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Aquatic carbon export from peatland catchments recently undergone wind farm development

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Scotland's peat landscapes are desirable locations for wind-based renewables due to high wind resources and low land use pressures in these areas. The environmental impact of sitting wind-based renewables on peats however, is unknown. Globally, peatlands are important terrestrial carbon stores. Given the topical nature of carbon-related issues, e.g. global warming and carbon footprints, it is imperative we help mitigate their degradation and maintain carbon sequestration. To do so, we need to better understand how peatland systems function with regards to their carbon balance (export versus sequestration) so we can assess their resilience and adaptation to hosting land-based renewable energy projects. Predicting carbon lost as a result of construction of wind farms built on peatland has not been fully characterised and this research will provide data that can supplement current 'carbon payback calculator' models for wind farms that aim to reinforce their 'green' credentials.

Transfer of carbon from the terrestrial peatland systems to the aquatic freshwater and oceanic systems is most predominant during periods of high rainfall. It has been estimated that 50% of carbon is exported during only 10% of highest river flows, (Hinton et al., 1998). Furthermore, carbon export from peatlands is known to have a seasonal aspect with highest concentrations of dissolved organic carbon (DOC) found mostly in late summer months of August and September and lowest in December and January, (Dawson et al., 2004). Event sampling, where high intensity sample collection is carried out during high river flow periods, offers a better insight, understanding and estimation of carbon aquatic fluxes from peatland landscapes.

The Gordonbush estate, near Brora, has an extensive peatland area where a wind farm development has recently been completed (April 2012). Investigations of aquatic carbon fluxes from this peatland system were started in July 2010, in conjunction with the start of construction of the 35-turbine wind farm, with a strong focus on event sampling. Fieldwork and sample collection is due to continue until at least September 2013 but data collated so far shows seasonal differences of carbon export from similar sized hydrological events. In addition, event sampling has highlighted the different characteristics between DOC and POC export as well as their contribution to the overall aquatic carbon flux. Phosphorous and nitrate concentrations have also been analysed and their export regimes and interactions with carbon export will also be discussed.