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Development of an ecohydrological and carbon flux peatland network in Ireland: progress for enhanced biodiversity and climate protection in Europe

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Biodiversity loss and climate change are the two grandest challenges facing humanity today, with the degradation of terrestrial ecosystems undermining nature's ability to regulate greenhouse gas (GHG) emissions and protection against extreme weather. It is thereby critical that long-term observational scientific data is collected for improved evidence of environmental change and serve as the basis for science, policy and decision making. Long-term, regular, standardised and co-located measurement of key biotic, abiotic and process parameters at sites representative of environmental and ecological gradients is essential. This is required for developing an advanced understanding of fundamental ecosystem processes, and their responses to environmental stresses induced by anthropogenic pressures such as land-use and climate change. Integrated scientific monitoring is thus essential. It is on this basis that an ecohydrological and carbon (C) flux network, incorporating hydrometric, ecological, eddy covariance/flux-chamber GHG and dissolved organic carbon (DOC) monitoring, is being deployed on a suite of contrasting peatlands in Ireland. The observation sites reflect the biogeographical and hydrological gradient that support Irish peatlands, and cover a range of conditions from intact, degraded/restored and severely damaged. The substantive cover of peatland in Ireland (> 20%) makes them key components of Ireland's Climate Action Plan, though they are currently a large source of carbon (> 6 million tonnes CO₂e per year) due a long history of mismanagement, and there is currently a large drive to arrest C emissions and restore their sequestration function through national and European Union funded restoration projects. A primary purpose of the network is to thereby measure and report on the impact restoration work has on C emissions, upscale fluxes to landscape level, and to determine the hydrological thresholds required for restoration-engineering design. This paper will present the rationale of the network and an overview of current results and their influence on Irish conservation and climate related policy. In addition to this, and arising from the peatland pavilion at the Climate Summit COP26, Glasgow, is the advancement of a European peatlands initiative, where countries with significant peatland cover will seek to formally work together in order for advanced peatland action. The network presented in this paper will contribute significantly to this dialogue and form part of a larger pan-European Network.