LIVING LAB OF LATVIA

Comparing productive after-use pathways for extracted and abandoned peat sites

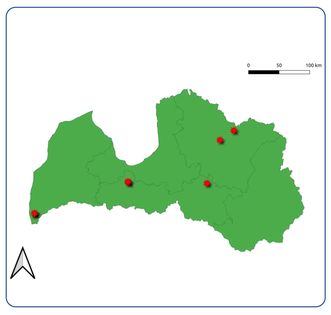


Six field sites compare afforestation, wood-ash-assisted revegetation and berry cultivation while tracking climate, water, biodiversity and production.

1 OUR LIVING LAB

WHERE?





THE CHALLENGE

Approximately 0.2 million ha of Latvian cropland and grassland occur on peat soils. Although these soils represent a relatively small share of agricultural land, the baseline assessment reports approximately 4.0 million t CO_2e yr^{-1} of emissions in 2024. Conversion from cropland to less intensively managed grassland does not necessarily produce a substantial reduction in soil greenhouse-gas emissions.

Latvia also has approximately 50,000 ha of peat extraction areas, including about 15,000 ha under extraction and approximately 20,000 ha of abandoned fields. These areas require technically feasible and economically viable after-use. Abandonment can leave nutrient-poor, bare peat without vegetation for decades, while complete rewetting may conflict with existing drainage systems, neighbouring land use, roads, energy infrastructure or production objectives.

The challenge is therefore not simply to select between drainage and rewetting. Management must balance CO_2, CH_4 and N_2O emissions; long-term carbon storage; biodiversity; water regulation; production; infrastructure costs; landowner income; local employment; and acceptance by neighbouring land users.



WETLAND TYPES

Former grassland with organic soils afforested with Norway spruce, 7.5 ha.

Periodically waterlogged former grassland afforested with black alder, 1.5 ha.

Naturally afforested former agricultural peatland dominated by birch, 2.7 ha.

Extracted peatland used for highbush blueberry production, 89 ha.

Extracted peatland afforested after wood-ash application, 9 ha.

Extracted peatland used for cranberry and blueberry production, 40 ha.

2 WHAT WE DID

ACTIONS

Monitor spruce, black alder and birch afforestation

Test wood ash (5-15 t ha^{-1}) and tree species

Assess blueberry and cranberry after-use

Co-create pathways: systems mapping, field-based reflection and scenarios



WHAT WAS MEASURED?

Monitoring covered heterotrophic soil respiration and CO_2, CH_4 and N_2O fluxes. At recently scarified afforestation sites, measurements distinguished mounds, scarified surfaces and the remaining undisturbed ground.

Supporting measurements included groundwater depth, soil moisture, soil and air temperature, precipitation, photosynthetically active radiation, soil and groundwater chemistry, and the physical and chemical properties of peat. Carbon inputs and stocks were assessed through above- and below-ground vegetation biomass, litter production, dead organic matter, photosynthetic CO_2 uptake, tree survival and tree growth.

The wider project added harmonised biodiversity and ecosystem-service indicators, soil microbial sampling, infrared spectroscopy of peat, remote-sensing and GIS analyses of vegetation, wetness, water quality and surface temperature. Socioeconomic work addressed management and restoration costs, landowner perceptions, willingness to accept compensation, public values and stakeholder acceptance.

CO-CREATION

The co-creation process in Latvia focused on the Kaigu purvs Living Lab and the challenge of sustainable after-use of former peat extraction sites. It brought together landowners, businesses, public institutions and researchers to explore both current barriers and future management pathways.

Across three consecutive workshops, participants moved from systems mapping of problems, causes and possible solutions, through field-based reflection at the Living Lab, to the 3 Horizons exploration of desirable futures, barriers and transition strategies.

The process highlighted the need for science-based and long-term planning, stronger dialogue among stakeholders, clearer public governance and closer cooperation between public authorities and businesses. It also broadened the discussion from individual reclamation measures towards more integrated and multifunctional peatland management pathways.

3 RESULTS & LEGACY

KEY FINDINGS

✓ Six sites cover 150 ha: four forest-management sites and two berry-production sites.

✓ Flux and biomass growth measurement results: afforestation may reduce GHG emissions by 1,300-1,500 t CO_2e ha^{-1} over 40-50 years.

✓ Flux and biomass growth measurement results: berry cultivation may reduce GHG emissions by 110-150 t CO_2e ha^{-1} over 40-50 years.

✓ Wood ash enabled vegetation cover to rise from 0% to 100% within two years, while produced biomass significantly reduces net CO_2 emissions from peatland.

Indicative benefits & trade-offs across the studied pathways

BENEFITS & TRADE-OFFS

Climate mitigation	++
Biodiversity	+/–
Water quality	+/–
Production	++
Management costs	–
Stakeholder acceptance	+/–

++ strong positive
+ positive
+/– mixed
– negative / trade-off

LESSONS

Operational sites with different management histories provide more transferable evidence than isolated short-term experiments. Long measurement records, harmonised methods and comparisons among tree species, water regimes and land uses help separate restoration effects from seasonal variability.

The most difficult issue is hydrology. A water level suitable for reducing peat oxidation may be unsuitable for tree roots, berry production, roads or neighbouring land. Long-term monitoring is also expensive, while the main carbon and ecosystem responses may take decades or centuries to become evident.

Other regions should begin with a site diagnosis covering peat depth and decomposition, nutrient availability, terrain, hydrological connectivity, drainage condition, infrastructure, ownership, labour availability and surrounding land use. After-use should then be selected as a pathway that can change over time, rather than as a permanent decision made immediately after extraction or agricultural abandonment.

LEGACY AND NEXT STEPS

The forest sites are intended to remain long-term research and demonstration plots through cooperation among Silava, the Forest Research Station, Latvia's State Forests and private managers. Continued scientific monitoring will depend on future funding and access agreements.

Harmonised Latvian data contribute to greenhouse-gas and carbon-stock models, peat spectroscopy, remote-sensing tools and regional and European upscaling. The sites also provide field evidence for restoration guidance, socioeconomic assessment and comparison of wetland measures with other agriculture and forestry mitigation options.

Open days, field excursions, videos and virtual tours can continue transferring the results to landowners, practitioners, municipalities and policymakers. The sites can also support future decisions about transitions from temporary production, including berries or forest cultivation, towards rewetting or another long-term land use.

ONE KNOWLEDGE GAP

Over several decades, which combination of target water level, tree or crop type, nutrient management and transition timing minimises net CO_2, CH_4 and N_2O emissions without unacceptable losses of biodiversity, water quality or economically viable production?

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