Organic soils within the EU regulatory framework and climate related policies: current status and scientific challenges

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OrgBalt LIFE project

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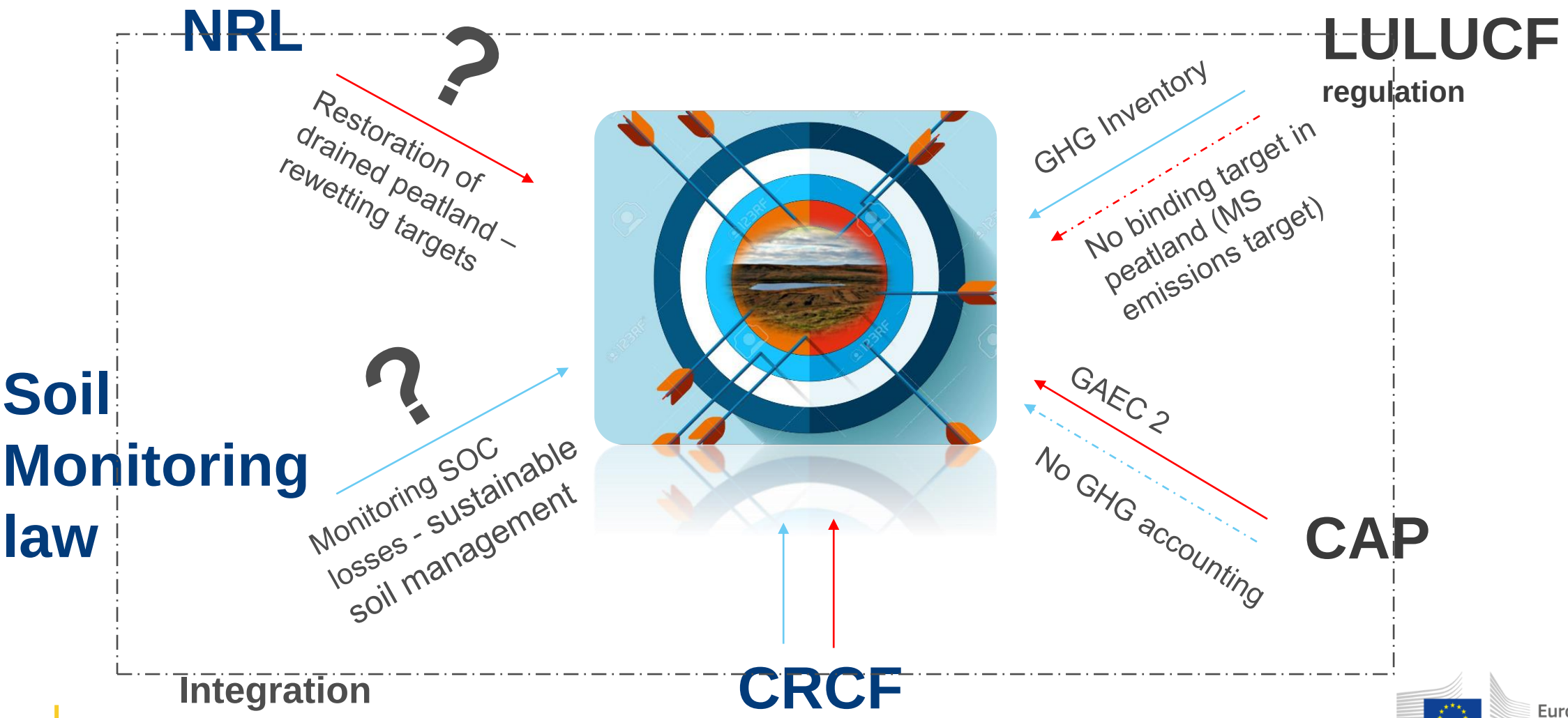
European Commission

Peatlands are targets of many EU policies



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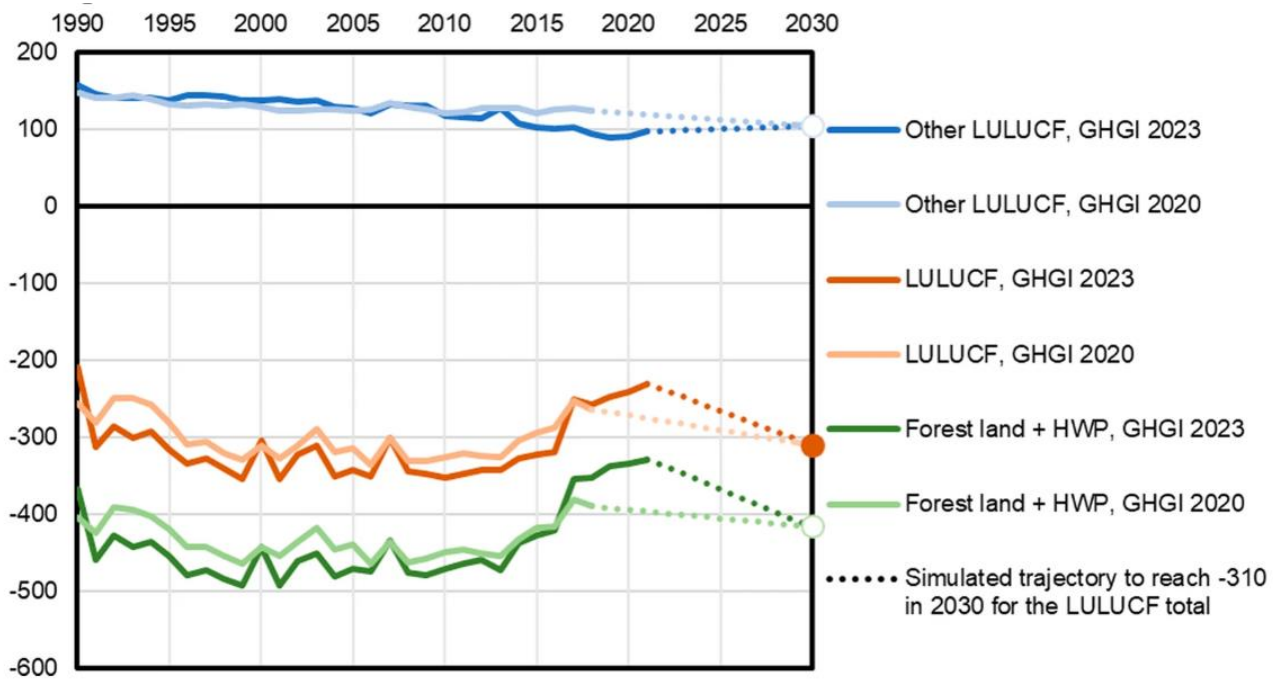
Pathway to climate neutrality

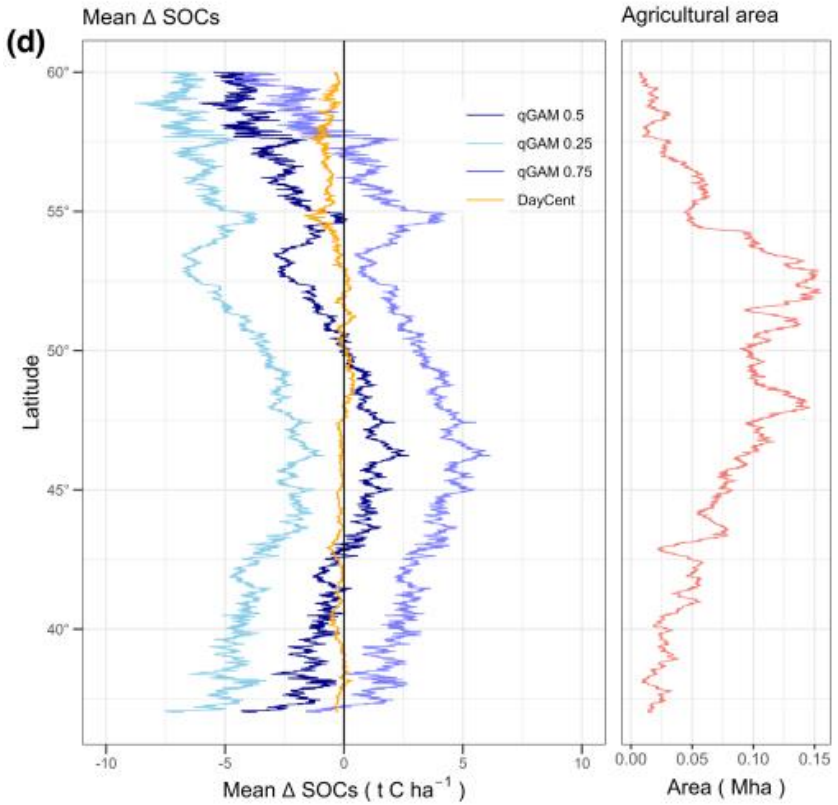
Trends of EU-27 net emissions and removals for LULUCF



Korosuo, A., Pilli, R., Abad Viñas, R. et al. The role of forests in the EU climate policy: are we on the right track?. Carbon Balance Manage 18, 15 (2023).

SOC losses in mineral soils 2018-09

= 9 - 28 Mt CO_2eq per year



De Rosa, D., Ballabio, C., Lugato, E., Fasiolo, M., Jones, A., Panagos, P. (2024). Soil organic carbon stocks in European croplands and grasslands: How much have we lost in the past decade? Global Change Biology, 30, e16992.

European Commission

Organic soils: a key “special” issue

GREIFSWALD MIRE CENTRE

>160 Mt CO_2e

ORGANIC SOILS IN NATIONAL INVENTORY SUBMISSIONS OF EU COUNTRIES

Martin, N. & Couwenberg, J.

EU emissions from organic soils

17 Mha -> 95 Mt CO_2

60% area correction
40% EF

Land use subcategory	Area (Kha)	ICECF (tC/ha)	Emissions from Org. Soils. (Kt CO_2)
 4A1	12 264	[-2.60; 0.65]	13 631
4A2	407		1 494
 4B1	1 242	[-10.01; -1.00]	25 813
4B2	273		5 814
 4C1	4 132	[-6.80; 0.25]	42 150
4C2	354		5 683

85%

Large uncertainty EF

Annual European Union greenhouse gas inventory 1990–2018 and inventory report 2020

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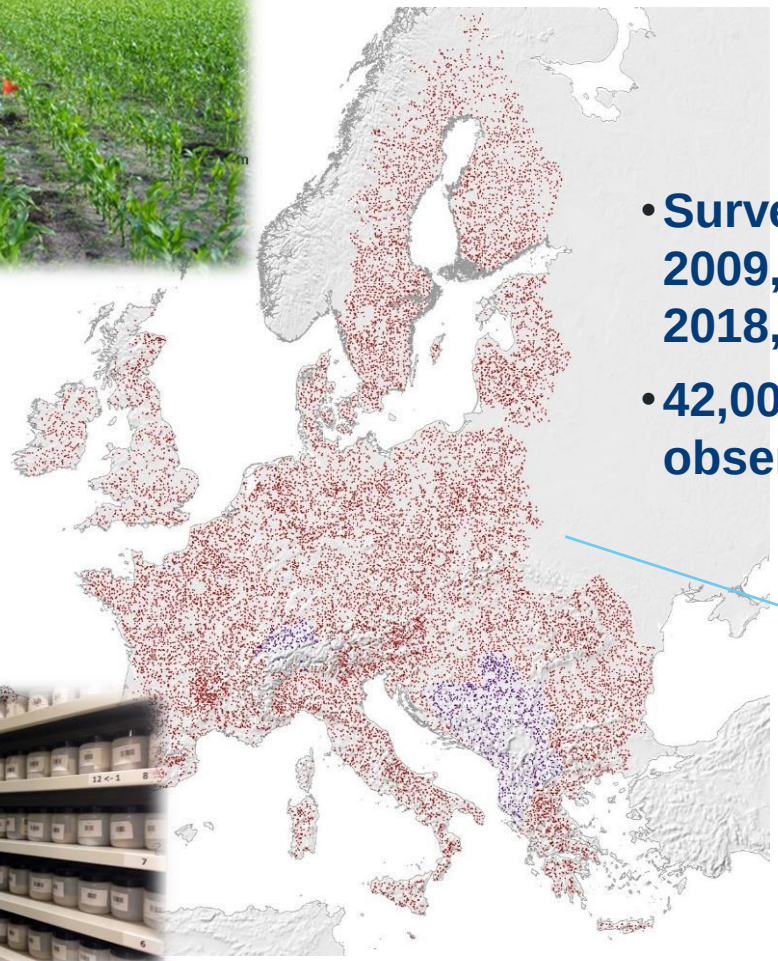
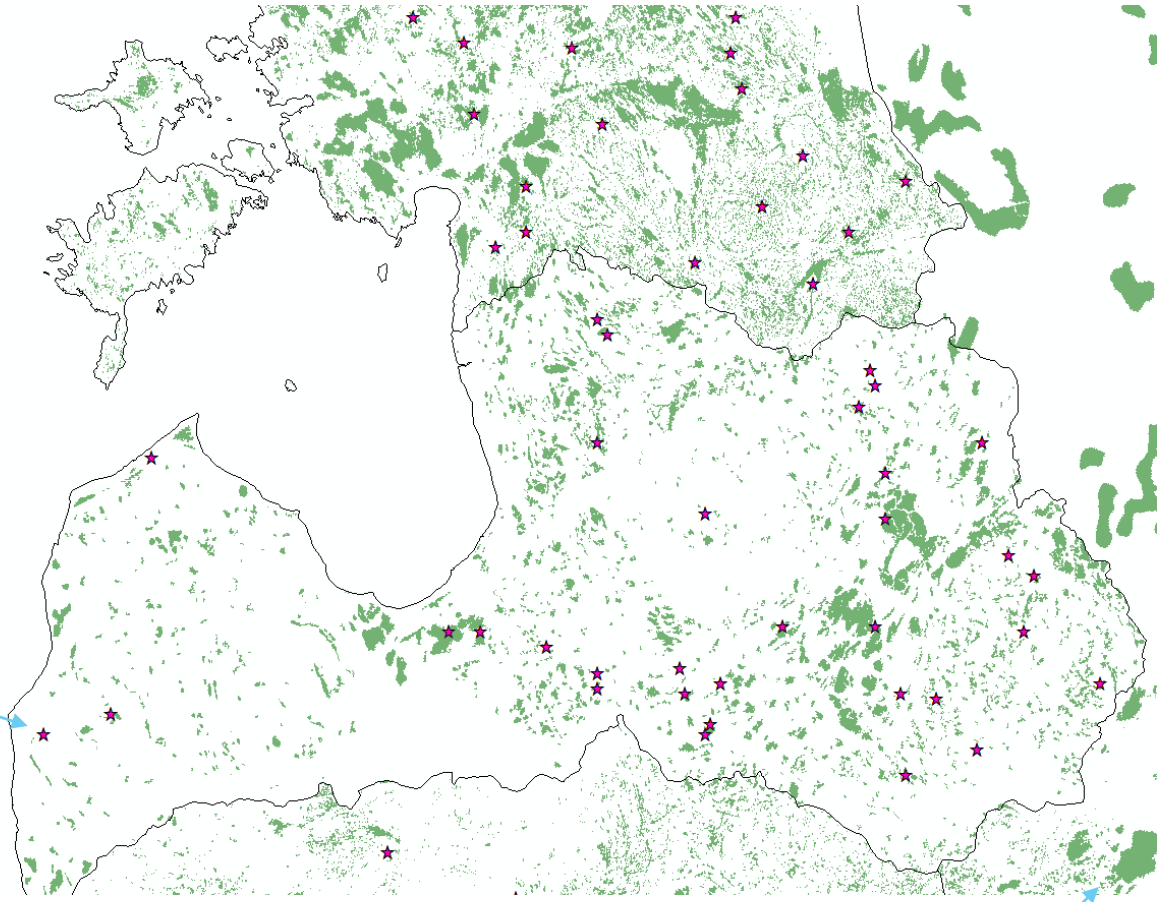
Moving from pan EU to local data



- **Surveys in 2009, 2015, 2018, 2022**
- **42,000 observation**

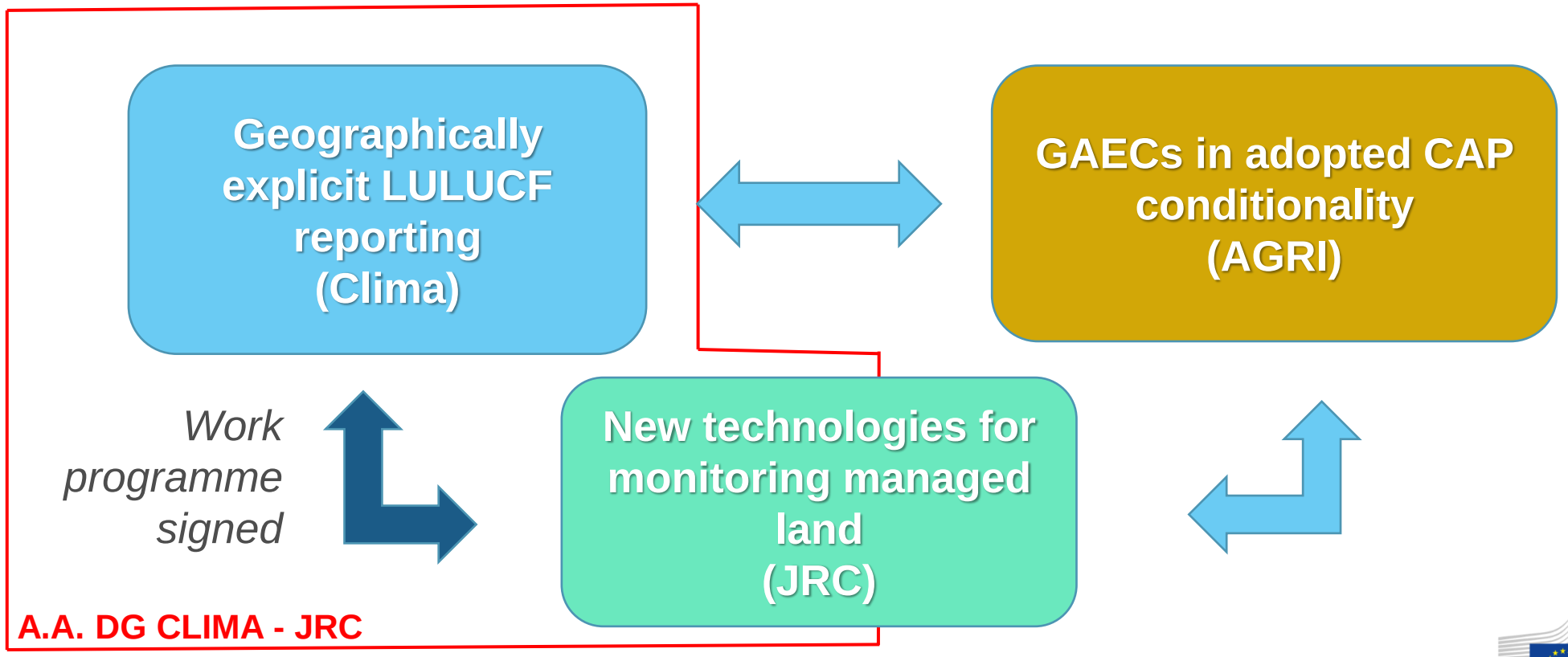


Tanneberger et ., *The peatland map of Europe*

Land **U**se and **C**overage **A**rea frame **S**urvey

The context of SEPLA project

"Ensure comprehensive inventory of wetlands and peatlands and address the monitoring of their preservation and restoration through the use of remote sensing and regularly updated geographically explicit datasets."



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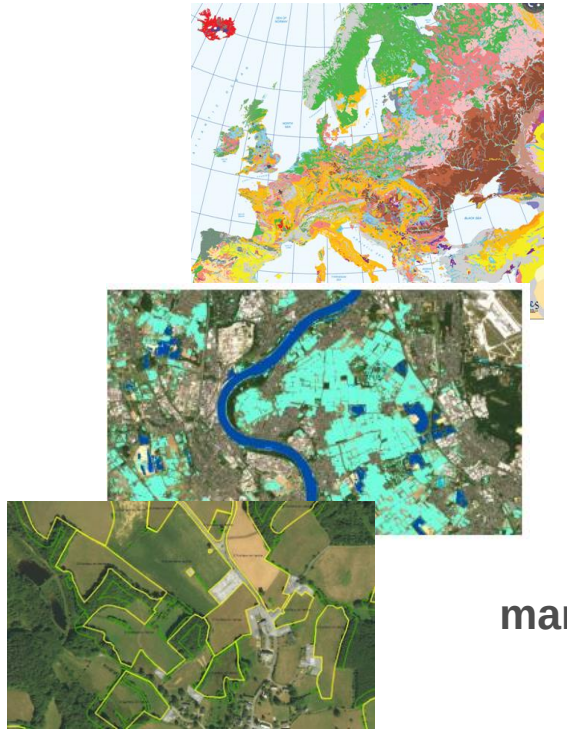
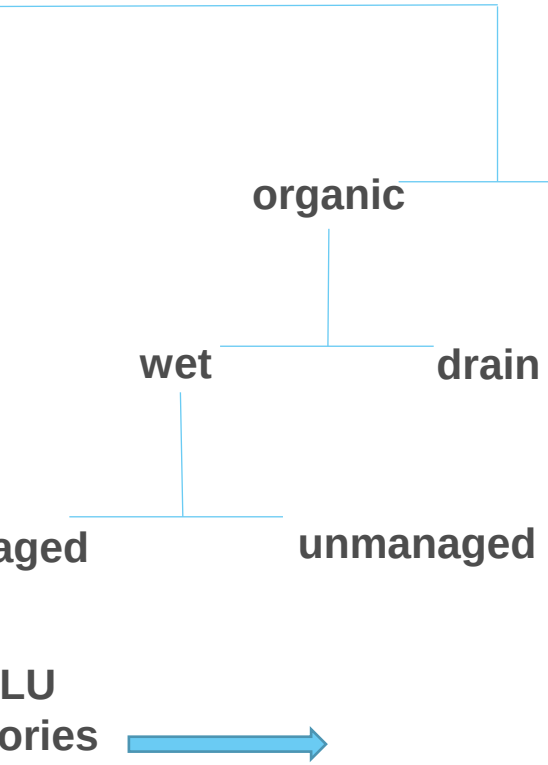
Best use of data available within MS

Participatory approach
with 4 MS in a development phase
DK, LV, BG, IE

Do we have the right data?
Is it complete?
Does it allow historic analysis?
Is it enough spatially disaggregated?
Where data enters the workflow?





IPCC wetland sub-categories

	Forest Land		Crop-land		Grass-land		Wet-lands		Settle-ments		Other Land	
	inland	coastal	inland	coastal	inland	coastal	inland	coastal	inland	coastal	inland	coastal
mineral soil	mineral drained		mineral drained		mineral drained		mineral drained		mineral drained		mineral drained	
	mineral wet		mineral wet		mineral wet		mineral wet		mineral wet		mineral wet	
organic soil	organic drained		organic drained		organic drained		organic drained		organic drained		organic drained	
	organic wet		organic wet		organic wet		organic wet		organic wet		organic wet	

What is a wetland?

Ecosystem that is flooded by water, either permanently or seasonally (Fresh, brackish, salt water)

Wetland

Swamp

Marsh

Peat

Growing peat - Mire

Accumulation of organic material (generally 30% OM in dw) different stage of decomposition (from fibric to sapric)

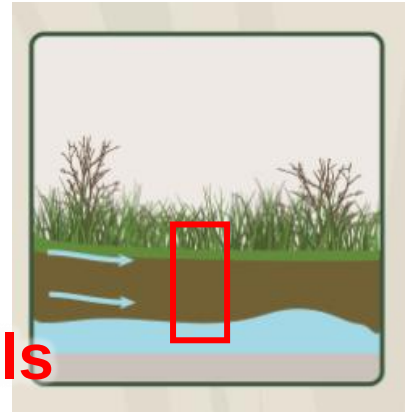
bog

- Ombrotrophic
- Acidic
- Mosses (sphagnum)

fen

- Minerotrophic
- Less acidic
- Mosses, sedge

histosols



PEAT

ORGANIC-RICH

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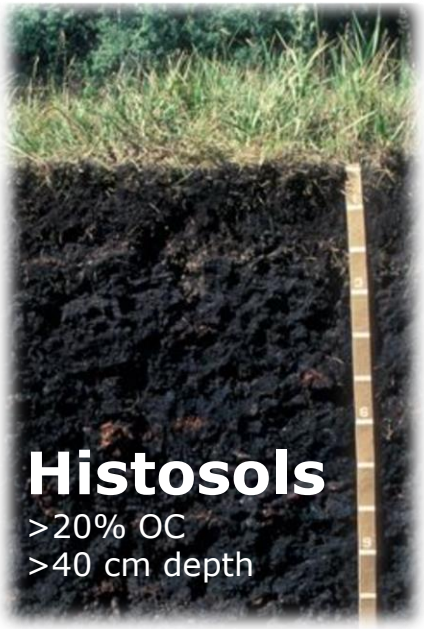
What is an organic soil?

What is an organic soil?



Organic carbon

Is there a minimum depth?

Is an organic soil a peat?

Is a peat soil a wetland?

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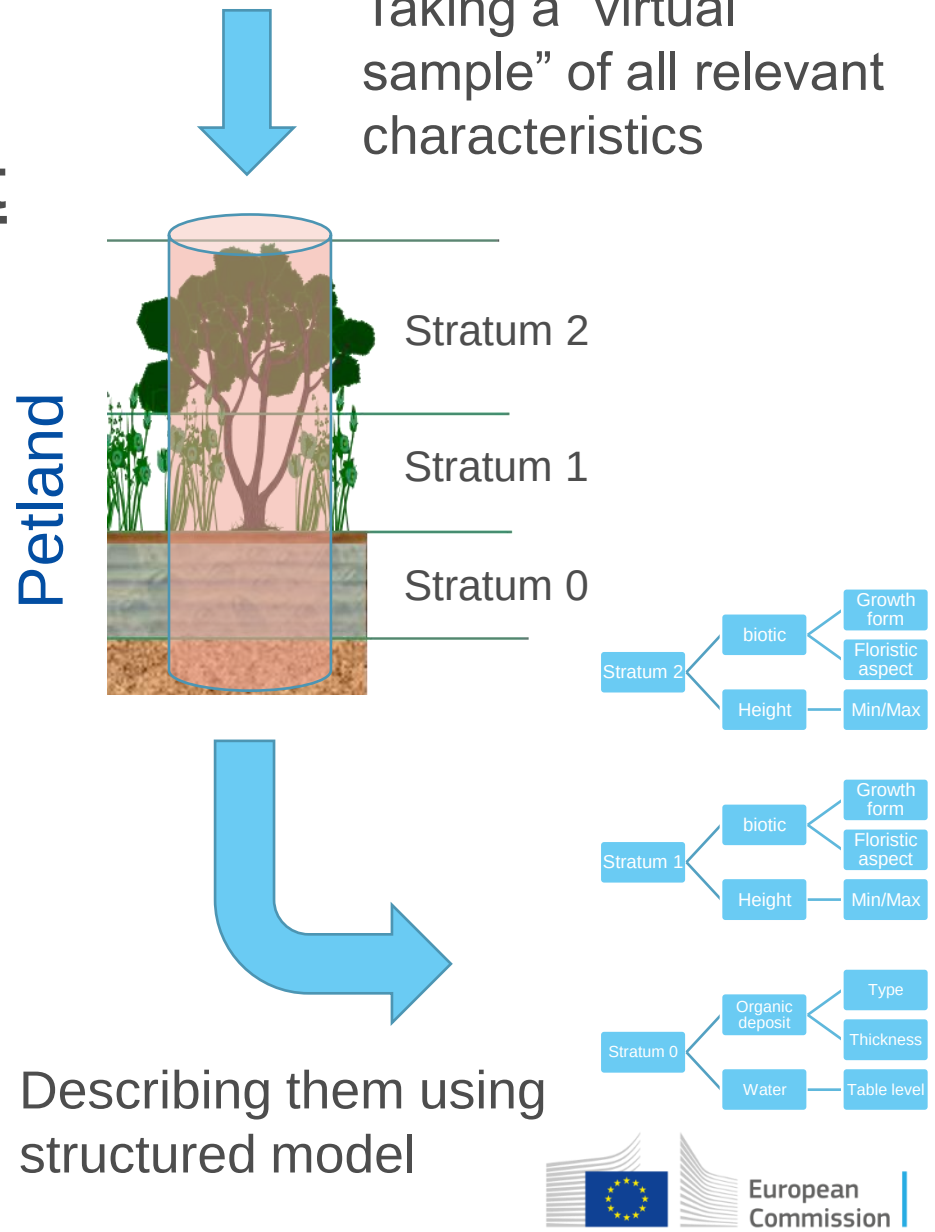
Semantic Meta-Model

No common definition, but a common set of classifiers to describe local definitions

- Based on broadly accepted bio-physical characteristics
- Hierarchically structured by semantic logic
- From LCML, EAGLE
- Allowing the link between land cover and soil
- Retaining the relationship with land use



Semantic passport

land

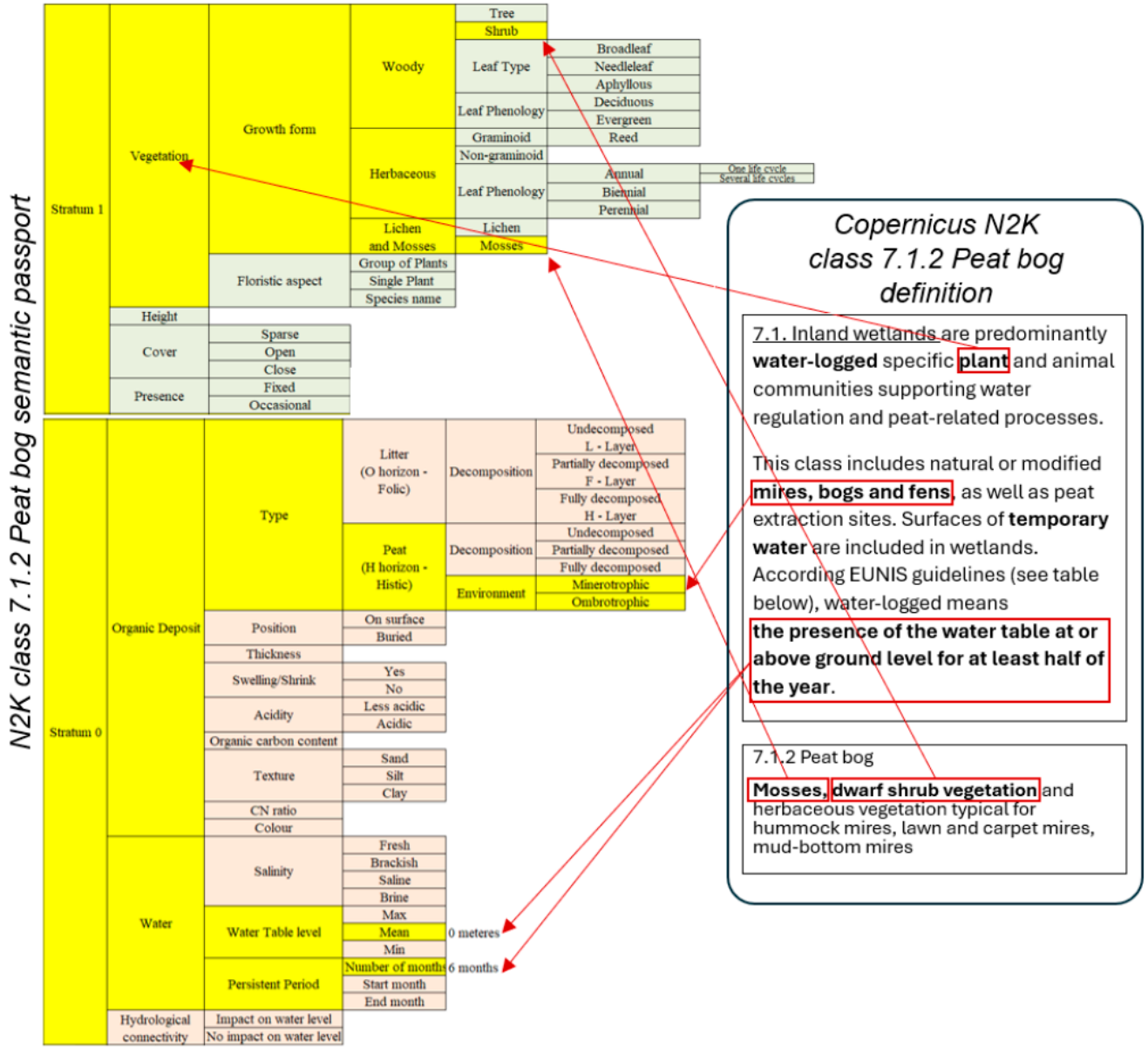
MDPI

Article

Enabling Spatial Data Interoperability through the Use of a Semantic Meta-Model—The Peatland Example from the JRC SEPLA Project

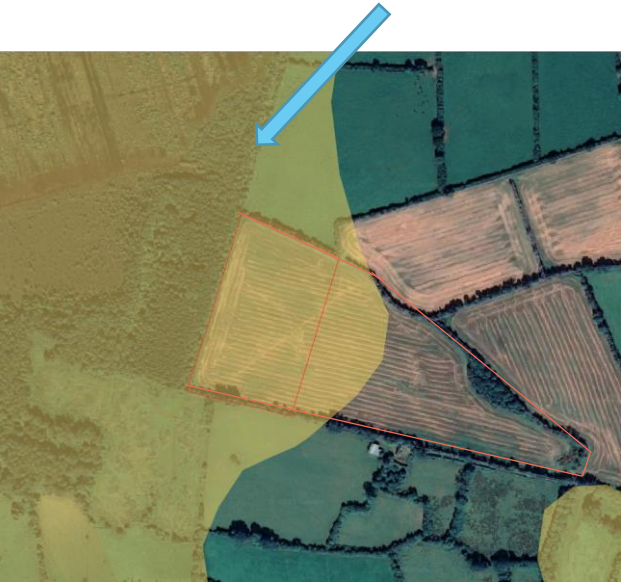
Pavel Milenov [1,†], Aleksandra Sima [2,†], Emanuele Lugato [3], Wim Devos [3] and Philippe Loudjani [3,*]

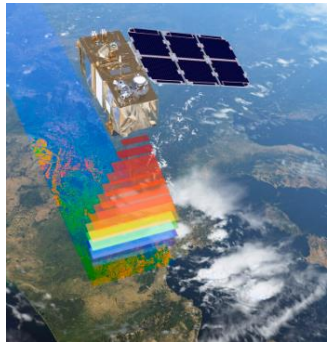
Map the local definition and create a semantic passport



Development of EO-AI based monitoring

A reference (sub)parcel is partially overlaid by organic (wet/dry) dataset

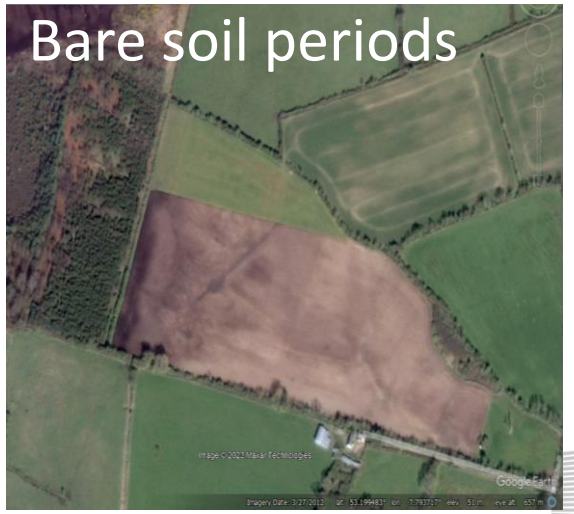




Earth Observation

Response of the vegetation (S1, S2, VPPI, LST, DEM)

Response of the soil (Ground Motion Service)



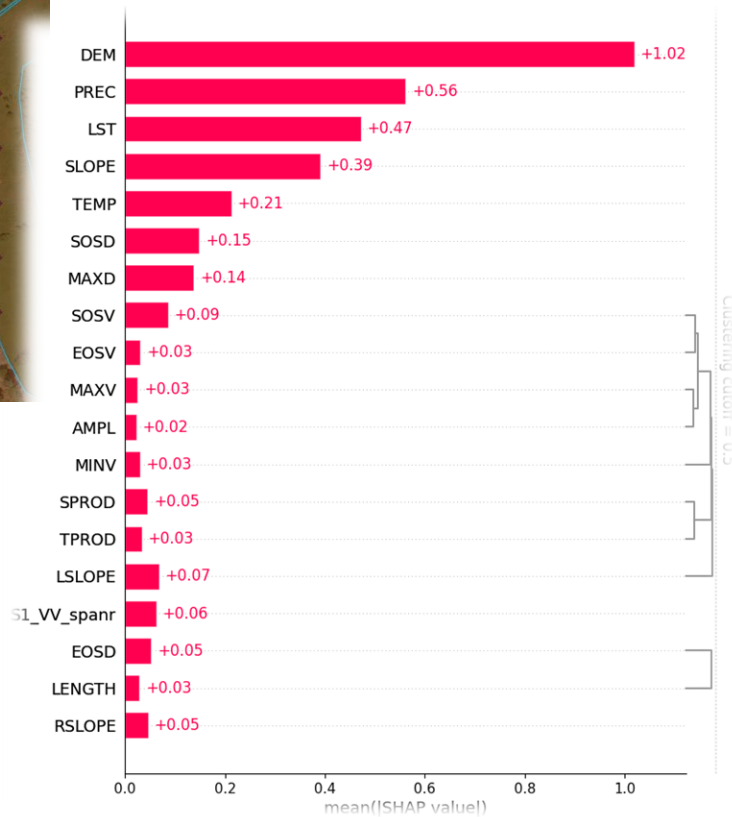
Visible properties of surface/soil (Segmentation)

Training and testing different ML model in some test areas of Ireland

Augmented mapping by AI

Virtual sampling (60 x 60 m grid)

Grassland GSA parcel (organic, mineral)



Data extraction

- VPPI index (Copernicus Sentilel2)
- Terrain (DEM, SLOPE)
- MAT, MAP, LST
- Sentinel S1

ML model

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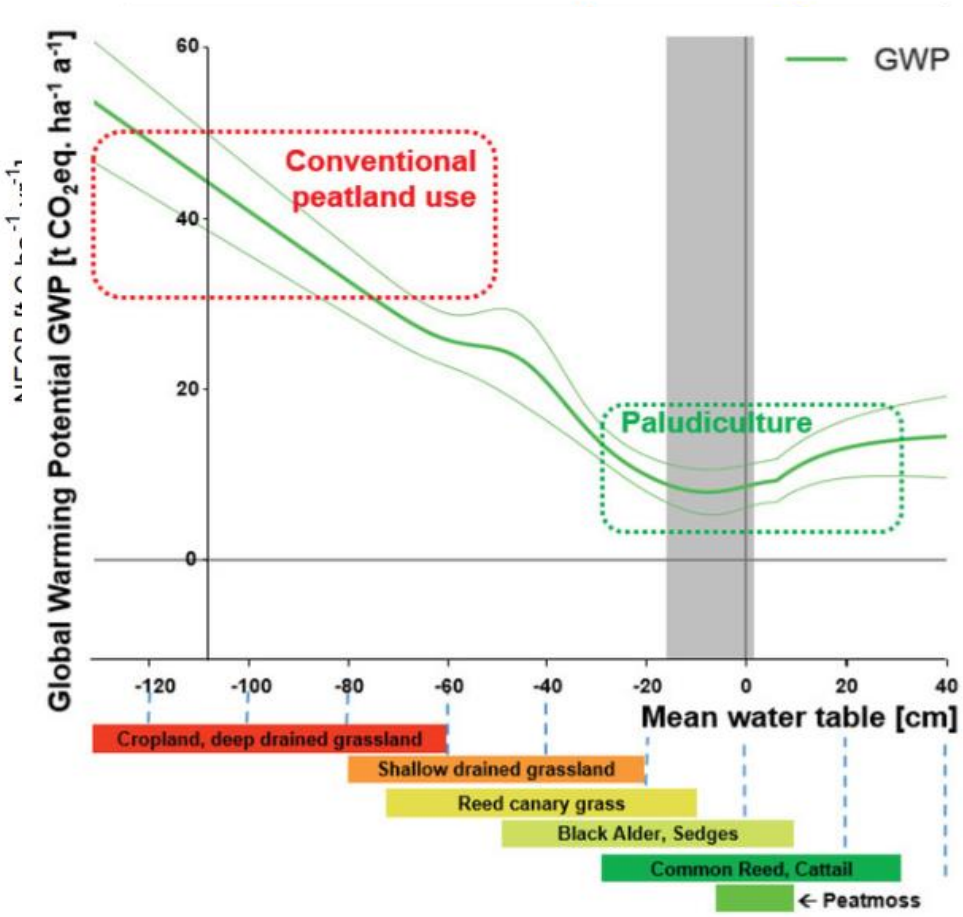
Peatland rewetting

The Power of Nature-Based Solutions: How Peatlands Can Help Us to Achieve Key EU Sustainability Objectives

Franziska Tanneberger ✉, Lea Appulo, Stefan Ewert, Sebastian Lakner, Niall Ó Brolcháin, Jan Peters, Wendelin Wichtmann



Article

Overriding water table control on managed peatland greenhouse gas emissions

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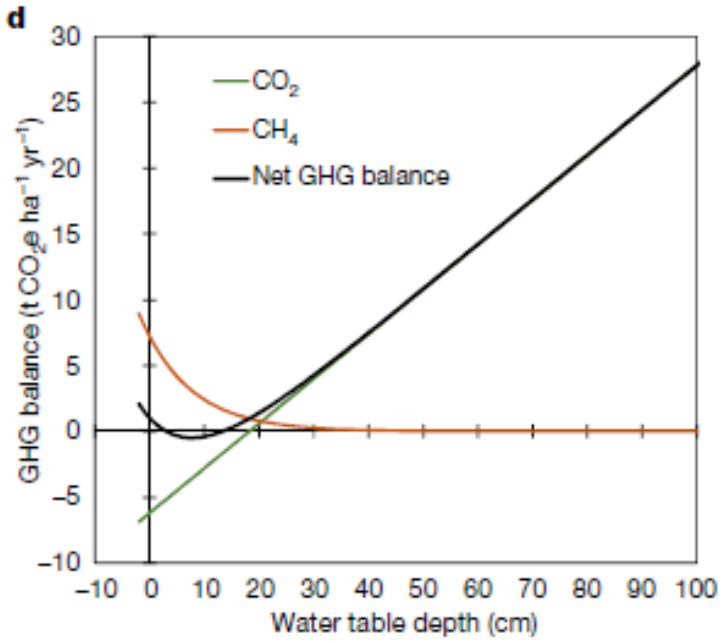
C. D. Evans[1,2✉], M. Peacock[2], A. J. Baird[3], R. R. E. Artz[4], A. Burden[1], N. Callaghan[1], P. J. Chapman[3], H. M. Cooper[5], M. Coyle[4,6], E. Craig[1,7], A. Cumming[8], S. Dixon[9], V. Gauci[9], R. P. Grayson[3], C. Helfter[6], C. M. Heppell[10], J. Holden[3], D. L. Jones[7,11,12], J. Kaduk[13], P. Levy[6], R. Matthews[14], N. P. McNamara[15], T. Misselbrook[14], S. Oakley[15], S. E. Page[13], M. Rayment[7], L. M. Ridley[7], K. M. Stanley[16], J. L. Williamson[1], F. Worrall[8] & R. Morrison[5]



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Conclusion and way forward

- More integration of policies to protect/restore peatlands
- Improved mapping and monitoring (ecosystems degraded)
- Importance of local knowledge
- Promising approach of AI
- Incentives (Carbon Farming) to promote effective actions (rewetting)

Thank you

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