

Life PeatCarbon Project: The role of peatlands for climate change mitigation

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Dr. biol. Māra Pakalne from the University of Latvia provides insights into the LIFE PeatCarbon project by exploring the significance of peatlands in mitigating climate change

Peatlands are vital for biodiversity and water regulation, but remain among Europe's most threatened ecosystems. The LIFE PeatCarbon project brings together experts from Latvia and Finland, with partners in Germany and Denmark, to demonstrate how peatland restoration and greenhouse gas (GHG) monitoring can deliver scalable climate solutions and strengthen regional collaboration.

Information about the LIFE PeatCarbon project

The LIFE PeatCarbon project, running from 2022 to 2027 and coordinated by the University of Latvia, works in Latvia and Finland to improve the site's hydrology and vegetation diversity in over 5,400 hectares of raised bogs and aapa mires. The project reduces GHG emissions, prevents further peatland degradation, and tests remote-sensing-based monitoring methods.

Funded by the EU LIFE Climate Action Programme, it brings together 12 project beneficiaries from Latvia, Finland, Germany and Denmark to develop transferable best practices and cost-effective tools that support climate change mitigation across the Baltic Sea region.

Peatland role in climate change mitigation

Peatlands are vital for climate change mitigation as immense natural carbon sinks – storing about 30% of the world's soil carbon while covering only about 3% of the Earth's surface. Restoring and preserving wetlands, including peatlands, significantly reduces GHG emissions.

In their natural state, peatlands sequester carbon rather than release it as CO₂, accumulating it as peat over thousands of years. Given their ecological importance and carbon storage capacity, protecting and restoring peatland ecosystems is critically important amid increasing environmental pressures and global warming.

Peatlands in Latvia and Finland: General situation

Peatlands in Latvia have been degraded by human activities such as drainage and peat extraction, causing them to transition from carbon sinks to sources of GHGs. Still, the most valuable are now under state protection within National parks and nature reserves. As long as the drainage effect remains, their natural ecosystems continue to deteriorate, highlighting an urgent need for protection and restoration.

The LIFE PeatCarbon project addresses this by applying nature-based solutions across four sites in Latvia – Cenas Mire, Lielais Pelečāres Mire, Melnais Lake Mire, and Sudas-Zviedru Mire – and two in Finland – Matorova Mire and Välisuo Mire – to mitigate emissions and revive ecosystem functions.

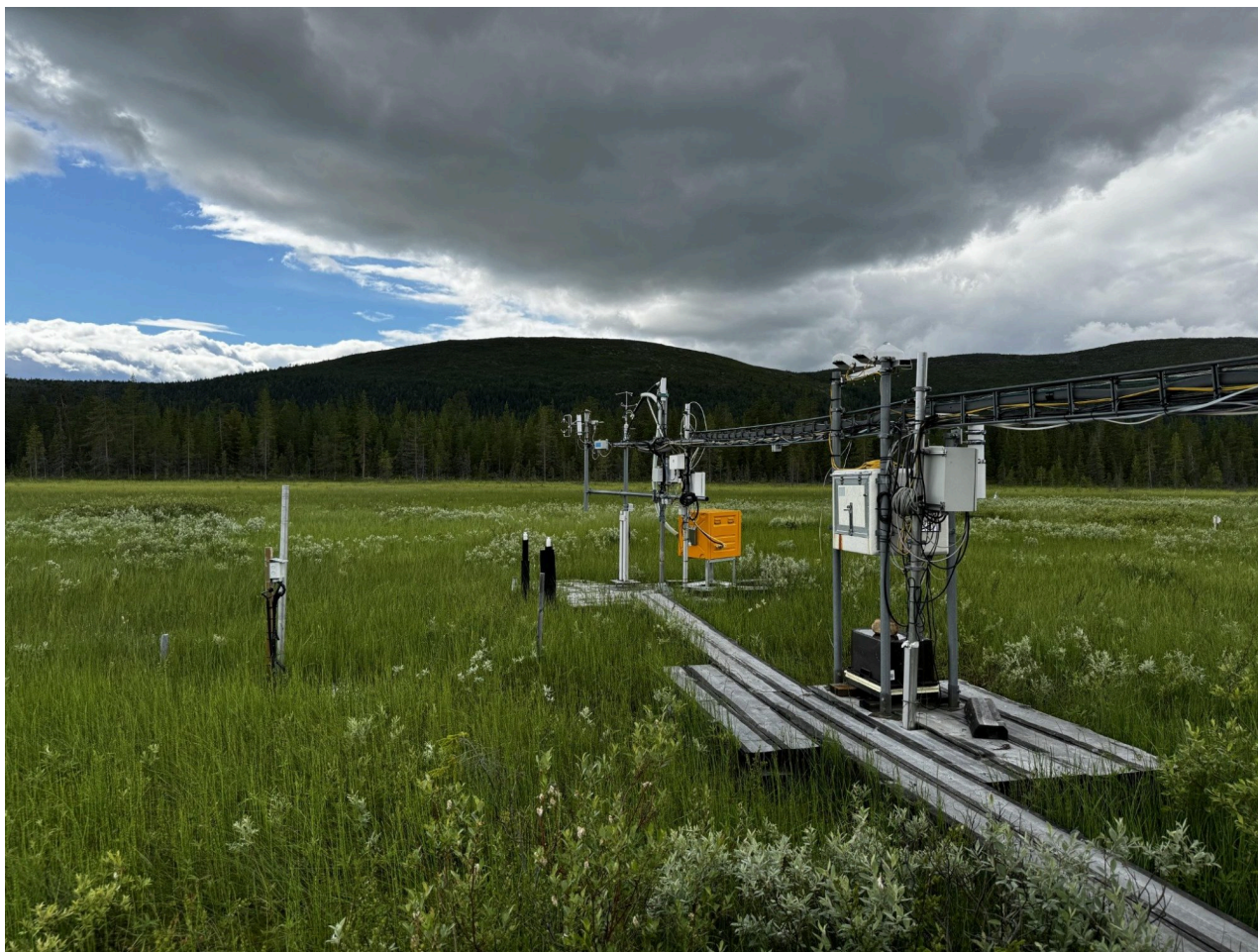
Peatland studies within the the LIFE PeatCarbon project

Within the LIFE PeatCarbon project, scientists conduct comprehensive research on peatlands in Latvia and Finland. They perform hydrological and geological surveys, develop hydrogeological models, and establish water table and GHG monitoring points using chamber and eddy covariance methods. Vegetation monitoring plots assess ecosystem recovery, while wireless sensors, ground-penetrating radar, and remote sensing support hydrological modelling projecting up to 50 years ahead.

In Finland, research also targets microbial dynamics, GHG fluxes, and vegetation shifts. These integrated methods enable precise evaluation of restoration impacts on peatland hydrology, carbon balance, and ecosystem regeneration.



Peatland restoration results in Melnais Lake Mire in Latvia. Photo: Jānis Bikše.



GHG measurement site in Finland. Photo: Dr. biol. Māra Pakalne

Problems identified through the project's experience

The LIFE PeatCarbon project highlights several major problems affecting peatlands. Decades of drainage for agriculture and forestry have lowered water tables, accelerating peat decomposition and releasing large volumes of GHGs. Peat extraction has further degraded ecosystems, turning many peatlands from carbon sinks into sources of emissions. Invasive plant species and disrupted hydrological regimes hinder natural regeneration.

Climate change intensifies these pressures, increasing the risk of fires and biodiversity loss. Together, these factors demonstrate that without active protection and restoration, peatland ecosystems in Latvia and Finland will continue to deteriorate, contributing to climate change.

Importance of GHG monitoring, methods, results

Monitoring GHG emissions is essential to evaluate the effectiveness of peatland restoration. Within LIFE PeatCarbon, researchers combine ground-based and remote sensing methods to achieve accurate results. Chamber measurements and eddy covariance towers quantify CO₂, CH₄, and N₂O fluxes, while hydrological and vegetation data help interpret emission dynamics.

Remote sensing and modelling tools allow extrapolation across larger areas and long-term projections. Initial results confirm that restored peatlands reduce emissions compared to degraded ones. These insights are crucial for national GHG inventories and policy development, and demonstrate that peatland restoration is an effective climate change mitigation strategy.

Restoring peatlands in Latvia and Finland: Scientific innovation meets climate action

In Latvia, the positive effect of restoration measures at sites such as Lielais Pelečāres Mires, Cenas Mire, Melnais Lake Mire, and Sudas-Zviedru Mire reaches more than 5,400 hectares. Rewetting and blocking drainage ditches have raised water tables, reduced GHG emissions, and created conditions for natural vegetation recovery. In Finland, actions at Vālisuo Mire and Matorova Mire have restored over 300 hectares.

Early monitoring shows improved hydrology and positive trends in peatland ecosystems. Together, these efforts demonstrate that large-scale rewetting effectively transforms degraded peatlands back into functioning carbon sinks and biodiversity-rich habitats, significantly contributing to climate change mitigation.

In Latvia monitoring is carried out also in the LIFE project sites where peatland restoration was carried out in earlier LIFE Wetlands and LIFE Mire and LIFE Raised bogs projects. Monitoring results show very good restoration sites both by the improved site hydrology regime and the development of natural raised bog vegetation in the previously degraded areas.

Restoring degraded peatlands conclusions

The LIFE PeatCarbon project demonstrates that restoring degraded peatlands is an effective climate action. Rewetting and nature-based solutions significantly reduce GHG emissions, enhance carbon sequestration, and support biodiversity. By combining field research and innovative monitoring, the project provides transferable practices that strengthen climate change mitigation efforts across the Baltic Sea region and the EU as a whole.

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