iCASP Response to Environment, Food and Rural Affairs Committee inquiry: Peatland

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iCASP

1. Yorkshire Integrated Catchment Solutions Programme (iCASP) is a five-year (2017-2022) Natural Environment Research Council-funded partnership established to support the UK Industrial Strategy. iCASP aims to generate £50 million+ of benefits to Yorkshire's economy by influencing investments, informing policies and strategies, identifying cost savings, and creating new products and jobs. It will do this through projects that support the use of environmental science in catchment management. As well as regional impact, iCASP is aspiring for national and international influence through sharing the experience of regional projects at the national level, and by exporting catchment management expertise and products internationally.

2. iCASP partners are: University of Leeds, University of Sheffield, University of York, National Centre for Atmospheric Science, Arup, Bradford Metropolitan Borough Council, City of York Council, Dales to Vales River Network-Yorkshire Dales Rivers Trust, Environment Agency, IUCN UK Peatland Programme, JBA Trust, Leeds City Council, Linking Environment and Farming, Met Office, Natural England, National Farmers' Union, Pennine Prospects, Yorkshire Water, Yorkshire West Local Nature Partnership, and Yorkshire Wildlife Trust. iCASP also works with additional organisations through its projects.

3. iCASP is based out of water@leeds at the University of Leeds, one of the largest interdisciplinary centres for water research in any university in the world.

4. This response is from the iCASP Programme Office based at the University of Leeds, rather than on behalf of the iCASP partners, many of whom will be making their own submissions to this inquiry. The Office have compiled the views of the following peatland experts for this submission: Professor Joseph Holden, Professor Julia Martin-Ortega. Professor Pippa Chapman and Dr Catherine Moody.

5. Further information about iCASP can be found on the iCASP website

Response to Inquiry

What is the current state of peatlands in England, and how is it changing?

6. Recent evidence suggests that the degree of degradation of peatlands is substantial, and that there is a significant potential to enhance the delivery of a wide range of ecosystem services by investing in peatland restoration[1]. Partnerships of several

organisations, such as Moors for the Future and the Yorkshire Peat Partnership have done valuable work over the last 10-15 years with their peatland restoration programmes, but there is still much to be done.

7. The dissolved and particulate organic carbon losses from peatlands have only recently (in the last 10 years) been included in carbon budgets, and the ultimate fate of the carbon is still unclear[2]. Some is lost as carbon dioxide after being used as an energy source by microbes or being degraded by sunlight and some is transported to larger water bodies, reservoirs, lakes and the sea[3]. The proportion of the total carbon that is lost as CO_2 is dependent on the actual chemical structure of the carbon molecules, which is determined by a variety of factors including catchment characteristics and climate.

What is the potential contribution of peatland restoration to the UK's net zero greenhouse gas target, and the consequence of inaction?

8. A recent monetary valuation study[4] focusing on the timing of peatland restoration in the context of climate change, finds significant benefits of immediate implementation of restoration action. Peatlands in a 'healthy' ecological condition are likely to be more robust to projected climate change in the long term than peatlands that are subject to ongoing degradation. This implies a greater robustness against climate change if peatlands are restored in the near future, and points to an important synergistic relationship between peatland restoration as a climate change mitigation strategy and as a climate change adaptation response. The study provides an additional economic argument for not delaying investments restoration action. The study shows that timing of restoration over the next decades has profound impacts on economic welfare. The cost of inaction in the short term is found to nullify a significant proportion of welfare gains associated with peatland restoration.

9. Despite the urgent need to reduce greenhouse gas (GHG) emissions, it is unlikely that lowland peatlands can be restored to a natural wetland condition in time to meet the UK and international commitments to achieve net zero GHG emissions by 2030 under the Paris Agreement[5].

10. Raising the water table has significant potential to reduce GHG emissions from peatlands drained for agriculture, without the need to halt their productive use. In the UK, where there is an estimated 433,000 ha of peat under intensive agricultural use it is estimated that halving average drainage depths could reduce total CO_2 emissions from 6.17 to 1.83 Mt yr^{-1}, with little or no offsetting increase in CH_4 emissions. This represents 28% of the UK's estimated total CO_2 emissions from managed peatlands, and around 1% of UK total CO_2 emissions.

11. While lowland peatlands represent a small proportion of peatlands in the UK, they contribute a significant percentage of the GHG emissions from peatlands.

What are the other economic, ecological and cultural benefits of restoring and maintaining peatlands?

12. We have increasingly good evidence for the role of revegetating upland bare peatlands in slowing the delivery of water into headwater streams which in turn can reduce riverflow peaks. This evidence comes from our research at the University of Leeds – both empirical field data[6,7] and our modelling work[8,9] - findings also backed up by at least two pieces of work by others[10,11]. Over a decade ago we published research that showed how water running over *Sphagnum* on blanket peatlands moved much more slowly than water running through sedges or bare peat[6]. In particular, if the roughness of the surface vegetation layer can be very high, such as that created by carpets of mosses across the peat surface then this has the greatest effect. Notably, however, our research has also shown that there are important zones that can be identified where enhanced roughness in the landscape would have the greatest effects on river flow peaks – thus aiding prioritisation of locations for restoration efforts to maximise flood benefits. These areas include strips of peatland several metres wide that run either side of streams, ditches and other watercourses, and areas of peatland covering other gently sloping parts of the catchment[9]. We have shown these effects hold (and can be proportionally greater) even for the very largest storm events[12].

13. We have also recently shown that sediment release from bare peat strongly influences peatland stream ecosystems[13,14] affecting both their biodiversity and functioning. We have shown that some systems are still eroding rapidly[15] and our climate modelling research has shown a range of significant erosion risks to UK peatlands which vary depending on their current location within the UK[16,17,18]. This research shows that we need to do all we can to disconnect sediment sources from peatland streams. The most effective way to do so is to support revegetation of peatlands, especially near any watercourses. Thus, targeted restoration work that aims to achieve an end-point with a dense surface understorey will deliver maximum downstream benefits for river habitats and flood risk.

14. Specifically with respect to water ecosystem services, and the hydrological and bio-geochemical knowledge on peatland restoration, there is strong evidence for rapid ecological responses to peatland restoration related to reduced suspended sediment loads, and sufficient evidence that re-wetting will prevent further decline in water quality[19].

15. However, little is known about the social welfare impacts of peatland restoration and in particular how to spatially target restoration activities to maximise net benefits from investments in restoration. Two main challenges arise for valuation of ecosystem services: (1) incomplete evidence of effects of restoration on final ecosystem services and benefits, and (2) the spatial and temporal differences in peatlands' responses[1].

What are the costs of peatland restoration, and what wider societal and economic adaptations might it require?

16. As established in a report on the costs of peatland restoration in the UK[20], existing information on restoration costs is very scarce and fragmented. The report shows:

    - The distribution of costs across the various categories, based on data from 38 restoration sites in England, indicates that costs of restoration works comprise on average 89% of total restoration costs.

    - Restoration techniques vary in operational costs: for instance considering median costs per hectare based on the anecdotal data gathered through a survey with peatland programme officers and other existing evidence, damming drains with rock appears as one of the most expensive techniques (reported at £5,883/ha); and damming drains with peat as the least expensive (reported at £105/ha). Overall, the median restoration cost per hectare across all restoration interventions is £1,009, with a difference of £3,707 between the minimum and the maximum costs.

    - Factors affecting restoration costs include: site characteristics, location of site, and land ownership characteristics; but the evidence on how these factors specifically affect restoration costs is still weak due to lack of sufficient and systematically collected data.

17. The majority of research on costs of peatland restoration has been carried out for upland blanket peatlands; there is much less information for lowland sites which are often used for much higher economic gains, including for horticultural crop production in the fens. This means that much wider societal and economic adaptation is required. This type of restoration may also be higher due to infrastructure costs to raise the water level using equipment such as pumps.

18. Peatland restoration work needs to consider the condition of the peat in the upper peat layers below the surface; yet often, only the surface of the peat is considered in condition assessment. For example, a peatland may look in good condition because it is vegetated, but the peat just below the surface may be very dense and well decomposed due to a deterioration in state – this may mean many peatland functions are not operating effectively and may also mean that assumptions about hydrology, carbon cycling and so on are not correct for that peatland system.

19. We should use more peat core investigations into peatlands to examine previous historic vegetation cover to tell us about their former 'natural' state[21]. This will also allow us to put vegetation cover driven by recent (last century or so) management for the grouse industry into a longer-term perspective[22]. So rather than assume/force some end-point vegetation assemblage position for all UK peatlands, we should determine whether a particular peatland ever had such a vegetation assemblage and also think more carefully about how our target assemblages match future climate change predictions for our peatland systems.

20. Restoration work may therefore need to evolve further to deal with such peatlands, moving beyond traditional gully blocking, ditch blocking and revegetation to considering

how to create a functioning peatland in other situations. An example may include creation of a wider range of shallow, open water pool sizes across peatlands to enhance the ability of the peatland to store new rainwater (this will be effective even if pools seem almost full most of the time due to the specific yield effect)[23] and enhance ecological diversity[24]. Further research is required to test new pool creation methods and also to establish the wider range of benefits this may generate, such as for downstream water quality.

21. Conservation information campaigns are often not effective in changing opinions, let alone behaviour. Alternative approaches based on understanding people's motivations, perceptions and relationships with nature are needed.

22. A study from Scotland shows that the general public's attitude towards peatland restoration is predominantly positive[25]. Reasons for supporting restoration include the opportunity to contribute to climate change mitigation, recreational purposes, opportunities to improve the rural economy, as well as responsibility for future generations and a sense of Scottish identity.

23. However, the study also shows that perceptions of peatlands are ambivalent and many-facetted[26]; they can be seen at the same time and by the same individual, as bleak wastelands; beautiful, wild nature and cultural landscapes. The study shows how ambivalent views of ecosystems such as peatlands seem not to stem necessarily from a lack of knowledge, but can be linked to its biophysical characteristics, history, and trade-offs between different uses and differences in personal relationships with nature.

24. To ensure the long-term success of conservation, it is vital to understand and manage the public's different and ambivalent views about and attitudes towards landscapes of a greater or lesser degree of wilderness.

25. A study from Scotland[27] quantifies the non-market benefits of changes in peatland ecological condition associated with changes in ecosystem service provision and depending on the location of restoration efforts:

    - The study shows that the average monetary value (benefits) associated with ecosystem services provided through peatland restoration (in terms of carbon storage, water quality and wildlife habitat) range from £127 to £414 per hectare and year, depending on the degree of improvement and where restoration takes place[28].

    - These estimates of benefits on a per hectare basis are compared to varying capital and recurrent cost in a net present value space, providing a benchmark to be used in decision making on investments into peatland restoration[29]. The findings suggest that peatland restoration is likely to be welfare enhancing. Benefits also exceed cost in appraisals of previous and future public investments into peatland restoration.

    - The findings do not indicate that the benefits of peatland restoration always exceed its costs or that all individuals will benefit, but it does provide evidence that restoring peatlands can generate net benefits to society. The results therefore strengthen the economic rationale for climate change mitigation through improved peatland management.

26. As part of iCASP's Optimal Peatland Restoration project a User Guide for Valuing the Benefits of Peatland Restoration has been produced[30]. This has been downloaded and used by researchers, peatland practitioners and organisations across the world to support decision-making when restoring peatland and in supporting a robust and evidenced case for restoration. We recommend adoption of the tool across the UK.

What should be included in the forthcoming England Peatland Strategy?

27. A comprehensive valuation encompassing the relevant public benefits of restoration in England/Wales/NI, and how these compare, is currently lacking, leaving policy makers with little guidance with respect to the economic efficiency of investments into restoring this climate-critical ecosystem. This should be addressed in the forthcoming strategy.

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