critically to the drafts and gave final approval for publication.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

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

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