PEATLAND REWETTING IN NITROGEN-CONTAMINATED ENVIRONMENTS: SYNERGIES AND TRADE-OFFS BETWEEN BIODIVERSITY, CLIMATE, WATER QUALITY AND SOCIETY

SUMMARY

Context

The PRINCESS project, funded by BiodivERsA, investigated how rewetting nitrogen-contaminated peatlands could simultaneously address biodiversity loss, climate change, and water quality issues. Drained peatlands in the EU had been significant sources of greenhouse gas (GHG) emissions, releasing around 200 million tons of CO_2-equivalents annually. Conventional agriculture on these lands had further exacerbated emissions and contributed to high nitrate levels, negatively impacting water quality and biodiversity.

Objectives

Focusing on temperate fens—groundwater-fed peatlands widespread across Europe—the project examined how rewetting affected biodiversity, GHG emissions, nitrate release, and biomass yield. Since these ecosystems had been largely drained for agricultural use, PRINCESS aimed to assess whether restoring water levels could reduce emissions while maintaining productive land use.

The research followed a multi-scale approach, incorporating controlled laboratory experiments, field studies, and modeling at catchment and EU levels. This methodology ensured robust findings, balancing scientific accuracy with practical applicability. The project brought together expertise from Austria, Belgium, Finland, Germany, Norway, and Poland—countries representing diverse peatland conditions and nitrogen load scenarios.

Conclusions

Key findings demonstrated that rewetting significantly reduced GHG emissions and nitrate leaching while promoting biodiversity recovery. However, the extent of benefits depended on site conditions, previous land use, and rewetting strategies. The project also highlighted the potential for paludiculture (wetland agriculture) to provide sustainable biomass production, offering economic opportunities while maintaining ecosystem functions.

Keywords: peatland rewetting, paludiculture, greenhouse gases, nitrogen pollution, biodiversity