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Carbon and Greenhouse gas dynamics at an industrial cutaway peatland

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Worldwide, peatlands are estimated to store around 30% of soil organic carbon on only 3% of the land area. In Ireland, these numbers increase with peatlands covering ~20% of the land area and storing up to 75% of the terrestrial soil organic carbon. However, a large proportion (≥90%) of these ecosystems have been degraded through drainage for agriculture, forestry, horticulture and extraction for energy. With the increase in global initiatives for the conservation, rehabilitation and sustainable management of peatland, further investigation of the effect of drainage and rehabilitation is needed to better understand the carbon and greenhouse gas (GHG) dynamics of these ecosystems. Additionally, it is crucial to understand the natural adaptive capacity of the ecosystem to further inform effective rehabilitation strategies. This study investigated the carbon dioxide (CO_2) and methane (CH_4) fluxes from a former industrial peat extraction site in Ireland, prior to rehabilitation using static chamber techniques. The site is an overall source of CO_2, releasing a cumulative annual flux of 9 g C-CO_2 m^{-2} y^{-1} for 2020-2021 and a small source of methane, releasing an average annual cumulative total of 1 g C-CH^4 m^{-2} y^{-1}.

This research highlights the potential emissions savings that can be made through rehabilitation as water tables increase with rewetting and these sites become re-vegetated. However, long-term measurements to track the temporal dynamics of C/GHG emissions post-rehabilitation are required to fully assess the climate mitigation of this approach, particularly in light of a changing climate which might further influence the ecological, hydrological, and biogeochemical functions of these important ecosystems.