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The price of knowledge in the knowledge economy: Should development of peatland in the UK support a research levy?

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ABSTRACT

Peatlands provide a wide range of ecosystem services, the most important of which are terrestrial carbon storage, maintenance of biodiversity and protection of water resources. Exploitation of UK peatlands may be detrimental to these services, but scientific understanding and quantification of the effects is currently limited. This paper considers the possibility of imposing a levy on the exploitation of peatland, which would be used to fund high-quality prioritised research into the impacts of such human interventions, thereby enabling improvements to environmental management during the development process. The viability of the concept was explored with a group of peatland stakeholders. The group included most of the significant stakeholders with an interest in development on peatland, including regulators, developers and consultants. Qualitative and semi-quantitative responses were gathered by direct consultation with individuals and using a questionnaire to determine group responses. The latter were generally positive. Offered a choice of research funding mechanisms, stakeholders responded most positively to a levy. Whilst other funding mechanisms were also viewed positively a levy (in the form proposed or with some modification) was regarded as equitable by a large majority and workable by a smaller majority. Developers were reluctant to pledge full support to the proposal but recognised the importance of a number of the concerns that it was designed to address.

Introduction

New knowledge generation is key to developing an understanding of natural and human-modified ecosystems. High quality information is developed using scientific methods and modern technology according to the so-called Mode-2[1] (Gibbons et al., 1994) and Triple Helix[2] (Etzkowitz and Leydesdorff, 1999) knowledge-production models. Once accepted and established,

[1] The thesis that knowledge production from the mid-20th century developed from traditional research ("mode-1"), which is academic, investigator-initiated and discipline-based, into research which is context-driven, problem-focused and inter-disciplinary.

[2] The Triple-Helix concept provides a perspective of mode-2 knowledge production driven by and organised through social and institutional structures, specifically universities, industry and the state.

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the new information can be used in decision-making processes pertinent to environmental management. The benefits of new knowledge may include more effective, appropriate, efficient and satisfying management outcomes. This knowledge may also contribute to the 'knowledge based economy', a term denoting trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors (OECD, 2005).

The generation of new knowledge through scientific research requires human resources, time and capital investment, all of which are ultimately dependent upon the availability of funding which can be difficult to acquire. In this study we examine the concept of a levy on industrial developments affecting peatland to fund the research studies that are needed to better inform peatland management. The concept was initially presented during a workshop attended by representatives of the UK peatland stakeholder community, and this was followed by consultation within the community on aspects of how it might be implemented, using a questionnaire.

Effective knowledge exchange in environmental research is associated with beneficial outcomes for stakeholders (Phillipson et al., 2011). The proposed levy is effectively a knowledge exchange mechanism designed, funded and managed by the stakeholder community which has an interest in the development and management of peatland, where there is a clear need for improving relevant applied knowledge production. The proposal holds potential for improving current mechanisms of knowledge exchange because it encompasses all technical stakeholders, thus avoiding the domination of research agendas by public sector stakeholders observed elsewhere (Lowe and Phillipson, 2006). The aim of this initial study is to determine the level and basis of stakeholder support for a levy relative to current mechanisms of funding and knowledge production. In this paper we: (i) outline the concept of a levy on peatland development/disturbance that could help fund research to promote and underpin evidence-based management of peatlands; and (ii) present the results of the consultation exercise about such a levy with members of the UK peatland stakeholder community.

The problem

Peatlands are globally important ecosystems. They contain more carbon per unit area than any other habitat on earth (Joosten and Couwenberg, 2008) and cover approximately 15% of the UK land area (Billett et al., 2010). The most recent estimates of peatland carbon (C) storage suggest that the UK total is 2302 Mt, and that most (70%) of this is in Scotland (Billett et al., 2010). When peatland is disturbed, some of the peat usually dewaters. Stored carbon which is thus re-exposed (via several routes) to air is quite readily converted to CO_2 and released to the atmosphere. The size of the store is such that conversion of just 5% of the UK's peat would be sufficient to match the current annual CO_2 production of the UK economy (Bain et al., 2011). This means that the overall UK carbon budget is sensitive to relatively small changes in the quantity of peat stored in our peatlands. Peatland carbon is not only vulnerable to human disturbance and changes in management (Ward et al., 2007; Armstrong et al., 2010), but also to climate change (Dise, 2009; Clark et al., 2010a,b).

Environmental change in the UK uplands has created an urgent need to collate and share research findings and the wider knowledge base among policy-makers and other stakeholders who have limited access to research findings (Reed et al., 2009). Many professionals working on peatlands in the UK are becoming increasingly concerned that industrial development[3] in these areas has outpaced the development of knowledge of the environmental consequences. Indeed, knowledge is often only gained following a widespread change in land use, by which time the consequences are real and long-lasting. Sound environmental management ideally requires a pro-active rather than a reactive approach, whereby information is gathered during the early stages of planning and implementation of land use changes. Subsequently-refined knowledge can be fed into the process later if an adaptive management approach is adopted. A number of development activities that were historically practiced at large scale on peatlands have already impacted on their form and functioning. In the post-war period there was a systematic programme to drain large areas of peatland in an attempt to increase the productivity of the uplands for sheep grazing (Holden et al., 2007). There has also been a substantial increase in the area of peatland managed by burning for grouse populations (Yallop et al., 2009); and in the 1970s much UK peatland was converted to forestry plantation. In all of these instances, some of the environmental impacts were formally acknowledged only decades after their initiation—for example loss of carbon through biologically-mediated oxidation as the water table is lowered (Freeman et al., 2001) and oxidation during burning resulting in loss of carbon via aquatic pathways (Ward et al., 2007; Yallop et al., 2009).

More recently there has been an increase in a number of other impacts which are less well understood. Probably the most important of these is a large increase in the number of wind farm developments sited on peatlands. These are complex developments with a number of subcomponents with potential for carbon losses (Greive and Gilvear, 2008; Waldron et al., 2009) including direct removal of peat to accommodate turbine bases and laying of power cables, felling of forestry located on peat, and drainage of the peat itself near roads and other infrastructure (Nayak et al., 2010; Smith et al., 2011). Other activities occurring on peat which may impact on the functioning of peatlands include mining (removal of overburden), road building (as part of national road building programmes or on private land), construction, extraction for horticulture and fuel, and infrastructure projects (e.g. associated with an increase in hydropower[4] implementation). Whilst some of these activities do not involve the removal of peat from site (and so are not flagged as extractive processes for regulatory purposes), they often involve extraction, compression and translocation of peat within the site (sometimes unintentionally); and so are nonetheless likely to disrupt the hydrological connectivity and ecological functioning of both the peatland ecosystem and the translocated peat, with knock-on implications for biodiversity, water supply and the peatland carbon store (Lindsay, 2010). The impact on carbon processing and sequestration, hydrological function and biodiversity of the resultant peatland matrix remains somewhat unknown. Developing a knowledge framework to aid in preventing or mitigating carbon losses during development is integral to the knowledge economy as outlined by (Levy et al., 2011).

Within the financial constraints of individual projects and organisations there are rarely opportunities to undertake substantial research targeted specifically towards increasing our understanding of the consequences of such developments on carbon-rich landscapes. The type of science funded by UK research councils and other funding bodies has not always addressed the questions which are directly relevant to the user community, at

[3] In this context 'development' is defined as any human activity pursued for economic gain which interferes with the form or function of a peatland.

[4] The prevalence of working, planned and under construction UK hydropower schemes can be found at http://www.renewables-map.co.uk/default.asp (accessed October 2011).