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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<sub>2</sub> 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 monetising 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 incentivise 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

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