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A place-based approach to payments for ecosystem services

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ABSTRACT

Payment for Ecosystem Services (PES) schemes are proliferating but are challenged by insufficient attention to spatial and temporal inter-dependencies, interactions between different ecosystems and their services, and the need for multi-level governance. To address these challenges, this paper develops a place-based approach to the development and implementation of PES schemes that incorporates multi-level governance, bundling or layering of services across multiple scales, and shared values for ecosystem services. The approach is evaluated and illustrated using case study research to develop an explicitly place-based PES scheme, the Peatland Code, owned and managed by the International Union for the Conservation of Nature's UK Peatland Programme and designed to pay for restoration of peatland habitats. Buyers preferred bundled schemes with premium pricing of a primary service, contrasting with sellers' preferences for quantifying and marketing services separately in a layered scheme. There was limited awareness among key business sectors of dependencies on ecosystem services, or the risks and opportunities arising from their management. Companies with financial links to peatlands or a strong environmental sustainability focus were interested in the scheme, particularly in relation to climate regulation, water quality, biodiversity and flood risk mitigation benefits. Visitors were most interested in donating to projects that benefited wildlife and were willing to donate around £2 on-site during a visit. Sellers agreed a deliberated fair price per tonne of CO_2 equivalent from £11.18 to £15.65 across four sites in Scotland, with this range primarily driven by spatial variation in habitat degradation. In the Peak District, perceived declines in sheep and grouse productivity arising from ditch blocking led to substantially higher prices, but in other regions ditch blocking was viewed more positively. The Peatland Code was developed in close collaboration with stakeholders at catchment, landscape and national scales, enabling multi-level governance of the management and delivery of ecosystem services across these scales. Place-based PES schemes can mitigate negative trade-offs between ecosystem services, more effectively include cultural ecosystem services and engage with and empower diverse stakeholders in scheme design and governance.

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1. Introduction

The natural environment delivers critical services that support human well-being (MEA, 2005; TEEB, 2010), yet these services are often forgotten or neglected in policy and land use decision making (Scott et al., in press). Worldwide, these services (e.g. food, water, protection from extreme weather, medicines and the health and cultural benefits people derive from nature) are estimated to be worth more than the global gross domestic product (Nelleman and Corcoran, 2010). When ecosystems become degraded, the cost of restoration can be prohibitive, and often results in poor imitations of the original ecosystem (Economics of Land Degradation, 2015; Crouzeilles et al., 2016 Crouzeilles et al., 2016). Evidence shows that the sustainable management and protection of natural capital and ecosystem services are the most cost-effective way to sustain their benefits to human wellbeing (Ekins et al., 2003; Constanza et al., 2014).

Neoclassical economics argues that if those responsible for managing provision of ecosystem services also benefit directly from them, the market should be able to protect and sustain these services (e.g. provisioning services, such as food and fibre; Engel et al., 2008). However, when benefits mainly accrue to others in society (e.g. downstream flood protection), markets often fail to reward service managers (e.g. upstream farmers or foresters). Conversely, some land uses and management activities provide benefits for landowners and managers at a particular location and time, at the expense of wider society. In response to this “social dilemma” (as it is characterised by Muradian et al., 2013), the concept of Payment for Ecosystem Services (PES) is gaining increasing attention as a way to pay for the societal benefits of sustainable land management (Nelleman and Corcoran 2010; Braat and de Groot, 2008 Braat and de Groot, 2008). PES offers monetary incentives to individuals or communities to voluntarily adopt behaviours that are not legally obliged, and which improve the provision of well-defined and quantifiable ecosystem services that it would otherwise have been economically unviable to provide (Sommerville et al., 2009; Muradian et al., 2013). Wunder (2015) defines five components of PES: 1) voluntary transactions; (2) between service users; (3) and service providers; (4) that are conditional on agreed rules of natural resource management; (5) for generating offsite services.

However, there are major challenges over the quantification and attribution of ecosystem services and their link to the values of different social groups in complex social-ecological systems at relevant spatial and temporal scales (Spash, 2009; Reed et al., 2015). Monetary valuation of ecosystem services has widely been used to place values on ecosystem services in the context of PES, but these techniques tend to overlook the value of cultural services and the values for ecosystem services that are shared by different social groups, as opposed to the aggregation of individual values (Kenter et al., 2014, 2015). They also tend to overlook the way in which these values may change over time for different groups e.g. due to environmental, social, economic or technological change.

Bundling and layering help to resolve issues of quantification and attribution in PES schemes by quantifying and monetizing a number of different ecosystem services at the same time, linked to a specific intervention (such as peatland restoration). Layering (also called stacking), refers to schemes where payments are made for different ecosystem services separately from the same system. An example of layering would be if the same peatland restoration project ran a carbon offset scheme in parallel with a scheme targeting water companies to pay for water quality benefits, whilst taking in money from a visitor giving scheme linked to cultural and aesthetic values. Bundling is defined as grouping multiple ecosystem services together in a single package to be purchased by individual or multiple buyers (Lau, 2013). As an example, climate mitigation, water quality, biodiversity, visitor benefits and reducing wildfire risk may be bundled together in a single scheme designed to pay for peatland restoration (as described in the case study below).

Despite progress in recent years towards the development of bundled and layered schemes, three important challenges remain unresolved. First, despite targeting multiple ecosystem services, PES schemes typically only target single habitats and/or ecosystems, and ignore interactions between different ecosystems within the same landscape (Calvet-Mir et al., 2015). As such, PES schemes may incentivize management activities in ways that lead to trade-offs for the delivery of ecosystem services from different ecosystems within a landscape (Engel et al., 2008). For example, re-wetting peatland to reduce greenhouse gas (GHG) emissions may compromise the growth rate, and hence carbon sequestration potential of adjacent forestry (Freléchoux et al., 2000). Conversely, planting trees next to a re-wetted peatland may dry out the peat, releasing GHGs, and provide habitat for species that prey on the ground-nesting birds that were a co-benefit bundled with peatland restoration (Amar et al., 2011).

Second, there has been little consideration of interdependencies between ecological and social systems that may be affected by PES schemes. Linked to this, governance of PES schemes in such complex social-ecological systems remains challenging (Farley and Costanza, 2010; Bennett and Gosnell, 2015; Hayes et al., 2015). This challenge relates to the inter-connected and quite different spatial and temporal scales at which different ecosystem services are typically managed (Schomers et al., 2015; Meyer et al., 2016; Jones et al., 2016). Although there are notable exceptions where PES schemes have been developed from the bottom-up in collaboration with local communities, particularly in international development contexts (e.g. Milder et al., 2010), it is common for PES schemes to be developed from the top-down by Governments, conservation agencies and NGOs, or developed with only partial involvement of a narrow range of stakeholders (Pascual et al., 2014).

Finally, with the exception of nature-based tourism, most PES schemes focus on provisioning, supporting and regulating ecosystem services, giving little attention to cultural services (Church et al., 2014). This is due to: i) measurement issues related to the intangible nature of many cultural services (Chan et al., 2012); ii) ontological issues related to whether values for these services are held individually or collectively (and hence whether a single value can be ascribed to an ecosystem service in any given location, given that its value will depend on whether social values are aggregated from individual values or negotiated between social groups; Kenter et al., 2015); and iii) philosophical issues over whether cultural services should be monetised via PES schemes (Fourcade, 2011; Cooper et al. in press).

These three challenges map onto the three elements of a place-based approach to PES that is developed in the next section of this paper. This is the first time these challenges have been addressed in an integrated way. By introducing a novel conceptual approach to PES, rigorously evaluated and illustrated through case study research, this paper provides guidance to help implement and harness the full potential of PES schemes. Specifically, the aims are:

- Based on the literature, develop a theoretically robust, new approach to develop and implement PES schemes that incorporate multi-level governance, bundling or layering of services across multiple scales, and shared values for ecosystem services (Section 2);
- Evaluate and illustrate this approach using case study research to develop a place-based PES scheme in the UK (Section 3); and
- Critically unpack the concept of ‘place-based PES’ by evaluating case study findings in relation to international experience and theory, identifying key characteristics, benefits, and challenges

of the approach, to inform the implementation of place-based PES schemes internationally (Section 4).

2. Defining a place-based approach

A place-based approach to environmental governance can be defined as "integrated management of the full suite of human activities occurring in spatially demarcated areas identified through a procedure that takes into account biophysical, socio-economic, and jurisdictional consideration" (Young et al., 2007: 22). With regard to ecosystem services and their management, place-based management can be seen as a strategy for translating ecosystem management into operational management (Brown and Weber, 2012)

Although place-based approaches are gaining popularity (Bremer and Funtowicz, 2015) they have not previously been applied in the context of PES.

A place-based approach has two fundamental pillars (Bolton, 1992; Barca et al., 2012). The first pillar pays particular attention to geographical context, encompassing spatial, social, cultural and institutional, as well as biophysical aspects (Selman, 2000). This pillar thus revolves around more holistic understandings of space. Space matters because many externalities from land management practices affect communities that are separated in space, and yet connected to each other via the consequences of decisions that they have little power over (Barca et al., 2012). Delivering a place-based approach is made difficult by fuzzy boundaries between ecosystems and administrative jurisdictions, which sometimes bear little resemblance to public perceptions and values of place (Allmendinger and Haughton, 2010). The multi-faceted and distinctive context and extant governance of any given place influences the way that social actors interact with and value ecosystem services (Kenter et al., 2014). By considering the different dimensions of value held by different social groups for a place, Kenter et al. (2015) argue that it is possible to broaden decisions to encompass a wider range of values (including deeply-held 'transcendental' values and beliefs) and ecosystem services (including cultural ecosystem services). Cultural ecosystem services in particular, are increasingly being conceptualized in place-based terms, as both the environmental spaces (or 'settings') within which people interact with nature (e.g. beaches or parks), and the cultural practices through which they interact with nature (e.g. exercise and play), which enhance human wellbeing (e.g. relating to identity (such as a sense of place and belonging), experiences (such as tranquillity or escape) and capabilities (such as knowledge and health)) (Scott et al., 2009; Church et al., 2014).

The second pillar of a place-based approach concerns the knowledge flows and interdependencies between social actors who have/can secure the power and social capital to capture and manage resources in places where they can exclude or marginalize others (Cowell and Lennon, 2014). This becomes particularly significant for PES, given critiques about social justice, equity and elite and or regulatory capture relating to many schemes (see discussion).

In this context, we define place-based PES as schemes that:

i) *facilitate networked and multi-level governance that incorporate a holistic understanding of the social, economic and biophysical attributes that shape a given place*
ii) *bundle or layer the widest relevant range of ecosystem services over relevant (potentially multiple) spatial and temporal scales (and in some cases, multiple habitats) in the same location*
iii) *are part of a voluntary transaction between service users and providers, with payments conditional on agreed rules of natural resource management and reflecting the shared values of multiple ecosystem service sellers and other offsite stakeholders who may be positively or negatively affected by the scheme.*

This definition extends Wunder (2015) definition of PES, providing three additional components relating to: multi-level governance; bundling or layering services across multiple scales; and shared values for ecosystem services. Taking this definition as its starting point, the next section describes a case study from UK peatlands, which explicitly used a place-based approach from the outset.

3. Case study

3.1. Context

Peatlands provide a useful system in which to explore payments for multiple ecosystem services across terrestrial and freshwater ecosystems at a range of spatial and temporal scales, given the range of services they provide and degradation concerns (Bonn et al., 2014). We focus on the development and implementation of the Peatland Code, as an example of a voluntary scheme explicitly developed to take a 'place-based approach' to PES.

Public funds are currently insufficient to restore peatlands on the necessary scale to maximize provision of ecosystem services (Bonn et al., 2014). The Peatland Code was therefore designed to provide a mechanism whereby peatland restoration projects that would not have been implemented (e.g. due to insufficient or inadequate funding) are able to access support from the private sector to overcome this barrier. Projects participating in the Peatland Code are independently validated and verified against the requirements of the Code to ensure that planned restoration will result in the permanent climate mitigation claimed over the duration of the project, providing assurance to the private sector. Project duration is for a minimum of 30 years, and funding can finance capital works, compliance with the Code, ongoing monitoring and maintenance and the possibility of additional ecosystem service payments. The International Union for the Conservation of Nature (IUCN)'s UK Peatland Programme (overseen by the IUCN UK National Committee) owns and administers the Peatland Code and has led its development. The work of the Peatland Programme is overseen by a coalition of environmental bodies including the John Muir Trust, Scottish Wildlife Trust, Yorkshire Wildlife Trust, RSPB, North Pennines AONB Partnership, Moors for the Future, Natural England and the University of East London.

3.2. Methods

Methods were developed through a number of research projects that together facilitated development of the Peatland Code. Setting up this place-based PES scheme involved interdisciplinary research on peatland ecosystem processes, management, and governance, and collaboration with ecosystem service buyers, sellers and other stakeholders. Many of the projects were carried out in parallel, with results feeding into other projects in an iterative fashion. The methods are presented here in 3 phases:

3.2.1. Phase 1: market research

1. Market research was conducted alongside the development of a draft UK Peatland Code comprising 11 semi-structured interviews with businesses from a range of sectors (Reed et al., 2013a)
2. To explore demand for PES from industry, 24 interviews with ecosystem service beneficiaries with direct dependencies on the natural environment, focusing on beverage manufacturers, food

manufacturers, and heavy water users from the chemical and paper manufacturing sectors (Eves et al., 2014)
3. Further feedback on the ongoing development of the Code was then sought from the water industry and wider peatland stakeholders via two professionally facilitated, participatory workshops in West Yorkshire (Reed et al., 2014)
4. Desk-based research using secondary data and a comparative analysis of the pilot Peatland Code and the German MoorFutures project explored research questions around co-benefits of peatland restoration that arose from the two participatory workshops (Bonn et al., 2014; Evans et al., 2014; Glenk et al., 2014; Martin-Ortega et al., 2014).

3.2.2. Phase 2: place-based pilot projects

1. A stakeholder workshop and desk-based research with a Local Nature Partnership was used to develop a place-based approach to PES for the South Pennines (Quick et al., 2013)
2. Questionnaires and interviews were conducted with 9 visitor giving schemes across the UK, with case study research in the Lake District National Park, where 49 visitors and 12 businesses were interviewed, to investigate the potential to integrate visitor giving with the Peatland Code, leading to the production of a suite of smart phone apps for the Lake District and south Pennines (Reed et al., 2013b)
3. A draft Peatland Code was piloted with project developers from 2013 to 2015 through a series of pilot restoration and research projects in the North Pennines, Exmoor and Lake District (Reed et al., 2015) and the South Pennines (Quick et al., 2013) in England and through Scottish Government's Peatland Action programme in sites across Scotland. Field protocols for assessing GHG emission reductions from restoration were trialled in a further 22 sites across the UK (Smyth et al., 2015)
4. An economic assessment of Peatland Code projects was conducted to assess the market potential and capacity for the Code to restore peatlands at appropriate scales, leading to the development of a project feasibility tool (Smyth et al., 2015)
5. The Code was piloted with the business community through a series of events organised by the International Union for the Conservation of Nature (IUCN)'s UK Peatland Programme (IUCN UK Peatland Programme, 2015)
6. Five focus groups with landowners and other stakeholders in Scotland and England were conducted to pilot the Code with the landowning community. These started with a problem tree analysis of the effects of peatland modification (causes and effects of modification drawn as roots and branches of a tree by participants) and matrices in which participants assessed the social, economic and environmental effects of different types of restoration for different groups of stakeholders. Next, social valuation of ecosystem services through deliberative-

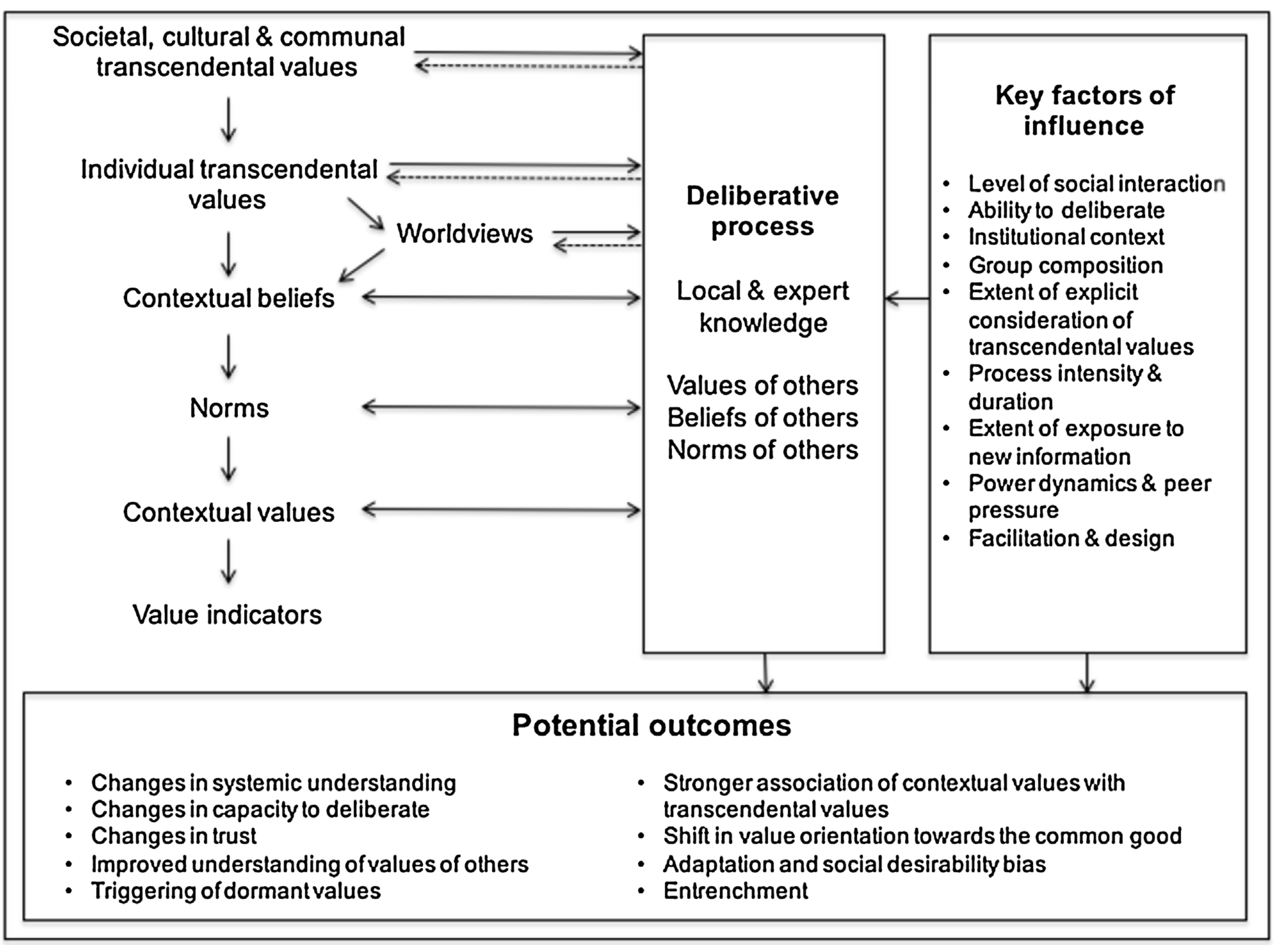

Fig. 1. The Deliberative Value Formation model, proving a theoretical template of how an individual forms contextual values and indicators through deliberation with others, the key factors that influence this process and its potential outcomes. Arrows indicate the direction of influence. Worldviews and transcendental values, while they influence the deliberative process, are assumed to be relatively enduring and are only likely to change as a result of long-term or repeated deliberative processes (dashed arrows) (taken from Kenter et al., in press, a).

Table 1
Alternative PES structures developed by stakeholders for the South Pennines National Character Area (from Quick et al., 2013).

Type of PES scheme	Buyer	Ecosystem Service (s)	Distribution of Finance	Capital or maintenance costs	Conditions of finance	Intermediaries	Spatial scale	Comments
Bundled PES Scheme 1	Water utility	Water quality[a]	Ultimately funded through customer water bills.	Capital costs	Demonstrate to Ofwat that it is a cost-effective way of improving water quality	Water utility can engage directly with landowners or establish an intermediary to do so on its behalf	To make an appreciable difference to water quality, changes at the sub-catchment scale are desirable	Water quality improvements are the focus of the PES scheme, but improvements to other ecosystem services are monitored and reported as part of the corporate strategy
		Biodiversity Climate regulation Flood risk						
Bundled PES Scheme 2	Corporations	Climate Regulation[a]	Finance distributed via intermediaries working within a Peatland Carbon Code.	Capital and maintenance costs. Funding is 'ex-ante' (i.e. before the carbon has been sequestered).	Carbon sequestration must be additional; verification and monitoring are required, ideally to a standard consistent with the requirements of voluntary carbon markets and corporate carbon accounting.	Necessary for intermediaries to broker deals between multiple buyers and sellers, in keeping with monitoring and verification guidelines under the proposed Peatland Carbon Code.	Payments could be made per tonne of carbon (the area of land this would equate to would vary from site to site), or per project area (for a fixed amount of carbon and co-benefits).	Since the scheme already bundles climate regulation with biodiversity, it would not be possible to secure additional funding from Biodiversity Offsets, as this would be double counting the biodiversity.
		Biodiversity Water Quality Etc.						
Bundled PES Scheme 3	Developers and Corporations	Biodiversity[a]	Funded through voluntary biodiversity offsets or conservation credits.	Capital and Maintenance costs. Funding is 'ex-ante'.	Biodiversity improvements must be additional; Monitoring and verification are required.	Intermediary to establish the metrics for measuring biodiversity improvements, putting in place the trading platform, and to monitor, verify and report the improvements.	1 credit is equal to 1 ha. The value of the 1 ha credit varies depending on habitat type.	Biodiversity offsetting and conservation credits are not likely to be in significant demand for sites such as those found in the South Pennines Pilot area, as there is not currently significant development pressure on peatland/moorland sites, and sites must replace "like for like".
		Climate regulation Water quality						
Layered PES Scheme 1	Water utility	Water quality	Funded through raising customer water bills.	Capital costs	Demonstrate to Ofwat that it is a cost-effective way of improving water quality.	Water Utility can engage directly with landowners or establish an intermediary to do so on its behalf.	To make an appreciable difference to water quality, changes at the sub-catchment scale are desirable.	Private and public funds are combined. The Water Utility pays for capital improvements while Government pays for ongoing maintenance costs.
	Government	Broad range of ecosystem services (biodiversity, landscape, cultural heritage etc.).	Funded through Environmental Stewardship (UELS and/or HLS).	Some funding available for capital costs but mainly for maintenance costs.	Dependent on scheme.	Natural England administer Environmental Stewardship payments.	Environmental Stewardship is available across the South Pennines NCA.	
Layered PES Scheme 2	Corporations	Climate regulation and biodiversity (bundled).	Finance distributed via intermediaries working within a Peatland Carbon Code.	Capital and maintenance costs.	Carbon sequestration must be additional; verification and monitoring are required, ideally to a standard consistent with the requirements of voluntary carbon	Necessary for intermediaries to broker deals between multiple buyers and sellers, in keeping with monitoring and verification guidelines under the proposed Peatland Carbon Code.	Payments could be made per tonne of carbon (the area of land this would equate to would vary from site to site), or per project area (for a fixed amount of carbon and co-benefits).	Market research suggests corporations are interested in paying premium prices for climate regulation that is bundled with biodiversity. If the scheme is focussed on peatland

Table 1 (*Continued*)

Type of PES scheme	Buyer	Ecosystem Service (s)	Distribution of Finance	Capital or maintenance costs	Conditions of finance	Intermediaries	Spatial scale	Comments
					markets and corporate carbon accounting.			restoration, then non-peatland restoration options would be chosen from agri-environment schemes. It may still be able to consider this restoration work as “additional” because land owners did not previously take up this option from the agri-environment scheme. If restoration only became financially viable due to the private PES scheme, then it would not otherwise have happened and could be considered “additional”.
	Government	Broad range of ecosystem services (biodiversity, landscape, cultural heritage etc.).	Funded through Environmental Stewardship (UELS and/or HLS).	Some funding available for capital costs but mainly for maintenance costs.	Dependent on scheme.	Natural England administer Environmental Stewardship payments.	Environmental Stewardship is available across the South Pennines NCA.	
Layered PES Scheme 3	Corporation and Individuals.	Climate regulation.	Non-bundled carbon credit.	Capital and maintenance costs.	Payments need to be additional.	A single intermediary is required to aggregate the different buyers and funding streams, to ensure funding from the different sources are additional, to cost-effectively monitor and verify improvements. The Local Nature Partnership, which has broad stakeholder engagement, may be in a good position to act as the intermediary.	Payments could be made per tonne of carbon (the area of land this would equate to would vary from site to site), or per project area (for a fixed amount of carbon and co-benefits).	This layered PES scheme is complex and likely to significantly increase the transaction costs associated with the PES scheme. Proving the additionality of the funds is likely to be difficult. The scheme would require a strong intermediary with broad stakeholder support, who is able to aggregate both buyers and sellers and meet distinct demands. The alternative here is a South Pennines Trust Fund which everybody pays into on the basis of the benefits anticipated for each buyer and a management group is mandated to make spending decisions on service enhancements which meet as many expectations as possible . . . which looks very like a bundled scheme, but with a layered shop front.
	Developers and Corporations	Biodiversity	Non-bundled biodiversity credit	Capital and maintenance costs	Payments need to be additional		1 credit is equal to 1 ha. The value of the 1 ha credit varies depending on habitat type	
		Water Quality		Capital costs			Sub-catchment level	

Table 1 (*Continued*)

Type of PES scheme	Buyer	Ecosystem Service (s)	Distribution of Finance	Capital or maintenance costs	Conditions of finance	Intermediaries	Spatial scale	Comments
	Water Utility Company		Funded through raising customer water bills		Payments need to be cost effective compared with other means on improving water quality			
	Visitors and Tourists	Recreation	Visitor Payback Scheme	Capital and maintenance costs	n/a		Landscape level improvements	
	Downstream residents	Flood Risk	Aggregated payments from downstream residents	Capital and maintenance costs	Payments need to be cost effective compared with other means on reducing flood risk		Land management changes targeted at reducing flood risk in strategic waterways.	
	Government	Support for a broad range of ecosystem services	Funded through Environmental Stewardship (UELS and HLS)	Some funding for capital costs but mainly for maintenance costs	Dependent on scheme		Environmental Stewardship is available across the South Pennines NCA	

[a] Lead ecosystem service.

democratic monetary valuation exercises (Kenter, in press, a; Orchard-Webb et al. in press) sought to characterize and quantify the cultural and social value and impacts of changes in ecosystem services arising from restoration. Methods were based on the Deliberative Value Formation model (Kenter et al., in press, a), which characterises deliberative valuation as a process of applying "transcendental" values (overarching principles and life-goals; Kenter et al., 2015; Raymond and Kenter, in press) that are important to people as individuals and to their communities and society, in a practical context (Fig. 1). Through a process of exchanging and debating transcendental values alongside information about peatland restoration, participants formed 'contextual' values (opinions about how much something specific is worth), and translated these into value indicators, in this case, fair prices for different restoration management options. Transcendental values were elicited through a storytelling exercise. In the first workshop, this was preceded by a 'values compass' questionnaire (Kenter et al. in press, b) asking participants to align themselves with a list of 56 broad transcendental values, based on Schwartz (1994) standard list of transcendental values. In subsequent workshops this step was omitted to save time, but probing questions were used to make transcendental values explicit.

3.2.3. Phase 3: code development

1. Emissions factors were developed to cost-effectively monitor GHG emission reductions arising from restoration projects under the Peatland Code, using the Greenhouse Gas Emissions Site Type approach (Couwenberg et al., 2011) to develop vegetation proxies. This involved the collation of all available emissions data for blanket bogs from the UK and other comparable locations, which were then categorised into four condition categories (near natural, modified, drained and actively eroding) that could be identified in the field to develop emissions factors through statistical analysis, using residual maximum likelihood to calculate the average emission factors and 95% confidence intervals for each of the condition categories (Smyth et al., 2015)
2. Governance structures: a range of governance structures were established to oversee the operation of the Code
3. A Peatland Restoration Handbook was developed to ensure restoration projects are based on the latest evidence from research and practice
4. The UK Peatland Code 1.0 and final draft of the Project Design Document were launched at the World Forum on Natural Capital in Edinburgh, in November 2015.

3.3. Case study analysis

3.3.1. Phase 1: market research

Market research suggested that the ecosystem services considered most "marketable" and able to generate private revenue to support their enhancement in peatlands, were climate regulation, water quality, biodiversity and flood risk mitigation. Although peatland restoration can enhance all of these services over the course of a typical project, certain types of restoration may in some circumstances lead to trade-offs with provisioning services, such as sheep and game production (Reed et al., 2013a; Bonn et al., 2014).

Preferences of ecosystem service buyers for single, bundled or layered ecosystem service schemes were explored in two ways. First, business sectors most likely to benefit from enhancements in ecosystem services were shortlisted. Interviews with companies in the food and beverage manufacturing and chemical and paper manufacturing sectors identified limited awareness of business dependencies on ecosystem services, or the risks and opportunities arising from the management of ecosystem services. Local authorities were more aware of PES opportunities, but primarily as brokers or sellers, rather than as buyers on behalf of others.

Second, potential buyers for ecosystem service improvements from peatlands were identified through market research and stakeholder workshops with: water utility companies; corporate entities interested in financing climate regulation as part of their Corporate Social Responsibility portfolio; corporations and developers interested in purchasing conservation/biodiversity credits to offset impacts generated elsewhere; government via agri-environment schemes; and members of the public paying for ecosystem service projects via Visitor Payback Schemes. Market research showed companies were particularly attracted by opportunities to invest in low-risk, UK-based projects, close to their headquarters, operations or customer base. Companies with a direct financial link to peatlands had a particular interest. This included companies whose activities damage peatlands (e.g. through mining peat for use in horticulture and whisky production or built development), or whose brand was also directly linked to peatlands (e.g. whisky distilleries), but also included companies with a strong focus on environmental sustainability as part of their business model (e.g. the carpet tile manufacturer that helped launch the Peatland Code in November 2015). Water companies showed significant interest, with one company fully funding restoration in one pilot project.

Companies were most likely to express interest in paying for climate mitigation, with the exception of water utilities who were equally or more interested in water quality benefits. There was considerable interest in biodiversity, however, there was little interest in paying significantly for accurate quantification of these benefits. Instead, there was a strong focus on the need for any scheme to be highly credible, with strong support from Government and association with well-known NGO brands. As such, buyers tended to prefer bundled scheme designs, where co-benefits are monetised through premium pricing of the anchor service rather than accurately quantifying and marketing these separately in layered schemes.

3.3.2. Phase 2: place-based pilot projects

Buyer preferences in Phase 1 contrasted with the views expressed by many of the ecosystem service sellers who took part in the second phase of the research. For example, stakeholders in the South Pennines were presented with a choice of three bundled PES schemes versus three layered schemes (Table 1) and overwhelmingly supported the scheme with most layers.

The research found interest in PES among both visitors and visitor giving schemes. Visitors were most interested in donating to projects that protected habitats for wildlife and were willing to donate around £2 on-site during a visit. Visitor giving schemes were attracted to PES due to the focus on measurable, positive benefits arising from donations, which they felt could avoid the perception that visitor giving was a form of 'bed tax' or 'payback' for past damage. However, a number of barriers were identified, including the high cost of marketing and running a visitor giving scheme. To overcome this barrier, the research team developed a suite of smart phone apps, giving walkers and cyclists routes through two parts of the Lake District and South Pennines, with the option in two apps to donate £2 to a local PES scheme for a measurable ecosystem service benefit (e.g. carbon or water from peatland restoration or pollination services from wildflower meadow creation). This work emphasized the place-based nature of visitor engagement and learning about nature. In theory, this provides a blueprint for PES via visitor giving with low ongoing running costs. However, the research found that without a marketing budget, uptake of the apps was limited, leading to insignificant revenues for linked projects.

During five workshops with landowners, managers and other stakeholders across the UK (Peak District, Cairngorms, Dumfries, Shetland and Thurso), participants considered the range of ecosystem services that could potentially be sold together in a peatland restoration project. Participants were presented with a summary of the latest research evidence for these co-benefits, and then asked to consider the range of management actions and ecosystem services that could be lost or accrued, depending whether peatlands were degraded or restored. In addition to different types of peatland restoration, management actions included afforestation of upland valleys and removal of forests planted on peat. When asked to consider the effects of peatland degradation and restoration on ecosystem services via a problem tree analysis, in all workshops at least a third of the perceived effects of peatland degradation and restoration pertained to changes in water flow or chemistry. Changes to wildlife and habitat condition were also frequently mentioned. However, effects on carbon storage and climate regulation were only mentioned in two regions (Cairngorms and Thurso). In all sites, there was a high degree of consensus among sellers over the feasibility and desirability of delivering ecosystem services from the revegetation of bare peat. This type of restoration was most likely to give landowners the capacity to reflect a wider range of shared values in the prices charged for these co-benefits, and least likely to attract

Table 2
Quotes from deliberative valuation workshops with stakeholders illustrating transcendental values expressed through storytelling, organised into emergent themes.

Illustrative quote	Speaker
Theme 1: Duty and responsibility	
"This is all about custodianship···?It's all about sustainability. It's about handing over something in a better state than what you were lucky enough to get it at."	Cairngorms, storyteller 1
"*You never become an estate owner through financial reasoning···?I think we are just stewards and passing through and doing the best we can in many ways.*"	Dumfries, storyteller 2
"I do feel I am probably a better steward than a public organisation because I have a heart, I have a stake in it."	Thurso, storyteller 2
"Because I've been there a long time, so know how it changes. I've seen it for a long time now."	Thurso, storyteller 2
Theme 2: Achievement and self-respect	
"The hills have to have sheep, because this is the one and only place where you find the Shetland sheep."	Shetland, storyteller 1
"Shetland men have sheep."	Shetland, storyteller 2
"The first time I went I was 1 year old. My mother had been going since she was 11. In family terms, there's a certain responsibility over the years."	Dumfries, storyteller 1
"I can see five kingdoms from up there . . . To be master of all you survey is a wonderful thing"	Dumfries, storyteller 1
"I love creating all the different habitats."	Dumfries, storyteller 2
"You've got to understand a bit how it developed, why it looks like that . . . how it got there and how old it is . . . you've got to have a perception of that before you can appreciate them fully."	Thurso, storyteller 1
Theme 3: Place identity and a sense of belonging	
"This was particularly poignant on an occasion with my young daughter on Kinder when there was snow lying on the ground and everything was silent with nothing to disturb the peace."	Peak District, storyteller 3
Theme 4: Legacy	
"Although I have good familiarity with the moor I have to remind myself that it is a wilderness and one can die up there."	Peak District, storyteller 4
Theme 5: Connection with others	
"I [. . .] was forlornly limping down the hill but was struck by the number of people in the race that stopped to see if I was OK. I feel that the community of people that like going up the hill have a close connection with each other; it's a people thing."	Peak District, storyteller 1

opportunity costs. Although restoration of bare peat areas was positive for production, concerns were raised about the effects of blocking drainage ditches, with particular concerns about potential declines in the productivity of sheep and grouse.

Bundling schemes with the recreational benefits of healthy habitats was explored from the perspectives of both sellers and buyers. First, benefits to sellers were captured qualitatively as part of the wider discussion of shared values for peatlands. Although this informed the subsequent discussion of a “fair price” (Spash, 2007; Kenter, in press, a) to charge for peatland restoration, it was not possible to disaggregate the value for recreation. In one site, this value was incorporated through inclusion of footpath restoration as a type of bare peat revegetation, which it was thought could be justified through additional signage opportunities for funders in high footfall areas of the Peak District National Park.

Finally, fair prices for restoration were explored using methods based on the Deliberative Value Formation model, starting with transcendental values elicitation, then moving to deliberation on contextual beliefs and values in relation to specific management options, through to the negotiation of value indicators (fair prices). Table 2 organises the transcendental values that emerged from storytelling thematically, with illustrative quotes. A sense of duty and responsibility was evident in all five workshops (theme 1 in Table 2). For example, many stories suggested a sense of responsibility for restoring damaged peatlands, and a perception that landowners were the ones with the knowledge, understanding and skill to do it well. Linked to this was a sense of achievement and self-respect (theme 2 in Table 2), for example linked to sheep farming and its associated heritage in Shetland, to the protection of nature and landscape aesthetics in Thurso, and to place identity and a sense of belonging derived from the wide-open spaces characteristic of the Peak District, and from ‘secret’ places that one can develop a special connection with. Linked to this, other stories emphasized the peacefulness associated with being alone and undisturbed in the landscape (theme 3 in Table 2). Legacy was important in stories from all regions (theme 4 in Table 2). This was linked to the idea of passing something on in good condition and stories placed value on longevity of tenure and management. A sense of determination and survival emerged, which emphasized values associated with self-direction, such as creativity and the ability to remain in control of land management choices. Engagement with nature in the stories often related particularly to specific shared experiences of nature, such as listening with other members of the local community for the calls of the first curlews *Numenius arquata* (theme 5 in Table 2). For some, this connection with others was felt through taking part in recreational activities that brought people together.

Next, workshop participants were asked to deliberate contextual beliefs and values in relation to specific management options. Participants were asked to consider the likely social and community, economic and environmental effects (whether positive or negative) of two types of restoration (revegetation and/or ditch blocking, depending on the types of restoration required in each area), identifying affected groups. The cost of re-vegetating bare peat was the only negative effect identified (due to capital costs). A range of positive effects were identified, notably improvements in the quality of grazing and, consequently livestock production. Workshop participants perceived mixed effects of ditch blocking, primarily because of potential impacts on productivity of sheep and game. In the Cairngorms it was felt that ditch blocking might be beneficial to grouse chicks due to increased invertebrate numbers and crossing points, while in Dumfries and Shetland there were concerns over livestock health as a result of liver fluke and sheep becoming stuck in wet flushes. Participants in Thurso saw potential employment opportunities and higher investment in the area resulting from restoration work, which could be particularly important given reduced demand for forestry and associated industries. Effects on water, such as lower water treatment costs, more reliable supply and reduced flooding, were perceived as important in the Cairngorms and, to a lesser degree, in Thurso. Similar effects were noted in Thurso but with concerns that neighbouring properties may be flooded as a result of re-wetting. Concerns in the Peak District focused on the need to avoid or reduce the frequency of managed burning on restored sites, and the impact this may have on grouse populations.

Building on the elicitation of transcendental values and the deliberation of contextual beliefs and values in relation to different restoration options, the last step was to negotiate value indicators (fair prices for restoration). These were based on an assessment of the costs of restoration, which varied significantly from site to site, the costs of meeting the requirements of the Peatland Code (including administration, validation/verification monitoring and maintenance), and other broader value concerns, including opportunity costs and payments for ecosystem services (typically based on a notional price of carbon), which could compensate landowners for the perceived risks of restoring peatland under the Code. Potential revenues from agricultural subsidies and other sources offset these costs. The deliberated fair price ranged from £11.18 per tonne of CO2 equivalent in Dumfries to £15.65 per tonne in Thurso, with substantially higher prices in the Peak District of £54 and £107 per tonne for revegetation and ditch blocking respectively. Much of the difference in prices can be explained by large differences in the costs of restoration, with restoration costs estimated to be four times the national average in the Peak District (due to the severity of degradation). However, the perception of risks, opportunity costs and inclusion of other values also varied significantly, with particularly high risks perceived by Peak District stakeholders in relation to ditch blocking, due to perceived impacts on grouse production.

The fair price deliberation included discussion of the terms of restoration, including the balance between ditch blocking and bare peat erosion (in some areas, only one type of restoration was viable) and the preferred contract length. As part of this fair price, the level of additional payment sought by landowners, after meeting the costs of restoring peatland under the Code, was £2 per tonne of CO_2 equivalent generated through restoration in Thurso (ditch blocking only over 30 years), £3 per tonne in Dumfries (50:50 mix of ditch blocking and revegetation over 30 years) and the Cairngorms (50:50 mix over 50 years), £3.50 per tonne in Shetland (50:50 mix over 30 years) and £4.30 per tonne (revegetation only over 30 years) in the Peak District. Under certain circumstances, landowners said that they would not seek any additional payments (to secure 30 year rather than 50 year contracts in the Cairngorms, or to secure funding for more expensive footpath restoration as part of the scheme in the Peak District). The main outlier was for ditch blocking in the Peak District, where there were significant concerns and perceived risks associated with this type of restoration, and where participants incorporated an additional charge of up to £15 per tonne of CO_2 equivalent into their fair price for this type of restoration. For the purposes of discussion, prices were calculated per tonne of CO2 equivalent, based on market research (reported above) that climate mitigation is likely to be the anchor service for most buyers, with water, biodiversity and cultural services more likely to be bundled as co-benefits.

Concerns over restrictions on managed burning had a significant bearing on the fair price discussion in the Peak District, and to ensure comparability to other sites, participants were asked to deliberate over fair prices with and without burning restrictions. This resulted in a substantial ‘burning premium’ being added by participants to what they perceived to be fair prices for ditch blocking (more than double the price if burning were allowed under certain circumstances). This is a direct example of the way transcendental values led to the expression of shared values that were significantly different, depending on the extent to which those shared values may be compromised by the proposed management intervention. These broader value concerns, including those expressed via storytelling and effects matrices, were also reflected in some of the indirect costs that were included in fair price calculations, for example considering indirect local economic costs for local hotels and restaurants resulting from a decrease in sporting activity, if ditch blocking significantly compromised the productivity of grouse populations. As such, it was deemed fair that a place-based PES scheme should use some of its revenue to compensate those who would lose out.

3.3.3. Phase 3: code development

An important component of the governance of any PES scheme is the ability to cost-effectively and accurately monitor and verify ecosystem service benefits (Arriagada and Perrings, 2009; Alston et al., 2013). Work was therefore undertaken to develop metrics based on the best available data and a field protocol that could be used easily by practitioners to accurately estimate GHG emission savings from restoration projects under the Code. The field protocol identifies four peatland conditions: 1) near natural; 2) modified; 3) drained; and 4) actively eroding (Fig. 2). Each of these is associated with a standard Emissions Factor derived from a review and statistical analysis of available GHG flux data to determine functional relationships between site condition and GHG emissions. Table 3 shows emissions factors for each condition

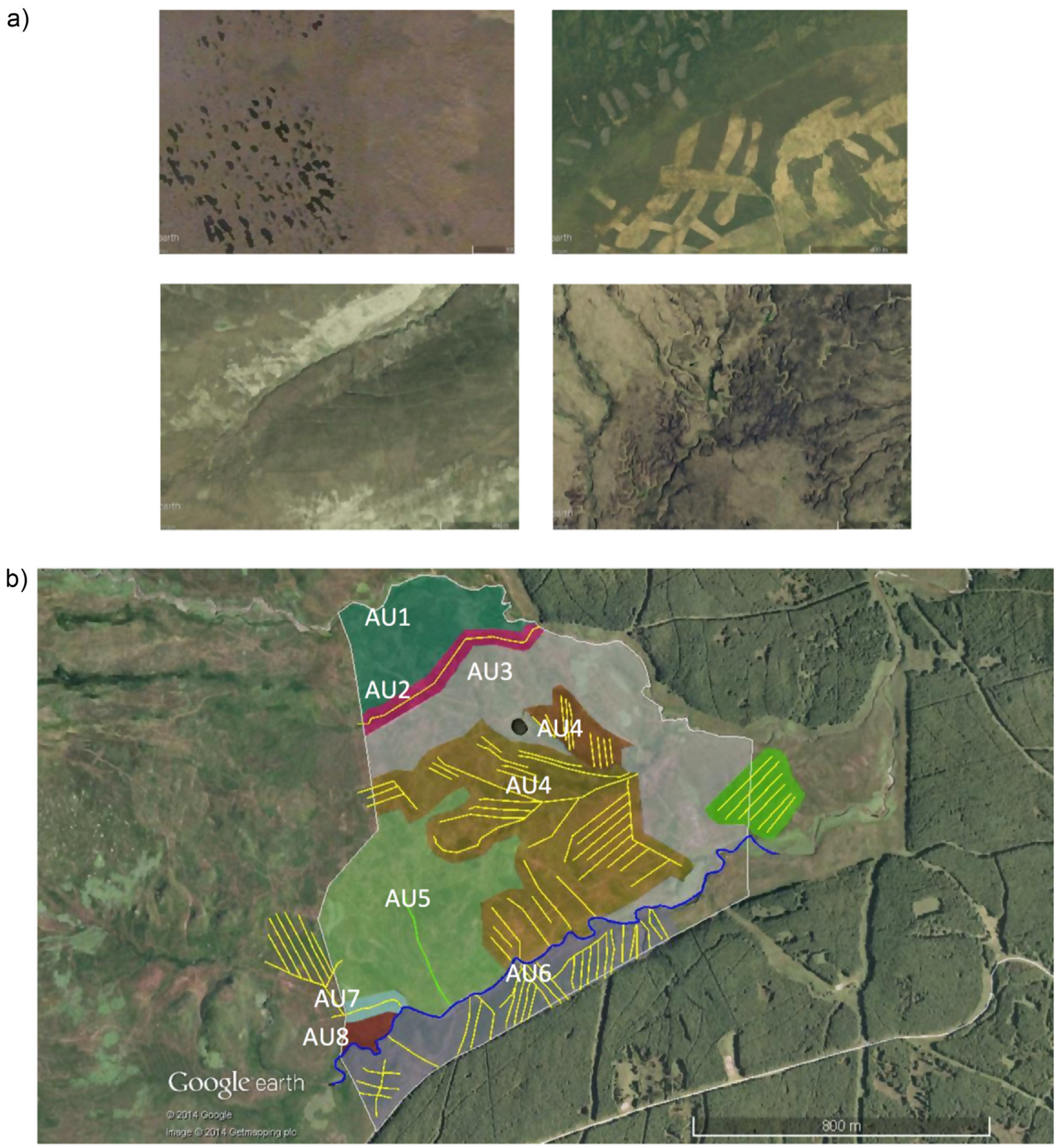

Fig. 2. a) aerial photographs of sites in each of the four condition categories used in the Peatland Code, showing (clockwise) near natural, modified, drained and actively eroding sites; b) example project site mapped into different assessment units (AUs) based on the condition category of different parts of the site, based on aerial imagery. Drains have been traced with a yellow line to aid mapping into the discrete AUs, and other features have been marked e.g. rocky outcrops (shown in dark grey towards the centre of the site), watercourse (blue line) and a quad bike track (green line). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 3
Emission Factors for each Condition Category after statistical analysis ($tCO_2eq/ha/yr$) using IPCC default values for Dissolved Organic Carbon (DOC) and relevant literature for Particulate Organic Carbon (POC). Table 4 gives net effect of restoration activities which change condition. See footnotes for details on how POC and DOC values were derived.

Peatland Code Condition Category	Descriptive Statistics	CH_4	CO_2	N_2O	DOC	POC	Emission Factor
Pristine[a]	–	–	–	–	–	–	Unknown
Near Natural	Mean (±StE)	3.2 (1.2)	−3.0 (0.7)	0.00 (0.00)	0.88[b]	0	1.08
	Median	1.5	−2.3	0.0			
Modified[h]	Mean (±StE)	1.0 (0.6)	−0.1 (2.3)	0.5 (0.3)	1.14[c]	0	2.54
	Median	0.2	0.1	0.5			
Drained	Mean (±StE)	2.0 (0.8)	1.4 (1.8)	0.00 (0.00)	1.14[d]	0	4.54
	Median	1.0	−0.9	0.0			
Actively Eroding	Mean (±StE)	0.8 (0.4)	2.6 (2.0)	0.0 (0.00)	1.14[e]	19.3 (average of 14.67[f] and 23.94[g]	23.84
	Median	0.1	0.4	0.0			

[a] Not enough UK appropriate data from pristine sites exists to give an Emissions Factor (taken from Smyth et al., 2015).
[b] Calculated as the mean value of reported values in UK studies given in Table 2A.2 of the 2013 Supplement to the 2006 Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement) http:/www.ipcc-nggip.iges.or.jp/home/wetlands.html.
[c] IPCC Tier 1 default value for drained peatland (best estimate for modified condition).
[d] IPCC Tier 1 default value.
[e] IPCC Tier 1 default value for drained peatland (best estimated for actively eroding condition).
[f] Estimated from UK blanket bogs (in Goulsbra, C., Evans, M. & Allott, T. (2013) Towards the estimation of CO_2 emissions associated with POC fluxes from drained and eroding peatlands. In: Emissions of greenhouse gases associated with peatland drainage waters. Report to Defra under project SP1205: Greenhouse gas emissions associated with non-gaseous losses of carbon from peatlands – fate of particulate and dissolved carbon. Report to the Department of Environment, Food and Rural Affairs, UK).
[g] Value from Birnie and Smyth (2013) unpublished, but recalculated to reflect that 70% of POC derived carbon assumed to be reaching the atmosphere with remaining 30% assumed and redeposited (Chris Evans *pers.comm*).
[h] Restoration of Modified is no longer eligible under the peatland code – emissions reduction over time cannot be accurately quantified prior to restoration therefore credits cannot be sold up front.

Table 4
Net effect on GHG emissions resulting from restoration and changing Condition Categories calculated using the Emission Factors given in Table 3 (Units are t CO_2 eq/ha/yr) (taken from Smyth et al., 2015).

Condition Category Change	Gross effect[a] (tCO_2 eq/ha/yr)
Restoring from Modified to Near Natural[b]	Saves 1.46
Restoring from Drained to Near Natural[b]	Saves 3.46
Restoring from Drained to Modified	Saves 2.00
Restoring Actively Eroding to Modified[b]	Saves 21.30
Restoring Actively Eroding to Drained	Saves 19.30
Allowing Drained to develop into Actively Eroding[c]	Loses 19.30

[a] Net effect calculated by removing a fixed 10% and then removing between 13% and 40% for the risk buffer and accounting for the baseline and leakage.
[b] Not eligible under the Peatland Code 1.0.
[c] Baseline does not take into account worsening of the peatland condition category for the purposes of conservatism.

category, and Table 4 shows the likely emissions savings derived from restoring peatland from one condition category to another.

The Peatland Code Field Protocol is designed to be used by landowners, managers and others with generalist rather than specialist knowledge of peatland ecology, based on indicator species and other indicators such as erosion features, and evidence of burning or grazing/trampling, which are used in combination with aerial photography to identify "assessment units" (AUs) where land falls into different condition categories. Fig. 2 shows an example project site mapped into eight different AUs based on the condition category of different parts of the site, inferred from aerial imagery. AUs are then checked via a field survey before quantifying GHG emission savings likely to arise from restoring each AU.

4. Findings and discussion

This paper has used case study research to show how a place-based approach can address three major challenges for the implementation of PES schemes. To address each of these challenges, the place-based approach extends established definitions of PES in three ways. The subsequent sub-sections draw on case study findings and international literature to discuss how the place-based approach addresses each of these challenges.

4.1. Bundling or layering services across multiple scales

PES schemes typically bundle or layer different services from the management of a single ecosystem (as defined by UKNEA, 2014). However, the interdependence of different ecosystem functions across landscapes often leads to trade-offs between services provided by different ecosystems or habitats (Engel et al., 2008). There is now a well-developed literature on the modelling and mapping of ecosystem services, which provides the necessary tools to quantify the widest relevant range of ecosystem services over relevant (potentially) multiple spatial and temporal scales (and in some cases, habitats) in the same location (the first element of our definition of a place-based approach to PES). A variety of modelling approaches have been used to assess and visualise: flows of ecosystem services to beneficiaries (Bagstad et al., 2013); supply and societal demand for ecosystem services (Burkhard et al., 2012); uncertainties in ecosystem service stocks and services (Crossman et al., 2013); and trade-offs between ecosystem services under different land use scenarios (Goldstein et al., 2012). These approaches tend to be used at regional and national scales, using secondary data (Martínez-Harms and Balvanera, 2012). The modelling approach developed in this case study (to develop emissions factors for peatland restoration) is being used at a national scale to provide data for the UK's Greenhouse Gas

Inventory under the United Nations Framework Convention on Climate Change, but crucially for the place-based approach, it can be applied at a local site scale. According to Martínez-Harms and Balvanera (2012), the most commonly used method to model ecosystem services in the literature is "the development of models based on well-known causal relationships between environmental variables". The modelling approach used in this case study follows this approach, basing estimates of GHG emission savings on a statistical relationship between site condition and GHG emissions. The case study illustrates how this approach can empower sellers of ecosystem services and other stakeholders to cost-effectively quantify bundles of ecosystem services arising from management actions without the need for specialist support.

4.2. Multi-level governance

The different spatial and temporal scales over which ecosystem services operate, creates major challenges for their governance. In this context, Paudyal et al. (2016:327) call for PES schemes to "incorporate local and indigenous knowledge, clear links to policy and decision making, public education and engagement about the value of ecosystem services and payment mechanisms that drive local actions and contribute to local livelihoods". Such challenges are particularly acute in systems where there are multiple overlapping land uses, management and tenure regimes, such as exist in many temperate uplands (Quinn et al., 2010), dryland pastoral systems (Reed et al., 2015) and transition environments, such as the rural-urban fringe (Scott et al., 2013). For example, small-scale, informal institutions governing grazing rights in a single village may not be capable of managing landscape scale changes in stocking density required to restore ecosystem functions, sequester carbon and regulate flooding (Reed et al., 2015). Moreover, landscape-scale institutions created to manage change at these broader spatial scales may then come into conflict with local level governance systems. For example, there is evidence that privatization of land in southern Africa to maximize provisioning services (cattle production) has replaced well-functioning common property regimes with poorly-functioning open access regimes, and has led to land degradation, in turn compromising cattle production and other important ecosystem services (Favretto et al., 2016).

Governance mechanisms for the Peatland Code were developed in close collaboration with 'horizontal' networks of relevant stakeholders at catchment, landscape and national scales. 'Nodal' or 'networked' governance refers to the development of horizontal partnerships of social actors to govern the natural environment based on bottom-up, collective decision-making processes by representative groups of stakeholders (Johnston and Shearing, 2003; Burris, 2004; Crawford, 2006; Parker, 2007). Networked governance approaches pay attention to power dynamics between different actors within the governance regime, and are often developed in contexts where there is considerable uncertainty and complexity (Stoker, 2006). This approach to governance has been described variously as "open architecture democracy" (Homer-Dixon, 2009) and "open policy-making" (Beveridge et al., 2000). Closely linked to this conception of governance, Haas (1992) describes multi-level governance arrangements as "epistemic communities" that connect social and ecological structures across various spatial and temporal scales.

There was extensive stakeholder involvement in each stage of the underpinning research, piloting and Code development, using stakeholder analysis (including Social Network Analysis in some cases) to represent the full range of stakeholders, and explicitly considering and managing power dynamics between stakeholders involved (e.g. Reed et al., 2013c). This networked governance approach was formalised through the invitation of individuals from government, third sector, landowners, business and research to join an Executive Board (responsible for management of the Code), which is guided by an Advisory Board. Together, these groups facilitate multi-level governance by co-ordinating the management and delivery of ecosystem services at multiple spatial scales through the Peatland Code. This experience shows how future place-based PES schemes may be able to support multi-level governance via multi-stakeholder involvement in boards or similar structures. In this way, it may be possible for PES schemes to more holistically represent understandings of the social, economic and biophysical attributes that shape a given place, and represent the needs and priorities of multiple stakeholders.

4.3. Shared values for ecosystem services

Finally, for successful implementation and governance of PES schemes, it is essential to understand the various dimensions of value that can be shared by different groups within society in relation to the natural environment. Kenter et al. (2015) identify seven non-mutually exclusive types of shared values: transcendental, cultural/societal, communal, group, deliberated and other-regarding values, and value to society. In contrast to traditional environmental economics approaches based on quantifying individual values, it is now clear that many of the values that people hold for the natural environment are not for themselves, but for the communities and society in which they live. These values are socially derived through individual and collective experiences (Everard et al. under review) and interactions within and between these different groups (social learning), and there is evidence that values expressed for the natural environment by groups change after they are given the opportunity to deliberate those values collectively (Kenter, in press, b; Kenter et al., in press, b). These collective, 'shared values' are typically place-based, for example relating to a particular landscape or stretch of coast. Cultural ecosystem services are often among those most valued by communities of people who have strong place-based connections with the natural environment, but these are among the least well understood of the services provided by nature (Church et al., 2014). Many people experience emotional and spiritual connections to such places, which are difficult to express in monetary terms, because they are relational and non-consequentialist (Bryce et al. in press; Cooper et al. in press; Chan et al., 2016).

Although bundling and layering ecosystem services in PES schemes attempts to capture the value of as many services as possible, these are typically restricted to a small number that can be easily monetized. There are few examples of PES schemes that explicitly include cultural ecosystem services or the shared values of place-based communities or communities of practice who share a particular interest in a place (which may differ from other groups, e.g. the contrasting interests of anglers versus divers in seascapes, or bird watchers versus grouse moor managers in an upland landscape). Capturing these broader conceptualisations of value in PES schemes is difficult. However, it is important to overcome these difficulties, because any PES scheme that sells a narrow package of ecosystem services that compromises important, un-quantified shared values, is likely to face opposition from groups whose values have been neglected. Given the range of different functions and associated, sometimes opposing, values derived from most ecosystems, price-setting is challenging in schemes that involve diverse actors with responsibility for the management of ecosystem service delivery at different scales. In particular there may be a danger that place-based PES schemes create or inflame conflict, and threaten the viability of a scheme. Despite these risks, it is essential to understand the many dimensions of value that can be shared by different social groups in relation to the natural environment, if PES schemes are to protect and enhance ecosystem services that are valued by society rather than just those that can be easily monetised and marketed.

4.4. Novel contributions

This paper has shown the need to move beyond bundled or layered schemes that typically focus on single ecosystem services or habitats, to create place-based schemes that consider how interdependencies with ecosystem functions and processes in other parts of a landscape may drive complementarities and trade-offs between services. Case study research in peatlands and other international examples show how a holistic, place-based approach to PES can provide a framework to co-ordinate the delivery of ecosystem services and other benefits across different ecosystems. There is a need to move beyond values derived solely from ecosystem markets or neoclassical environmental economics, in order to recognise the complex, shared social and cultural value of ecosystems to different groups within society. In this way, it may be possible to enhance cultural ecosystem services that have previously been under-represented in PES schemes. For example, our research has shown how PES schemes have the potential to enhance cultural services based on recreation and facilitate awareness raising, learning and payments for other ecosystem services via visitor giving schemes. Additionally, by establishing shared values through deliberation, it is possible to consider broader issues to do with equity and fairness. For example, in our case studies the fair prices that were negotiated through a deliberative value formation process, could incorporate compensation for those who may be indirectly disadvantaged by PES schemes.

By prioritizing stakeholder involvement via networked and multi-level governance, it was possible to co-design and adapt the PES scheme, so that sufficient benefit could be derived by different stakeholders. Given challenges over time-lags and attribution in PES schemes, a key element of successful governance is the cost-effective, timely and accurate monitoring and verification of ecosystem benefits arising from the scheme. This research has demonstrated how proxies may be used to assess ecosystem service benefits inexpensively by practitioners, without the need for significant specialist equipment or advice. Rather than becoming a “black box” that may disempower stakeholders (Reed et al., 2006), monitoring and verification has the potential to engage landowners and managers to monitor ecosystem services, providing important feedbacks to sustainable land management.

5. Conclusion

Based on a better understanding of place-based social dynamics and the shared and cultural values associated with habitats and ecosystem services, this paper has shown how PES schemes can reduce trade-offs between ecosystem services and the needs and priorities of different social groups. This attention to context is important if future PES schemes are to be both environmentally and socially robust, and adapt to the needs of buyers, sellers and the wider stakeholder community.

The place-based approach draws attention to knowledge flows and other social interactions between networks of social actors involved in multi-level governance of ecosystem services. By highlighting the interpersonal and institutional power dynamics implicit in the governance of PES schemes, it may be possible to tackle concerns over social justice and equity that have affected many schemes. In this way, PES schemes may be better able to address the “social dilemma”, as Muradian et al. (2013) put it, that they were meant to help solve. Taking a place-based approach, PES schemes can bundle or layer a wide range of ecosystem services over relevant (potentially multiple) spatial and temporal scales (and in some cases, multiple habitats) in the same location. This can help minimize trade-offs between ecosystem services and provide sufficient benefits to incentivize engagement from a range of buyers and sellers. Finally, the place-based approach reflects the shared values of multiple ecosystem service sellers and other offsite stakeholders, who may be positively or negatively affected by the scheme. This reduces the likelihood of trade-offs between groups with competing values and interests, in particular local communities who may place a high value on ecosystem services that are difficult to monetise.

Competition over scarce natural resources is intensifying around the world, in increasingly multi-functional landscapes, due to the interactive pressures of climate change, land degradation processes and other social, economic and environmental pressures (Reed and Stringer, 2016). Despite growing interest in PES among the international policy community, the potential for PES schemes to alleviate these pressures remains unrealised. This is in large part due to the social, cultural and environmental trade-offs that are often inherent but unrecognised in scheme design. Further research and practice is required to understand the extent to which the application of a place-based approach to PES can help reduce or manage these trade-offs in different contexts internationally. However, by presenting a robust empirical and theoretical case for a place-based approach in this paper, it is possible to see how PES schemes may become an increasingly important component of future environmental governance.

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