Rewetting drained peat soils is necessary for climate neutrality in Finland

Large-scale rewetting activities mitigate GHG emissions and support climate neutrality

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Greenhouse gas (GHG) emissions from drained peatlands are higher than the carbon sink of forests

In Finland, half of the original peatland area is drained, mostly for forestry but also for peat mining and agriculture. The area of drained peatlands under forest, cropland, grassland and peat mining are 6, 0.3, 0.06 and 0.1 Mha, respectively. PRINCESS project mapped GHG emission hotspots based on peatland density and management intensity (Fig. 1). Western Finland stands out as a hotspot with large area and intensive use of peatlands (Fig. 1).

GHG emissions from drained peatland soils amounted to 20 Mt CO_{2e} in the land use sector in 2023 (Fig. 2). The share of forestry, agriculture and peat mining were 11.6, 7.6 and 1.6 Mt of CO_{2e}, respectively. In addition, 1.4 Mt CO_{2e} of N_2O emissions from cultivated peatlands and 4.9 Mt CO_{2e} from peat incineration were reported as part of total emissions.

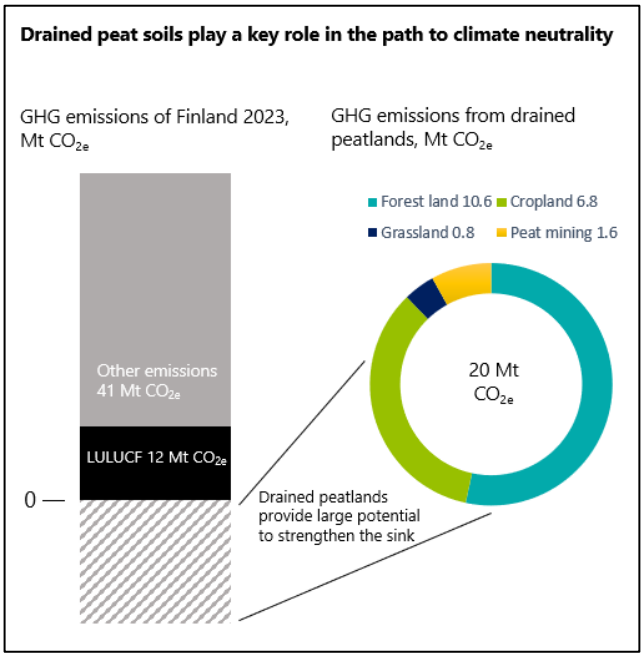

Figure 2. Total GHG emissions and emissions of drained peatlands in the land use (LULUCF) sector of Finland in 2023. Source UNFCCC 2025.

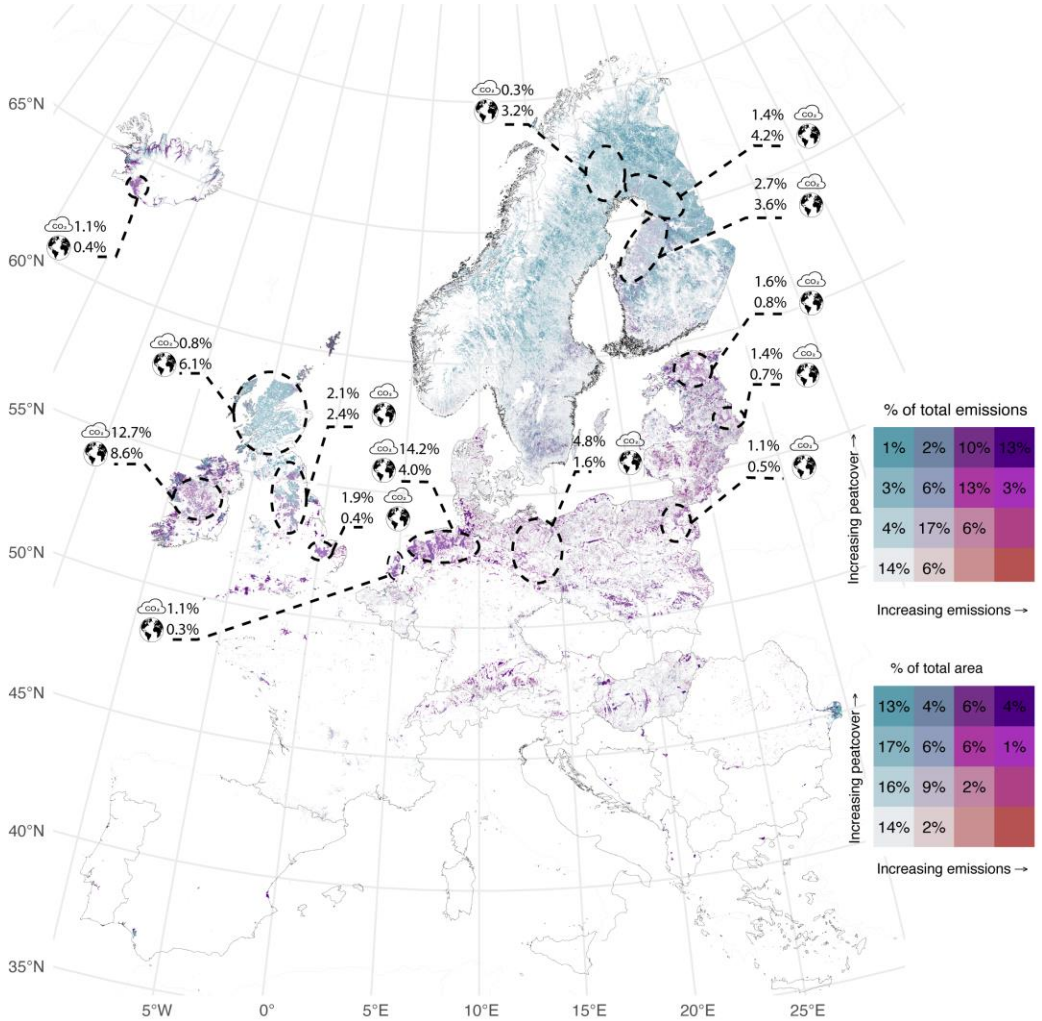

Figure 1. Hotspot map of peatlands showing the contribution of regions to the total emissions or area of peatlands in Europe. The darker the colour, the higher fraction of European peatland area or emissions the region represents. See details in van Giersbergen et al. 2025.

Climate neutrality requires peatland rewetting

Finland aims at climate neutrality in 2035 (Climate Act 2021), which is defined as total emissions equalling to net LULUCF sector sink. The total emissions have been decreasing even faster than anticipated, but the diminished LULUCF sink complicates achieving climate neutrality. All means of strengthening the sink are thus needed to meet the goal. Drained peat soils provide fast and large potential to strengthen the sink. The Nature Restoration Regulation of the EU (EU 2024) sets the target of restoring 30% of drained agricultural soils by 2050, and half of this should be rewetted. Emission reduction caused by rewetting is the higher the more intensive is the preceding land use. Thus, a maximum possible area of croplands should be rewetted when implementing the Nature Restoration Regulation.

Rewetting strengthens the carbon sink

If all peatlands under agriculture and peat production were rewetted in Finland the emission mitigation would amount up to 9.5 Mt CO_{2e} (Fig. 3). The share of 8.1 Mt would add to the net carbon sink and 1.4 Mt reduce agricultural GHG emissions in the effort sharing sector.

The additional benefits from rewetting are:

- Flood, drought and fire prevention
- Less nutrient pollution in watercourses
- New business opportunities from paludiculture (crop production in rewetted peatlands).
- Feeding sites for migrating birds leading to less damage to fields
- Improved status of protected areas currently surrounded by drained areas
- Improved sustainability of food production and consumption

Finland will not reach climate neutrality without extensive rewetting of drained peatlands.

What is rewetting?

In rewetting, water flow out from a drained area is restricted. The ground water level rises and enables restoring the wetland functions of the ecosystem. Emissions of carbon dioxide (CO_2) and nitrous oxide (N_2O) decrease and the increase in methane (CH_4) emissions is usually moderate. The effects of rewetting were calculated assuming an instant change from the current reported average emissions of each land use type to emissions corresponding to the default emissions of rewetted peatlands (IPCC 2014).

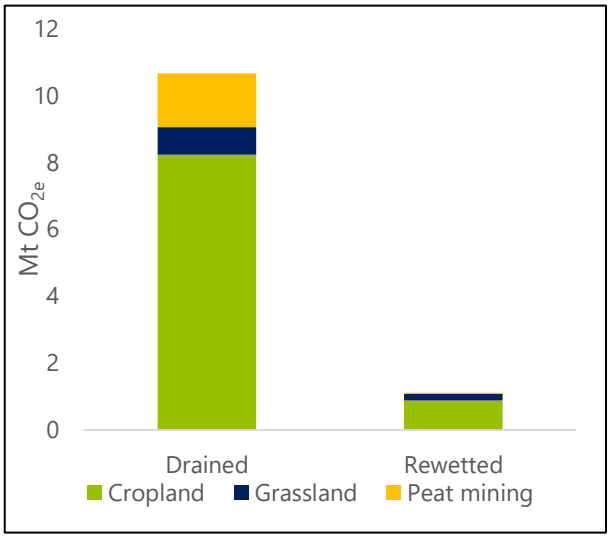

Figure 3. Predicted change in the annual GHG emissions caused by rewetting of the most intensively used drained peatland (agricultural and peat mining) of Finland.

Incentives are called for

As part of the green transition, livelihoods utilising peatlands will need to adapt to future demand of sustainability in production. Transformation pathways involving large-scale rewetting are possible but urge for policies that abolish harmful subsidies and create incentives for protective actions on peat soils.

Paludiculture is a way to achieve both GHG mitigation and provision of novel biomass types. Paludiculture should be made a feasible option for both primary producers and industry.

Funding is needed for efficient implementation of rewetting as well as for developing industrial use for paludiculture biomass.

References

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Front page photo: abandoned peat mining site in 2021. Last page photo: the same site in 2024 after rewetting.

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