Institution: Newcastle University

Unit of Assessment: 6

Title of case study: Restoring global peatlands for climate benefits

Period when the underpinning research was undertaken: 2016-2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Mark Reed	Professor	2016-2020
Orla Collins	Lecturer	2018-present
Guy Garrod	Professor	1997-present
Regina Hansda	PDRA	2017-present
Helen Kendall	PDRA	2012-present
Mercy Ojo	PDRA	2019-2020
Amy Proctor	Lecturer	2008-present
Chris Rodgers	Professor	2003-present
Gavin Stewart	Senior Lecturer	2014-present
Mark Whittingham	Professor	2004-present
Dylan Young	PDRA	2016-2020

Period when the claimed impact occurred: 2016-2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

Damaged peatlands account for 5% of all global Greenhouse Gas emissions, making their restoration a key target for achieving net zero emissions. Newcastle University research contributed to the design and implementation of the UK's first ever ecosystem market for peatland restoration, the Peatland Code, generating >£300 million public and private investment in restoration to meet climate targets. Research then extended to other ecosystems in the UK, Italy and Hungary, leveraging a further £5M private investment in regenerative agriculture and conservation. This work also significantly shaped the work of the United Nations' Global Peatland Initiative to establish baseline evidence of peatland condition as a basis for global action, and was instrumental in securing international resolutions that led to the creation of new peatland policies in 29 countries.

2. Underpinning research

Current rates of global land degradation are estimated to be 10-12 million hectares per year and this is being exacerbated by the effects of climate change, leading to food insecurity for billions of people in some of the poorest countries of the world. Newcastle research provided the international policy community with the most comprehensive analysis of links between land degradation and climate change at the time, driving international policy decisions. Subsequent research considered these links in global peatlands, which contain twice as much carbon as all the world's forests. Damage to peatlands is causing significant greenhouse gas emissions, accounting for 10% of emissions from global land use and 5% of the total global carbon budget. In the UK, peatlands are the country's largest carbon store, containing more carbon than the forests of France and Germany combined. However, over 80% of the country's peatlands are degraded and therefore a substantial source of Greenhouse Gas emissions from the land use sector (second only to agriculture). This presents a major challenge for reaching net zero targets under the Paris Agreement, given that the cost of restoring these peatlands is far in excess of the available public funding, both in the UK and in countries with peatlands around the world.

Newcastle research [R1] underpinned the development of the UK Peatland Code (version 1.1, published 2017), enabling private investment in peatland restoration in return for the climate mitigation benefits of healthy peatlands for the first time. The research [R1] provided the first full description of an operational Code and its scientific basis in the peer-reviewed research literature. It used the Code to propose a place-based approach to Payments for Ecosystem Services, enabling multi-level governance to mitigate negative trade-offs between ecosystem services and engage with and empower diverse stakeholders in scheme design and governance.

Building on research findings from R1, Reed led the Valuing Nature Programme's Peatland Tipping Points project between 2017 and 2019 with Stewart, Young and Whittingham, and project partner IUCN UK Peatland Programme who own and manage the Peatland Code (Prof Reed is their Research Lead), informing the ongoing development of the Code and its wider adoption in the UK and internationally. This led to research commissioned by Natural England, led by Reed with Hansda, Garrod, Proctor, Collins and PhD student Heidi Saxby, on social barriers to the adoption of peatland restoration and sustainable management practices to inform the development of the England Peat Strategy [R2]. Based on 50 interviews, photo survey and deliberative valuation workshops in five English peatlands, the research provided insights into social drivers of behavioural change including place identity and attachment and the need for message framing that is consistent with the identity, values, norms and beliefs of landowners and managers.

Following this work, research from the Global Food Security programme's Resilient Dairy Landscapes project (led by Reed with Stewart, Rodgers and Kendall) showed how private schemes like the Peatland Code could integrate with agricultural payment schemes to avoid competition between public and private funding. This project tested and helped develop Landscape Enterprise Networks (LENs) in collaboration with 3Keel, Nestle and other partners, showing how they could be integrated with green finance and national carbon markets like the Peatland Code and Woodland Carbon Code [R3], following R1's place-based approach to Payments for Ecosystem Services.

In parallel with this, the team worked with the United Nations Environment Programme-led Global Peatlands Initiative to pioneer the development of core common outcomes for peatland research and monitoring, to standardise data for future research synthesis and mapping [R4] and with the UN Convention to Combat Desertification (UNCCD) to provide the most comprehensive analysis to date of links between land degradation and climate change [R5]. Building on this, in collaboration with the UNCCD and the Consultative Group for International Agricultural Research (CGIAR), Prof Reed helped to co-ordinate research on upscaling restoration and sustainable land management, leading to an official Global Land Outlook working paper and journal article that helped shape the UNCCD's first Global Land Outlook [R6].

3. References to the research

R1. Reed MS, Allen K, Dougill AJ, Evans, K, Stead SM, Stringer LC, Twyman C, Dunn H, Smith C, Rowecroft P, Smith S, Atlee AC, Scott AS, Smyth MA, Kenter J, **Whittingham MJ** (2017) A Place-Based Approach to Payments for Ecosystem Services. *Global Environmental Change* 43: 92-106. DOI:10.1016/j.gloenvcha.2016.12.009

R2. Reed MS, Kenter JO, **Hansda R**, Martin J, Curtis T, Saxby H, Mills L, Post J, **Garrod G**, **Proctor A**, **Collins O**, Guy JA, **Stewart G, Whittingham M** (2020) *Social barriers and opportunities to the implementation of the England Peat Strategy*. Final Report to Natural England and Defra, Newcastle University. DOI:10.13140/RG.2.2.23295.23208

R3. Reed MS, Curtis T, **Kendall H**, Gosal A, Andersen SP, Ziv G, Attlee A, Hay M, Hill D, Martino S, Olesen AS, Prior S, **Rodgers C**, Rudman H, Tanneberger F, Waylen K (2020) Integrating ecosystem markets to deliver landscape-scale public benefits from nature. *PLOS ONE* DOI:10.31223/X54G74 (published in EarthArXiv 21/12/20).

R4. Reed MS, Chapman P, **Kendall H**, Taylor AE, **Stewart G**, Ziv G, **Young D**, Blundell A, Kopansky D (2020) Improving the evidence base for delivery of public goods from public money in agri-environment schemes. *Emerald Open Research - Sustainable Food Systems* DOI:10.35241/emeraldopenres.13833.1

R5. Reed MS, Stringer LC (2016) *Land degradation, desertification and climate change: Anticipating, assessing and adapting to future change.* Routledge. ISBN: 9781849712712

R6. Thomas RJ, **Reed MS** et al. (2017) A framework for scaling sustainable land management options. *Land Degradation and Development* DOI:10.1002/ldr.3080 (also published as a Working Paper for the UN Global Land Outlook at: http://bit.ly/2vP2V7w)

Newcastle-led research projects from 2016-2020 totalled £2.1M, including funding from:

- NERC Valuing Nature Programme (2016-2018): Peatland Tipping Points (£456,000)
- BBSRC, ESRC, NERC, Scottish Government Global Food Security Programme (2018-2021): Resilient Dairy Landscapes (£1.5M)

4. Details of the impact

Impact 1: UK peatland policy

Research at Newcastle University contributed to the development and implementation of the Peatland Code [R1], the first private Payment for Ecosystem Service scheme of its kind in the UK. The Code supplements public funding with new private investment for restoration, paying landowners to restore land in return for the climate and other benefits of healthy peatlands. Since Prof Reed moved to Newcastle University in 2016, he has helped lead the Peatland Code from its pilot phase to a fully functioning national carbon market:

> *"Prof Reed's research at Newcastle University has been instrumental in the development and operation of the Peatland Code. His paper in* Global Environmental Change *and subsequent research on the Peatland Code and ecosystem markets, alongside his role as Research Lead for IUCN UK Peatland Programme and on the Executive Board of the Peatland Code, have played an important role in establishing the credibility of the Code, and driving funding and uptake in the policy and investment community."* [S1]

So far, four privately funded projects to restore peatlands have been validated or are in the process of validation (confirming emission reductions of 101,944 tCO_{2e} over their lifetime), with a further 20 projects initiated, covering 4,232 hectares of damaged peatlands across England, Scotland and Wales [S2]. It has been estimated by the International Union for the Conservation of Nature's (IUCN) UK Peatland Programme that together, these projects will avoid the loss of at least 570,000 tCO_{2e} of peat stocks to the atmosphere [S1], equivalent to taking 230,000 flights from London to Sydney. Interest from the corporate sector in peatland carbon has grown rapidly since the inception of the Code, with demand from investors seeking to mitigate climate change now far outstripping the supply of projects [S1].

Research on the Peatland Code [R1, R2, R3] has made "*a highly significant contribution to the policy landscape in the UK with respect to peatland restoration*", according to Defra's Head of Peatland Strategy & Recovery [S5]. The IUCN UK Peatland Programme Leader explained the breadth of the policy influence of Newcastle peatland research [S1]:

> *"During his time at Newcastle, Prof Reed's research significantly informed and shaped peatland policy, enabling civil servants and parliamentarians in each of the four UK countries to prioritise funding for peatland restoration. This included direct input to the structure and content of the UK Peatland Strategy, which has been applauded by Governments, UN agencies and NGOs internationally as a world leading approach to peatland conservation. This strategy in turn has driven the creation of peatland policies and strategies in each of the UK countries, leading to investment in peatland across the country, including £250M committed in Scotland over the next 10 years".*

The research shaped two major investments in peatland restoration by Defra in England and key elements of the England Peat Strategy, as well as further investment by Welsh Government and the EU LIFE fund. Building on this success, peatland restoration was integrated into Defra's 2020 Nature for Climate Fund (funding nature-based solutions to climate change), as a direct result of findings from Newcastle's Peatland Tipping Points project that were used in the Committee for Climate Change's (CCC) 2020 Land Use Report (Prof Reed is acknowledged as a member of the expert advisory group for the report) [S5]. Defra's Head of Peatland Strategy & Recovery stated [S5]:

> *"Defra successfully secured funding [redacted] for peatland restoration as part of the Nature for Climate Fund's historic goal to restore 35,000 hectares of damaged peatland in England. This decision was influenced by the peatland recommendations in the CCC Land Use report, which was heavily reliant on findings from the Valuing Nature Programme's Peatland Tipping Points project led by Prof Reed in collaboration with Julia Martin-Ortega (University of Leeds), Klaus Glenk (SRUC) and colleagues. We ensured Defra's analysis on costs were comparable with the CCC report. Defra consulted Prof Reed and his team and, based on their research, advised Natural England on options to ensure the peatland scheme prioritises projects using the Peatland Code and effectively integrates private and public funding for restoration."*

This built on the success of Defra's first stand-alone peatland restoration scheme, which was secured as a result of Newcastle research during a period when Defra's budget was being

significantly cut. Defra's Head of Soils at the time stated [S4]: *"Defra was able to secure more than £10M for peatland restoration in the context of an austerity budget (distributed via grants in 2017), as a direct result of evidence from the research underpinning the Peatland Code that was led by Professor Mark Reed from Newcastle University."*

The research has also shaped Defra peatland policy, as detailed by Defra's Head of Peatland Strategy & Recovery [S5]:

> "*Prof Reed's research has also informed further policy changes in the form of the England Peat Strategy. Professor Reed's research (notably research commissioned by Natural England)* [R3] *played a particularly important role in shaping the commitments that have so far been announced from the England Peatland Strategy, which it is hoped will be published in 2021. This includes our approach to stakeholder engagement around the design and purpose of the lowland agricultural peat task force, which prioritises farmer engagement from the outset."*

Private investment in Peatland Code projects also leveraged public funding as part of a £1M Welsh Peatlands Sustainable Management Scheme, and a £5.6M European Pennine PeatLIFE project in northern England. According to the Welsh scheme co-ordinator, *"The Peatland Code has been integral to the success of the 1M Welsh Peatlands Sustainable Management Scheme, funded by Welsh Government, giving us the opportunity to leverage additional funding for peatland restoration"* [S3]

Finally, this work also informed the development of ecosystem markets in other systems across the UK and Europe via Landscape Enterprise Networks (LENs), an open-source platform pioneered by 3Keel and Nestle in collaboration with the Newcastle-led Resilient Dairy Landscapes project [S6, R3, R4]. LENs enables businesses with regional interests to co-invest in regenerative farming and conservation to deliver benefits for their business, local farmers and society. There are now six LENs landscapes channelling private investment into sustainable agriculture and nature conservation in England, Scotland, Italy and Hungary, with investment totalling £5M to date [S6]. The LENs landscapes in Cumbria and SW Scotland work with >80 farmers covering 8% Scottish and 2% UK dairy output, with other LENs landscapes focusing on arable farming and catchment management [S6]. The Head of Value Chain Sustainability for Nestle UK and Ireland explained the importance of the research in developing and rolling out LENs [S6]:

> *"The Resilient Dairy Landscapes project led by Professor Reed was crucial for the development of LENs as an open-source platform, which along with the academic rigour and analysis provided by the research, has enabled uptake of LENs across the UK as well as prominence in English policy (LENs featured prominently in Defra's 25 year plan) and Scottish Policy (LENs is one of the most developed pillars of SEPA [Scottish Environmental Protection Agency] and Scottish Wildlife Trust's £1 billion challenge initiative). Social science from the project has helped us design schemes to drive farmer uptake, and evidence on the multifunctional benefits of interventions has helped drive interest from a wide range of investors."*

Impact 2: International peatland policy

Newcastle University research on peatlands and links between land degradation and climate change significantly shaped UNCCD decisions, the work of the United Nations' Global Peatland Initiative, and was instrumental in securing international resolutions that led to the creation of new peatland policies in 29 countries.

Prof Reed was commissioned by the UNCCD to publish a report and book [R5] which was quoted in official UNCCD documents (ICCD/CST(S-4/3) and ICCD/COP(12)/CST/2) feeding into UNCCD COP12. According to the UNCCD's Lead Scientist [S9]: "*The Newcastle team, led by Prof Reed, has worked with the UNCCD to provide the most comprehensive analysis at the time of links between land degradation and climate change… The research led to the recommendations made by the SPI [Science Policy Interface] and the CST [Committee on Science and Technology], which were subsequently enshrined in Decisions made by the COP."* These decisions included: 1) recognition for the first time of the importance of links between climate change and land degradation (Paragraph 2 of Decision 18/COP.12); and 2) a decision to ask the UNCCD's Science Policy Interface to further explore these links [S10]. This decision led

the CST to propose a special report on climate change and land to IPCC (published in 2019). This report helped shape negotiations in COP14 (2019) that led to a target for countries who are party to the convention to achieve land degradation neutrality by 2030.

Newcastle peatland research is being used by the Global Peatlands Initiative (GPI), led by UN Environment Programme with partners including the UN Food and Agriculture Organisation (FAO) and the Convention on Biological Diversity (CBD), to standardise restoration monitoring of the most important climatic, hydrological and biodiversity "core outcomes" from peatlands. This is important because currently different variables are monitored in different ways, making it difficult to base policy or practice on evidence synthesis or integrate data to create global baselines or maps. The GPI Coordinator explained the significance of the work [S7]: *"…one of the core tasks of the GPI is to create baseline evidence of peatland condition as a basis for global action. The approach we have been able to pioneer with Newcastle University has been central to this work, identifying and reaching consensus on core outcomes for tropical peatland research and monitoring. CIFOR subsequently ran a series of workshops building on this approach with FAO, the Government of Indonesia, and UNEP with support from Norway and USA. We will also be integrating the approach in the next edition of the IPCC wetlands supplement, which is used by Governments around the world to guide emissions reporting to the UNFCCC."*

Newcastle research also played a major role in securing international resolutions on peatlands, garnering international consensus on the importance of restoring and sustainably managing peatlands. The implementation of these resolutions has been monitored by staff seconded from Newcastle University to the IUCN UK Peatland Programme (Young and Ojo) in collaboration with the Global Peatlands Initiative, leading to evidence of significant changes in peatland policy around the world [S8]. According to the GPI Coordinator [S7]:

> *"Prof Reed's research on peatland policy and the Peatland Code with IUCN UK Peatland Programme was pivotal in securing IUCN Resolution 43 "Securing a future for global peatlands" in September 2016. The research was important because it showed how Governments could share the financial burden of restoration with the private sector. The resolution specifically references the work of the IUCN UK Peatland Programme, which Newcastle research informed. This resolution in turn paved the way for Ramsar Resolution XIII.13 on restoring degraded peatlands and the UN Environment Assembly's resolution 4/16 "Conservation and sustainable management of peatlands"*.

The GPI Coordinator [S7] also confirmed the importance of these resolutions in driving the creation of new peatland policies worldwide: *"We worked together with the Newcastle team to conduct joint resolution reporting between IUCN, Ramsar and UNEA for the first time* [S8]*, and this showed that since the original IUCN resolution, new strategies and policies were introduced to protect peatlands in 29 countries, which together represent the majority of global peatland emissions".*

5. Sources to corroborate the impact

S1. Testimonial: Emma Goodyer, Programme Leader, IUCN UK Peatland Programme
S2. Peatland Code Registry, available from: https://www.iucn-uk-peatlandprogramme.org/funding-finance/peatland-code/peatland-code-registry
S3. Testimonial: Rachel Harvey, Manager Welsh Peatlands Sustainable Management Scheme
S4. Testimonial: Maggie Charnley, Senior Climate Negotiator, former Head of Soils, Defra
S5. Testimonial: Sophie Chapman, Head of Peatland Strategy & Recovery, Defra
S6. Testimonial: Andy Griffiths, Head of Value Chain Sustainability, Nestle UK and Ireland
S7. Testimonial: Dianna Kopansky, Coordinator, Global Peatlands Initiative, UN Environment Programme
S8. IUCN (2019) WCC 2016 Res 043 - Activity Report. Available at: https://portals.iucn.org/library/node/46460
S9. Testimonial: Baron Orr, Lead Scientist, UNCCD
S10. UNCCD policy documents: Decision 18/COP.12, ICCD/CST(S-4/3), ICCD/COP(12)/CST/2