

Simulating the long-term response of peatlands to extraction and post-extraction management strategies

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Peatlands have been and remain exploited either for agricultural purposes, forestry, peat extraction or infrastructure development in the northern latitudes as well as in the tropics. Modelling current and future carbon exchanges in peatlands thus requires further understanding of carbon dynamics in drained, exploited and restored peatlands.

This study aimed at quantifying the centennial to millennial carbon balance in extracted and restored peatlands. On-site data measurements only started recently and only cover up to 15 years. The chosen approach was thus based on modelling. We modified the Holocene Peat Model (Frolking et al. 2010) to simulate peat extraction and restoration and calculate the carbon balance at different stages of exploitation and restoration.

The model simulates drainage occurring prior to and during peat extraction, changes in peat bulk density and the specific vegetation succession occurring during the restoration process. As in the previous version of HPM, vegetation dynamics and interactions between vegetation and ecohydrology were included in the simulations.

Simulation results offered an estimate of the amount of carbon accumulated in the peatland prior to exploitation as well as the carbon loss during exploitation. Estimates of current and future net carbon accumulation/loss, associated with different management scenarios, such as state-of-the-art restoration, drainage blocking or abandonment, gave an insight into the benefits of restoration and moreover into the millennial scale impact of peat extraction.