

<p>Institution: University of Leeds</p>
<p>Unit of Assessment: C-17</p>
<p>Title of case study: Case 5 - Creating sustainable uplands through stakeholder-academic co-learning and policy influence</p>
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>The project combined stakeholder knowledge with natural science to identify future scenarios and adaptation options for uplands. Research into upland ecosystem services identified win-win scenarios (e.g. around carbon management) and important trade-offs (e.g. effects on biodiversity). These were embedded within government policy reports leading to additional work in government departments seeking to overcome policy barriers in these areas in order to implement the recommendations from the research. Overcoming these policy barriers has influenced government's decision to work in partnership to launch a new peatland carbon code, focussing on upland peatlands, creating corporate social responsibility (CSR) options for companies via peatland protection and restoration.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The UK uplands are undergoing significant change [1, 2]. They are experiencing effects of climate change, rising demand for home-grown food and energy security, ongoing upheaval in financial support for agriculture, new European regulatory demands to improve water quality, and cultural/demographic change. Upland stakeholders must appreciate the range of possible futures they may face, if they are to prepare effectively. The Sustainable Uplands project investigated methods to anticipate, monitor and sustainably manage change in the UK uplands.</p> <p>The Sustainable Uplands project (funded 2005-9) combined the research and knowledge of natural and social scientists, policy makers and stakeholders. The interdisciplinary consortium included Co-Principal Investigator Joseph Holden (at Leeds Geography since 2000, NERC fellow 2002-5, currently Professor), other School of Geography (SoG) staff, the School of Earth and Environment (K. Hubacek PI) and the Institute of Integrative and Comparative Biology at the University of Leeds with co-investigators from Durham University, University of Sheffield and University of Sussex and was funded by ESRC/NERC/BBSRC/Defra/SEPA ('Managing Uncertainty in Dynamic Socio-Environmental Systems: An Application to UK Uplands', Grant RES-227-25-0001, total value £750K, 1/5/06-31/10/09) within the Rural Economy and Land Use (RELU) programme. Additional support was provided by some spin-off projects including commercially leveraged funding which provided underpinning research to support corporate policy making. Through research and active engagement, the project considered how the UK's uplands might change under future social, economic and environmental conditions.</p> <p>Members of SoG led significant parts of the project including developing models of the hydrology, water quality and carbon storage potential of the UK's uplands, model integration, devising data collection methods, leading field measurement campaigns and analysing data. Models were combined with socio-economic data across three major case study sites (Peak District National Park, Nidderdale Area of Outstanding Natural Beauty (AONB) and the Southern Uplands of Galloway) [5]. Significant contributions were made by SoG staff including academics Holden, Michael Kirkby (Leeds academic since 1973, Professor), Pippa Chapman (Leeds academic since 1999, currently Reader) and Irvine (research staff since 2001), and a three year postdoctoral researcher Nanlin Jin (now lecturer at Northumbria).</p> <p>Contrasting policy scenarios for land use and management were developed using simulation models and qualitative inputs from interviews and focus groups. These scenarios identified positive and negative consequences for ecosystem services (such as flood risk, climate regulation through carbon storage, provision of drinking water) from the uplands [1, 5]. For example, Holden and collaborators demonstrated the multiple ecosystem service benefits from blocking drains in the uplands but showed that there would be a long lag time to some benefits because biodiversity and ecological improvement will follow the recovery in hydrological processes. Research by SoG</p>

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showed how upland landscape condition including vegetation cover and water depth affect flow velocity and therefore runoff times and peak flood levels [3]. Peatlands are a major source of stored carbon. In collaboration with Durham University and Moors for the Future (a non-academic stakeholder partnership based in the Peak District), field sampling and improved process understanding resulted in a model for calculating carbon fluxes from peat soils with different land management scenarios [4, 5]. The project showed that where extensification reduces managed burning and grazing, changes in vegetation could compromise conservation species, provisioning services, amenity value and wildfire risk. However, where extensification results in damaged peatland restoration, there would be increased carbon storage, with co-benefits to water quality and flood risk countering habitat loss elsewhere in the landscape. Intensification to boost UK food security would benefit some provisioning services but negatively impact carbon storage and water quality and reduce abundance of certain conservation species.

Subsequently, the SoG led an ESRC 'follow-on project' ('Sustainable uplands: communicating and learning to live with change', RES-189-25-0017, £101K, 14/9/09-13/11/10, **Holden** PI) to disseminate research results, supported by FT KE officer Sarah **Buckmaster** (now communications manager at UK Collaborative on Development Sciences), to ensure impact-orientated recommendations were directed to multiple audiences.

3. References to the research

The research is published in a wide range of internationally-recognised, rigorously peer-reviewed journals. Output 3 is included in REF2. External funding of the research is described in Section 2.

1. Government commissioned peer-reviewed paper adopting the project approach and foresight on science/social science understanding to inform uplands policy development:

Reed MS, Bonn A, Slee W, Beharry-Borg N, Birch J, Brown I, Burt TP, Chapman D, **Chapman PJ**, Clay G, Cornell S, Fraser EDG, **Holden J**, Hodgson J, Hubacek K, **Irvine B**, **Jin N**, **Kirkby MJ**, Kunin W, Moore O, Moseley D, Prell C, Quinn C, Redpath S, Stagl S, Stringer LC, Termansen M, Thorp S, Towers W, Worrall F (2009) The future of the uplands. *Land Use Policy* S26, S202-S216. doi: 10.1016/j.landusepol.2009.09.013

2. A position paper compiling the science baseline for the research project:

Holden, J., Shotbolt, L., Bonn, A., Burt, T.P., **Chapman, P.J.**, Dougill, A.J., Fraser, E.D.G., Hubacek, K., **Irvine, B.**, **Kirkby, M.J.**, Reed, M.S., Prell, C., Stagl, S., Stringer, L.C., Turner, A., Worrall, F. (2007) Environmental change in moorland landscapes. *Earth-Science Reviews*, 82, 75-100. doi: 10.1016/j.earscirev.2007.01.003.

3. Research paper which is the first to comprehensively establish the role of vegetation cover in attenuating overland flow velocity – important implications for flood management:

Holden, J., **M. J. Kirkby**, S. N. Lane, D. G. Milledge, C. J. Brookes, V. Holden, A. T. McDonald (2008), Overland flow velocity and roughness properties in peatlands, *Water Resources Research*, 44, W06415, doi:10.1029/2007WR006052.

4. Paper on modelling work to determine the carbon offsetting potential of upland peatlands:

Worrall, F., Evans M.G., Bonn, A., Reed, M.S., Chapman, D., **Holden, J.** (2009) Can carbon offsetting pay for upland ecological restoration? *Science of the Total Environment*, 408, 26-36. doi:10.1016/j.scitotenv.2009.09.022

5. Research paper showing key outputs from the field, modelling and scenario work and opportunities for practical benefits from the underpinning research:

Reed MS, Hubacek K, Bonn A, Burt T, **Holden J**, Stringer LC, Beharry-Borg N, **Buckmaster S**, Chapman D, **Chapman P**, Clay GD, Cornell S, Dougill AJ, Evely A, Fraser EDG, **Jin N**, **Irvine B**, **Kirkby M**, Kunin W, Prell C, Quinn CH, Slee W, Stagl S, Termansen M, Thorp S, Worrall F (2013) Anticipating and managing future trade-offs and complementarities between ecosystem services. *Ecology and Society* 18(1). doi: 10.5751/ES-04924-180105.

Impact case study (REF3b)**4. Details of the impact** (indicative maximum 750 words)

One of the key recommendations of the research was for the need to develop finance opportunities to enable payments to be made for ecosystem service benefits to be derived from upland landscapes. The project directly influenced the policy debate in this regard enabling a policy shift towards facilitating private investment in upland management which maps on to the policy briefing documents and Westminster workshops produced by the project. For example, our findings were reported by the Commission for Rural Communities Inquiry into the Future of England's Uplands. This reported to the Prime Minister in June 2010 with some of our inputs verbatim, particularly those relating to carbon and water markets, and payments for other ecosystem services [A].

This work influenced a Government Upland Policy Review published on 10 March 2011 outlining the actions to be taken by the Government. This review stated that Defra were going to "explore and review the opportunities and challenges for the use of payment for ecosystem service approaches, including in upland areas" [B] and this was a direct result of our project. The above review also fed into the Government's Natural Environment White Paper in 2011 (which consequently included a number of commitments on payments for ecosystem services (PES) and peatlands) [C]. One of the direct recommendations made in research papers [5], and at policy-maker workshops in Whitehall and Edinburgh organised by the Sustainable Uplands research team, was to implement a UK peatland carbon code to facilitate corporate investment for the protection of upland peatlands. Notably, one of the commitments in the 2011 Natural Environment White Paper was to publish a PES Best Practice Guide [C], and this Guide features Sustainable Uplands research about peatland carbon markets [D]. Project researchers worked closely with Defra, DECC and International Union for the Conservation of Nature (IUCN) to break down barriers to implementing a UK peatland carbon code, work which also supported by a NERC Knowledge Exchange Fellowship (Viki Hirst) held in SoG and a number of follow-up initiatives developed from the underpinning research (e.g. NERC funded Valuing Nature Network project <http://www.valuing-nature.net/news/2012/peatland-carbon-code>; <http://tinyurl.com/cyade85>). The project team was invited to submit the idea for the proposed peatland carbon code to the Ecosystem Markets Taskforce (a commitment in the Natural Environment White Paper to identify business opportunities in light of the National Ecosystem Assessment). The code was ranked joint top opportunity out of 44 submitted opportunities by the Taskforce [E] (made up from industry leader representatives) and they recommended the development of a robust code for peatland restoration in their final report of March 2013, which reported directly to three Secretaries of State in Defra, DECC and BIS. The code (which has to be open, consistent, credible and verifiable) was developed with funding from Defra as a PES Pilot. Defra published its PES Action Plan in May 2013 and announced its intention to work in partnership with the IUCN UK peatlands programme and others to support the testing, development and launch of a pilot peatland carbon code [F] (<http://www.iucn-uk-peatlandprogramme.org/peatland-code/about>). This code is the UK's first regulated scheme to facilitate peatland restoration using carbon finance. It takes account of the trade-offs and complementarities between ecosystem services as determined by the underpinning research. It is a direct impact from the Sustainable Uplands project [F]. It enables companies to develop CSR via investment in upland blanket peat restoration and protection which also yields multiple ecosystem service benefits (e.g. improved water quality and flood alleviation) [F].

Other Sustainable Uplands project findings have been used by water companies to justify using land management and PES to reduce water treatment costs. These strategies are being implemented in the business plans prepared in early 2013 to be submitted to OFWAT as part of the 2014 Price Review. Exemplar companies include South West Water [G] and Yorkshire Water [H]. The former was supported by a NERC internship run jointly by SoG and Birmingham City University, to develop PES approaches within the business bundling carbon and biodiversity benefits in tandem with their clean water programme. Yorkshire Water commissioned a direct piece of work (fieldwork and further modelling using the models developed by the Sustainable Uplands project) about costs and benefits of water treatment costs versus reducing water colour and fertiliser inputs from upland management through land management change and paying or incentivising farmers to change their behaviour. Related to this the project's outcomes (citing **Holden**) were used as part of the St George's House (Windsor) consultation into the uplands recommending that more water companies should be pushed to invest in upland management for

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multiple benefits to society and that regulators should be encouraged to incentivise such approaches [I].

The project has also benefited land owners and managers. For example, it provided inputs to Pennine Prospects' review of its Integrated Management Strategy and Conservation Action Programme for the South Pennine Moors and Nidderdale Area of Outstanding Natural Beauty's last Management Plan [J]

Our technical reports for the IUCN Commission of Inquiry (reports available <http://www.iucn-uk-peatlandprogramme.org/resources/reports> - see for example 'Peatlands and climate change') provided evidence for IUCN lobbying of the UK Government and for EU Common Agricultural Policy reform as part of the IUCN process. As a result the environment ministers of the UK governments formally announced in February 2013 (<http://tinyurl.com/acn84x2>) that they were committed to conserving peatlands in the UK and British Overseas Territories and set out an action framework to protect and enhance the natural capital of peatlands recognising their importance for biodiversity, water and climate change. [K]

The project received the Rural Economy and Land Use (RELU) *Best Impact Award* from the £30m cross research council RELU programme which ran from 2004-2013. The award was voted for by business people, scientists, and policy makers. Sir Howard Newby, who presented the award, said: "Environmental and social change in the uplands has implications for all of us and this project has helped our understanding of these changes, and enabled people who live in and make use of the uplands to make more informed choices." [L]

5. Sources to corroborate the impact (indicative maximum of 10 references)

- [A] Former Government Rural Advocate, Commission for Rural Communities; to corroborate the contributions our work made to the CRC inquiry. [Available on request].
- [B] Uplands Policy Review, Defra, March 2011, Paragraph 85, page 28. Available from <http://www.defra.gov.uk/rural/documents/interim2/upland-policy-review2011.pdf> [Available on request].
- [C] The Government's 2011 Natural Environment White Paper *The Natural Choice: Securing the Value of Nature*. See, for example, page 28. The commitments in the 2011 Natural Environment White Paper to publish a PES Best Practice Guide can be found on page 39. Available from: <http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf>.
- [D] Payments for Ecosystem Services Best Practice Guide, May 2013. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/200920/pb139_32-pes-bestpractice-20130522.pdf (e.g. page 40) [Available on request]
- [E] Ecosystems Market Taskforce: <http://www.defra.gov.uk/ecosystem-markets/files/Ecosystem-Markets-Task-Force-Final-Report-.pdf> (see page 19 in particular). [Available on request]
- [F] Senior Economic Adviser, Defra – Commissioned review on barriers and opportunities to payments for ecosystem services, the PES Best Practice Guide and the PES Pilot to develop the Peatland Code. [Available on request].
- [G] Exmoor Mires Project Manager, South West Water; to corroborate the work with South West Water. [Available on request]
- [H] Environment Strategy Manager, Yorkshire Water; to corroborate the work with Yorkshire Water. [Available on request]
- [I] St. George's House (2010) *Securing a Positive Future for England's Uplands*. [Available on request].
- [J] *Nidderdale Area of Outstanding Natural Beauty: Evidence Base to Management Plan 2009-2014*. [Available on request]
- [K] Joint DA Ministerial letter to IUCN, dated 5 February 2013 (For a specific example paragraph 3 mentions the climate change and carbon sequestration component of the IUCN inquiry which we delivered at <http://tinyurl.com/nwgtqij>. Paragraphs 7 and 8 note government actions on these issues). [Available on request].
- [L] RELU press release, 18 November 2011. [Available on request].