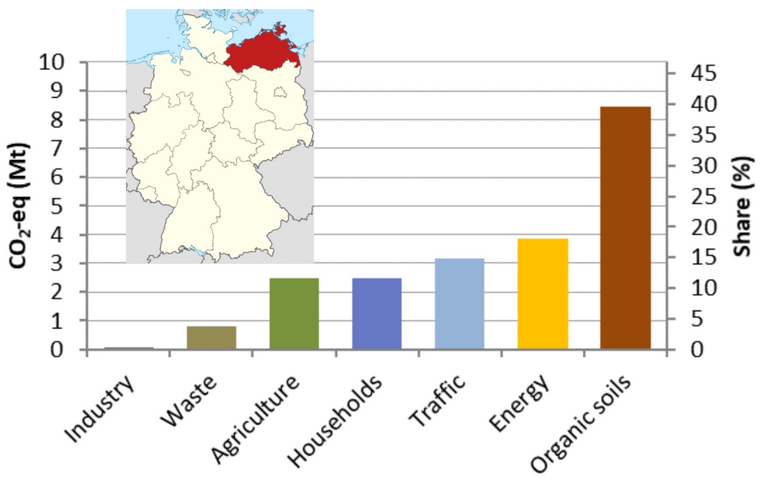
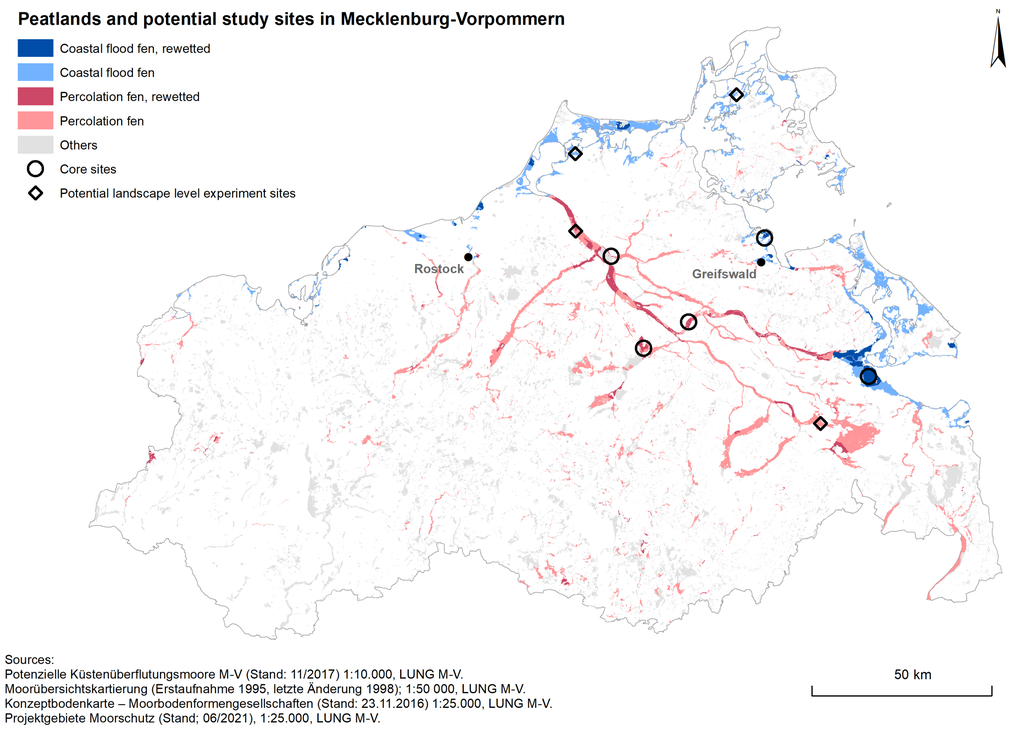
SFB-TRR WETSCAPES2.0: Sinks, links and legacies of novel ecosystems in rewetted fens

Challenge

Draining of peatlands leads to range of problems: greenhouse gas emissions, eutrophication, subsidence, loss of biodiversity
Rewetting might solve the issues and has begun (in MV, 11% of peatlands rewetted)
However, it leads to novel ecosystems with new characteristics
Missing: process-based, interdisciplinary understanding of rewetted fens



Uellendahl et al. (2023)

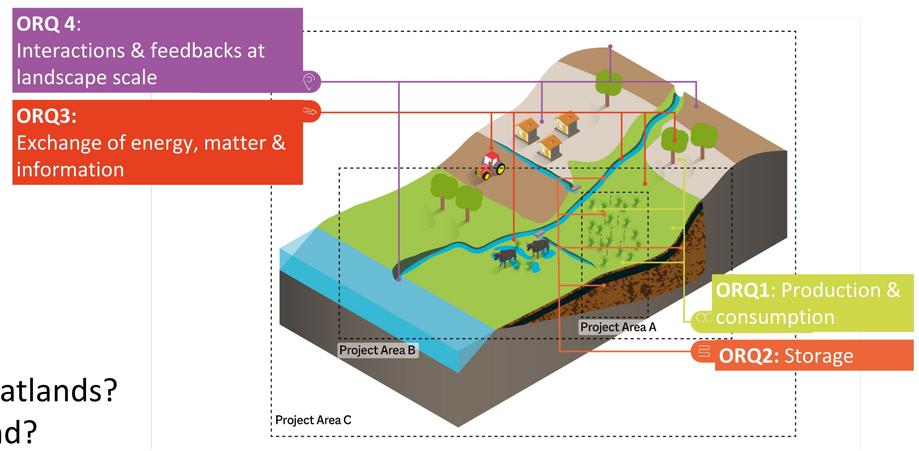


Aims and research questions

In WETSCAPES2.0, we
- Provide functional understanding of new wetscapes
- Adress spatio-temporal implications of rewetting at landscape level and beyond
- Quantify environmental, climatic and land use consequences of rewetting

➢ Provide the basis for developing sustainable management

Overarching research questions (ORQs)
ORQ1: What drives production and consumption in rewetted peatlands?
ORQ2: What and how much is stored in rewetted peatlands?
ORQ3: How are matter, energy and information exchanged within and beyond rewetted peatlands?
ORQ4: How do rewetted peatlands interact with and feed back to the landscape and beyond?



Integrative structure

- Interdisciplinarity & integration of utter importance
- Experiments, observations and modelling inform each other
- ORQs will be answered together
- On common sites

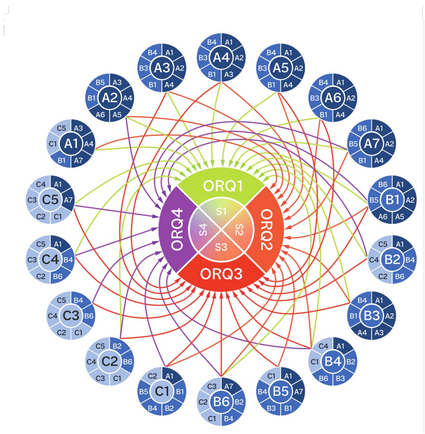
Synthesis projects

S1: Biotic interactions drive greenhouse gas fluxes in wetscapes 2.0

S2: Conceptual understanding of peat formation in rewetted fens

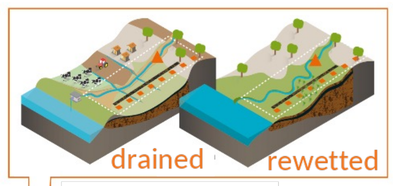
S3: Causes for and consequences of spatial patterns in rewetted peatlands

S4: Fusion of multi-scale-data & process-based models within the wetscapes 2.0



Screening Sites
(n = 100)

Indicators for generalizability of findings

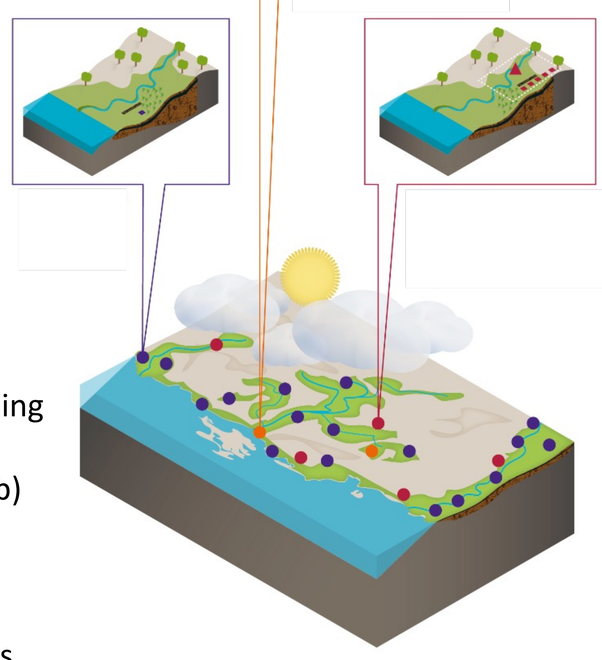


Landscape-Level Experiments
(n = 2)

Causal understanding at large scale

Core Sites
(n = 5)

Focus on spatial patterns and exchenge processes in high detail



Hypotheses of synthesis projects:
S1: a) plant growth dynamics as well as trophic interactions drive GHG production, b) microbiome-based proxy for CH_4 sink/source status of wetscapes can be developed
S2: a) new strata of organic matter develop after rewetting, b) degraded peat horizons are modified, leading to the development of a novel type of peat
S3: a) the spatial distribution of (vegetation) patches determine the future trajectories of rewetted fens, b) understanding the interactions between these patches improves our predictions of the development of these novel ecosystems
S4: a) multi-criteria calibration using auxiliary data reduces model uncertainty and increases process representation of peatland-landscape feedbacks, b) model sensitivity decreases and uncertainty increases with coarser model resolutions and at larger spatial scales

Outlook

- Project has started per April 1st 2025
- We have big plans

As newly appointed professor, you can still become a part:
Talk to N. Wrage-Mönnig

Phase 1:
Basics & extreme events

Phase 2:
Effects & opportunities of paludiculture

Phase 3:
Global future

Vision:
Center for Peatland Research