CARBON landscapes

Simon Drew explains why peat land management will be critical to climate change policy

'The nation that destroys its soils, destroys itself'

Franklin Roosevelt (1937)

SOME OF THE NUMBERS CONCERNING carbon in British soils are more than enough to give pause for thought. Approximately eight per cent of the land area of UK catchments is covered with peat-rich moorland, accounting for about 14 per cent of total European peat land. Estimates of the amount of carbon locked up in the peat-rich soils of Britain's uplands range from three to seven million tonnes - equivalent to 25-35 years of carbon dioxide emissions from the entire UK economy. There is more carbon stored in UK peat than in the forests of Britain and France combined.

These figures underpin a growing appreciation that our peat-rich moorland catchments are a carbon resource of global significance and require careful management with respect to their carbon content. They have even contributed to the coining and adoption of a new term, 'carbon landscapes'. Carbon landscapes (which are not restricted to peat lands) is a relatively new concept, which encourages the understanding of landscapes with respect to their ability to store and process carbon in different forms. Storage may be manifest as carbon captured in plant matter such as trees, shrubs, herbs and grasses, in organic matter present in soils, or dissolved in water bodies as organic and inorganic forms.

The processes of photosynthesis and peat formation have led to the sequestration of massive amounts of carbon. Unfortunately carbon can be lost from peat lands as well as sequestered. Peat extraction for fuel and compost, managed burning for grouse shooting, large scale disturbance for infrastructure development projects and a number of other human activities can lead to significant losses of carbon. Carbon lost by these mechanisms is returned to the atmosphere rapidly. Given current concerns regarding rising atmospheric carbon dioxide and methane concentrations, it is necessary that peat land management is incorporated into climate change policy.

Improved understanding of the activities which can contribute to carbon losses and gains from peat lands is required to inform the management of these areas. A new project funded by the Natural Environment Research

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Council (NERC), entitled CLAD (Carbon Landscapes and Drainage) aims to enhance this interaction between scientists, managers and stakeholders.

CLAD arose from two research studies undertaken by Susan Waldron of Glasgow University and Dave Gilvear and Ian Grieve of Stirling University. They monitored the carbon lost from peat lands through water courses draining watersheds developed as sites for wind farms. This carbon is lost in the form of dissolved organic carbon (DOC), which gives rise to the brown colour commonly seen in water draining these upland areas. Both studies provided evidence that wind farm-induced disturbances were the cause of significant increases in carbon losses in streams. These observations were made against the background of a number of studies showing that DOC concentrations have been increasing in many UK catchments for the past couple of decades (with important consequences for the water treatment industry, which has had to bear the increased costs associated with DOC removal).

The scientists realised that an academic interest in these findings needed to be complemented by an attempt to engage the groups responsible for management and development of these areas. This led them to apply for NERC funding for a Knowledge Exchange (KE) project. KE projects aim to facilitate understanding within a particular field of interest. CLAD aims to enhance understanding of the effect of disturbance on carbon losses in peat lands, and improve management practice through a programme of events and other activities. Its membership is a broad church of interest groups, renewable developers and landowners, conservation groups, regulators, researchers and environmental consultants.

The academic researchers will contribute to a review of the impact of disturbance on carbon losses from peat, which is due to be published in a peer reviewed journal. This will provide the scientific foundation for one of the most important outputs of CLAD, a series of development guidelines provisionally called the *Carbon & Water Guidelines (or Handbook)*. These will be produced by all CLAD members and will outline a series of best practice measures to ensure a reduction of the impact of disturbance on carbon losses, and to mitigate for carbon losses where they are unavoidable.

CLAD will also run a series of workshops examining issues such as how to execute meaningful water quality monitoring using state-of-the-art technology to determine DOC losses. As part of this component of the project, CLAD will field test an absorbance spectrometer, which has the potential to provide in-situ continuous monitoring of DOC in the field. A further workshop will provide the opportunity to learn how to understand and value a carbon landscape.

The CLAD programme has flexibility to respond to emerging issues. For example, during its inaugural meeting, it became apparent that there were a number of questions surrounding the use of the recently developed carbon payback calculator. CLAD organised a meeting to allow the calculator users to meet its developers and put those questions to them formally.

Geo-engineering projects such as ocean fertilisation, which aims to manipulate the Earth's natural systems to reduce atmospheric carbon concentrations, have received significant coverage in the popular press. However, more modest first stage endeavours like CLAD will become important increasingly as humans begin to exert more sophisticated control on different components of the planetary carbon cycle. This will be achieved by modifying human activities, which have the potential to alter the carbon cycle in natural systems and will be affected by a number of different controls. Currently there is little formal management of activities in peat lands, designed with carbon management in mind. This situation will inevitably change with a raft of potential new controls such as the inclusion of carbon assessments, and monitoring at the scoping stage of developments and during the Environmental Impact Assessment process.

Eventually, international agreements, such as those that governments strived for during the Copenhagen climate change summit, are likely to address these issues. Interestingly, while Copenhagen was generally viewed as a failure, the one area which it is generally agreed saw most progress was the Reduction in Emissions from Deforestation and Degradation (or REDD) initiative. This agreement seeks to include forest conservation within carbon trading mechanisms and is viewed as the 'low hanging fruit' in carbon management, as significant carbon emissions result from deforestation.

Negotiators are already looking to include peat lands in this agreement. While REDD looks to conserve environments in developing nations, it demonstrates the degree to which 'natural' pools of carbon are likely to come increasingly under the control of international agreements and law in the future. Significant resources, such as those found in the UK, are unlikely to escape the close scrutiny of international lawmakers.

This is an important time for those involved in the study, conservation, development and management of peat lands. It presents significant opportunities for conservation, the demonstration of sensitive development, and commercial opportunity for consultancy. Organisations such as CLAD represent an ideal opportunity to engage in the emerging field of carbon landscape management. ■

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Further information can be found at the CLAD website (www.clad.ac.uk)