

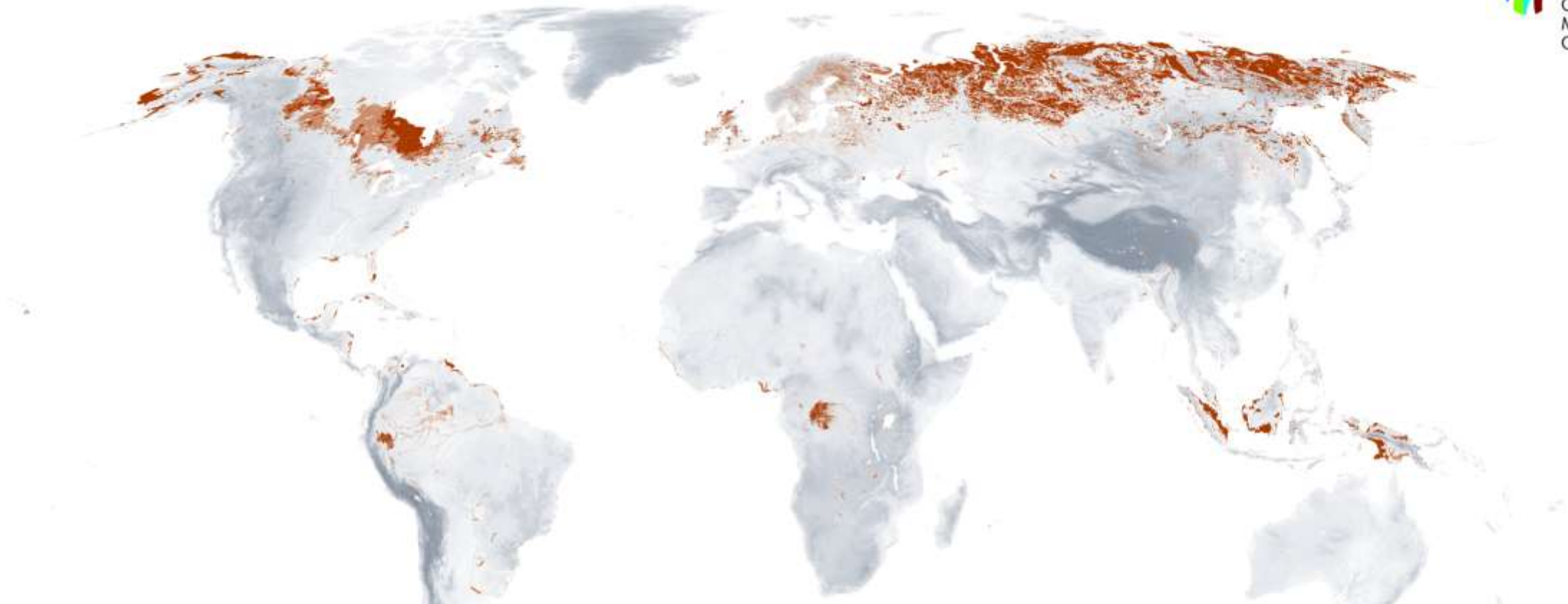
The Global Peatland Map 2.0, statistics and thematic maps for Europe

Webinar: Peatlands in Europe and the way forward: Insights from the Global Peatland Assessment – Europe



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Greifswald University
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Global Peatland Map 2.0

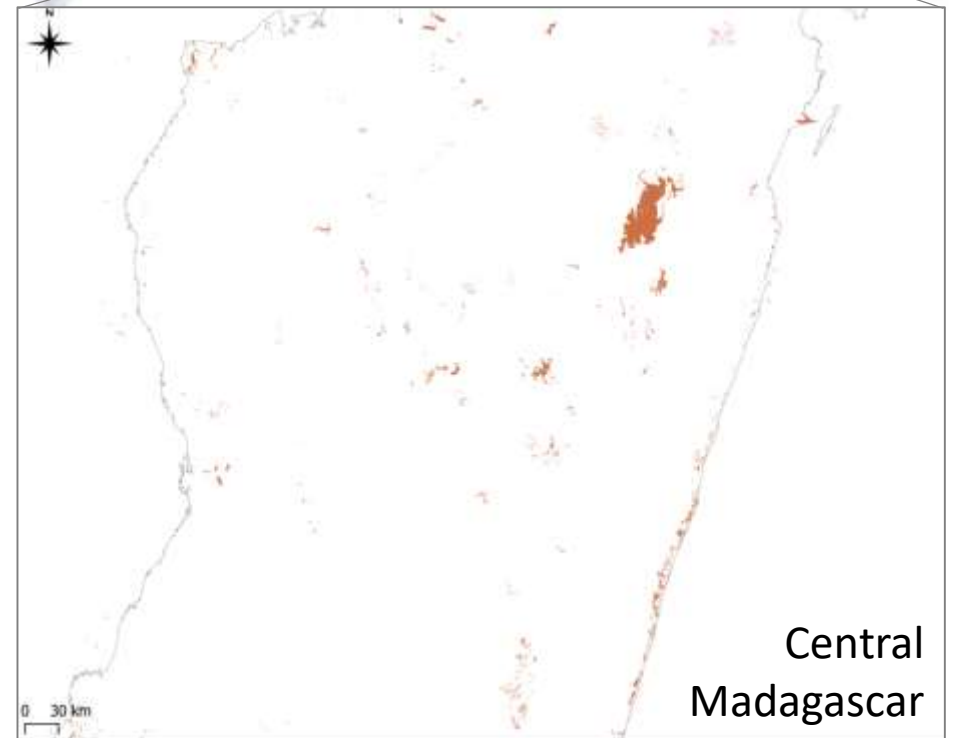
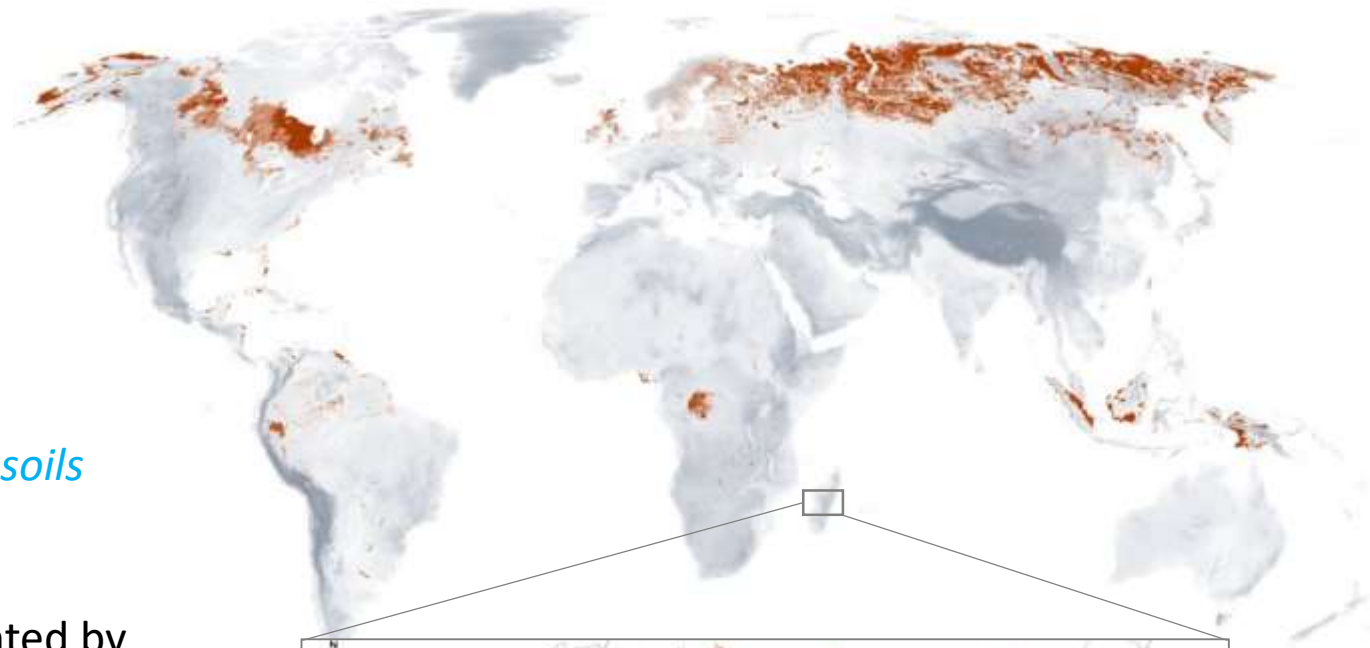


■ peat dominated
■ peat in soil mosaic

-publication is submitted to *Mires & Peat*
-download of 1x1 km grid: <https://nextcloud.uni-greifswald.de/index.php/s/s7Ln5QKxdQG5aaA>

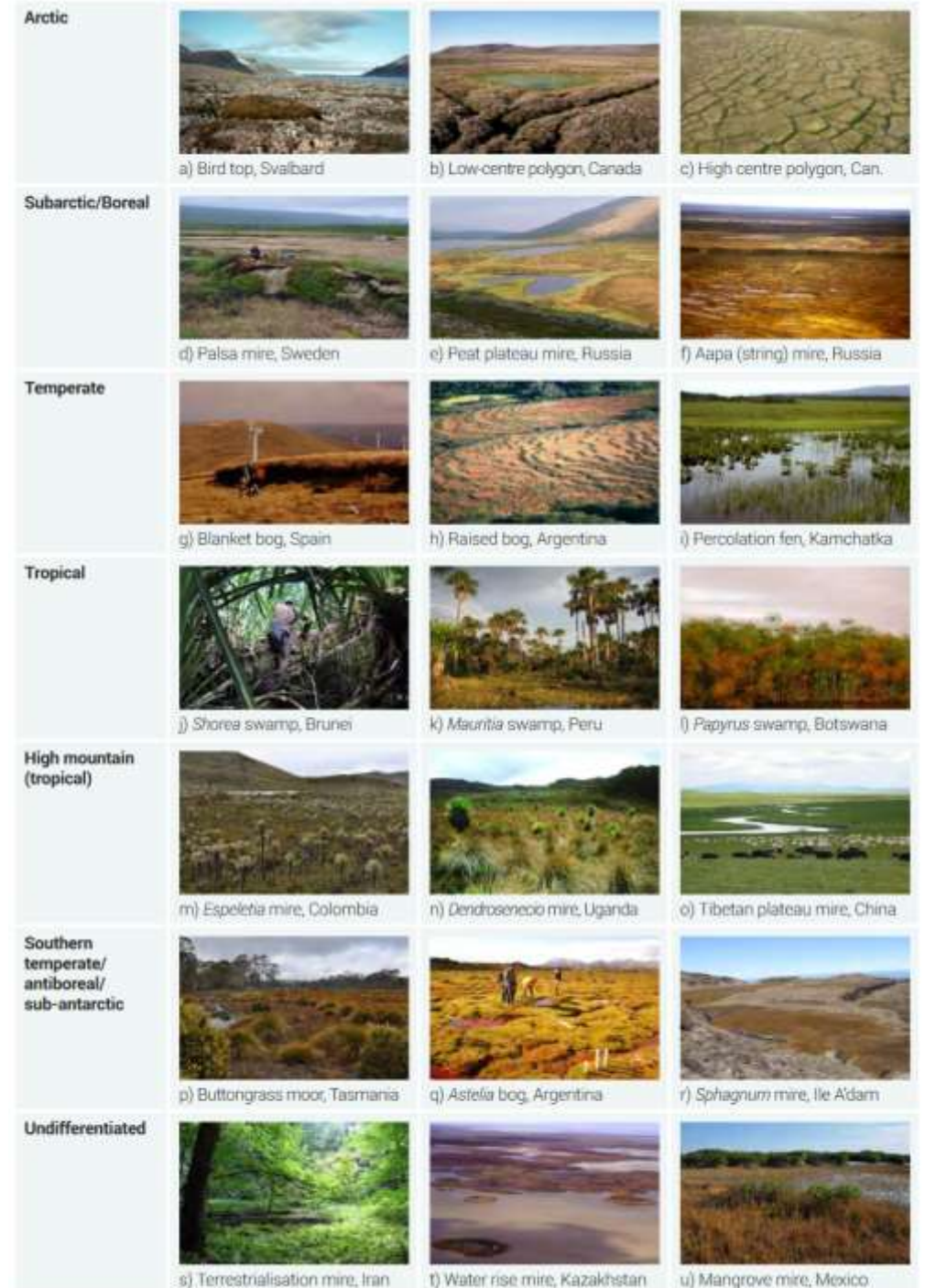
Global Peatland Map 2.0

- composite map showing *global peatlands, organic soils and suitable proxy data*
- mainly based on collated external data; supplemented by 'own' mapping at GMC
- covers *global peatland distribution* more comprehensive and correct
- *improved peatland coverage* for many tropical countries
- *most regions and countries still have to be accurately mapped* for peatlands to guide regional and local action



Global Peatland Database ('GPD') - mapping and documenting peatlands globally

- **'globally'** means **'everywhere'** (not restricted to the 'global scale', but covering all scales)
- **'mapping'** includes **multiple data sources and types, and different methods** - depending on regional available input data, purpose of mapping and skills of the mapper
- includes data on **peatlands, organic soils, histosols and indicative proxies**
- if documented & applicable **>12% SOC threshold** for including of data
- **no minimum depth** of peat layer applied



Step I: Familiarize with peatland types and their distribution in the area, collect proxy data for high water levels, and set up a DEM

Step II: Check the availability of external peatland data for the area or region

external peatland data available

Step IIIB: Plausibility check



Step I: Familiarize with peatland types and their distribution in the area, collect proxy data for high water levels, and set up a DEM

Step II: Check the availability of external peatland data for the area or region

external peatland data available

Step IIIB: Plausibility check

✓ **external data approved**
(unchanged)

✗ **external data not approved**

Step IVA:
clean, correct or amend
suitable external data

Step IVB:
exclude unsuitable
external data

edited external data
(modified)

Step V: Adding various GIS data into GPM 2.0

Step I: Familiarize with peatland types and their distribution in the area, collect proxy data for high water levels, and set up a DEM

Step II: Check the availability of external peatland data for the area or region

no external peatland data available

external peatland data available

Step IIIA: Own (GMC) mapping to fill information gaps

Step IIIB: Plausibility check

1. Peatland probability mapping using overlay analysis of proxy data

✓ external data approved
(unchanged)

✗ external data not approved

2. Manual delineation of peatland using extrapolation and downscaling

3. Remote sensing of peatlands by satellite image classification and field surveys

4. Supervised satellite image classification with machine learning and Google Earth Engine (GEE)

Step IVA: clean, correct or amend suitable external data

Step IVB: exclude unsuitable external data

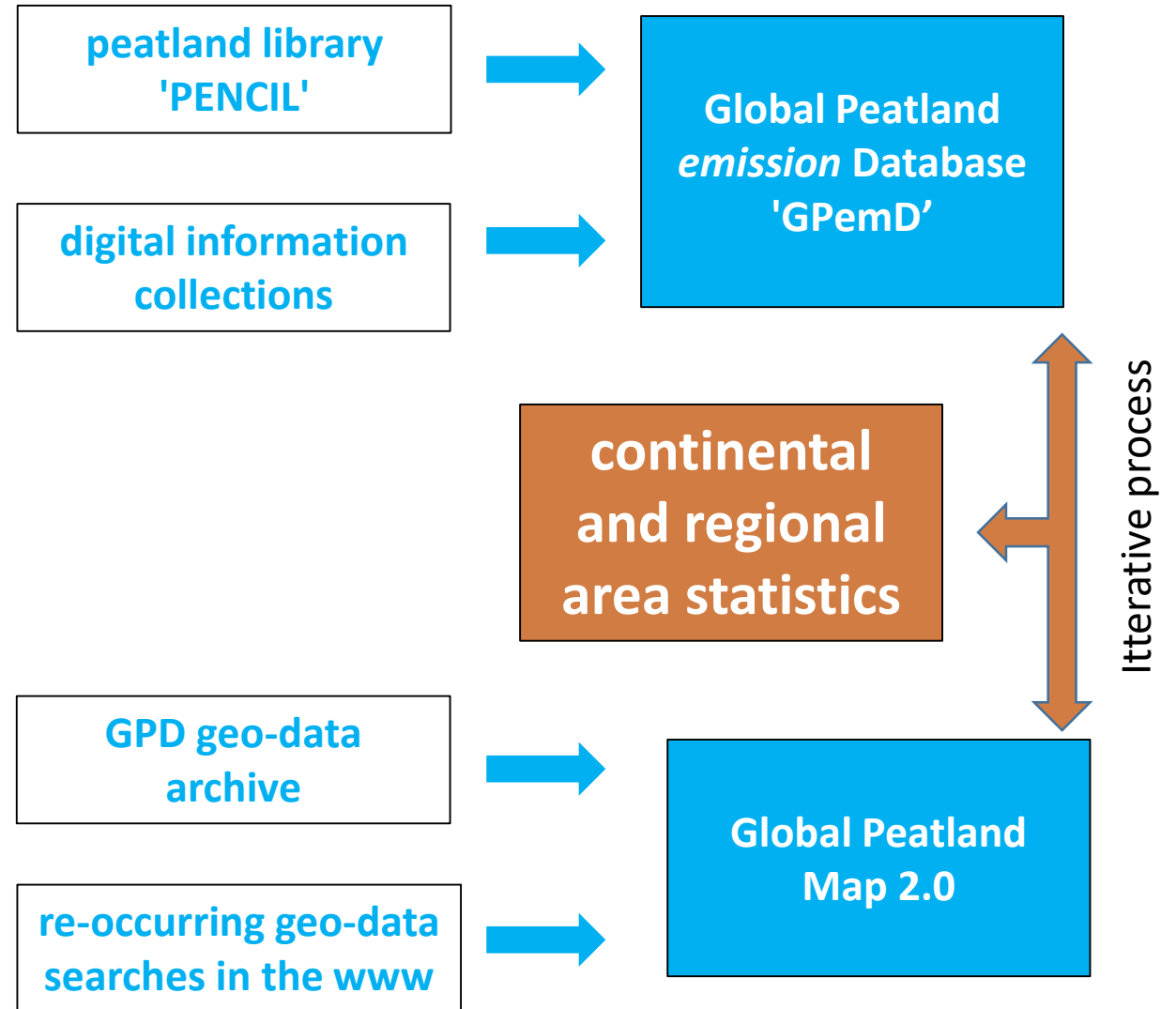
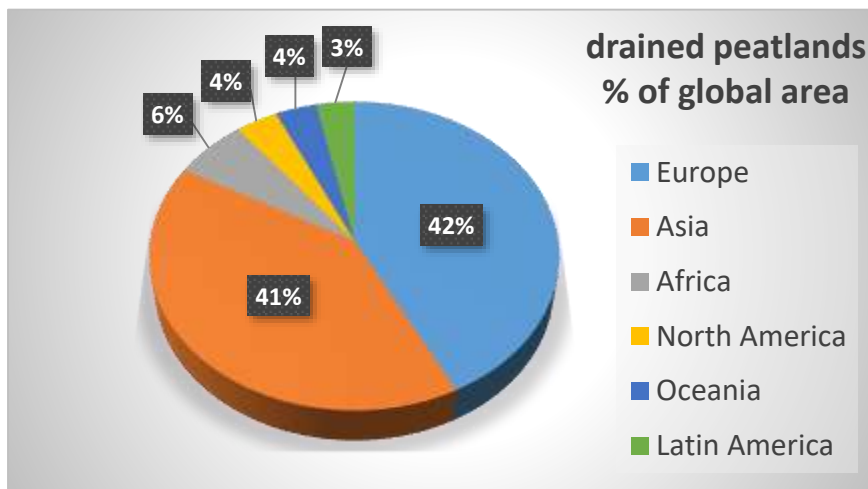
edited external data
(modified)

Step V: Adding various GIS data into GPM 2.0

Approaches for developing own mapping data

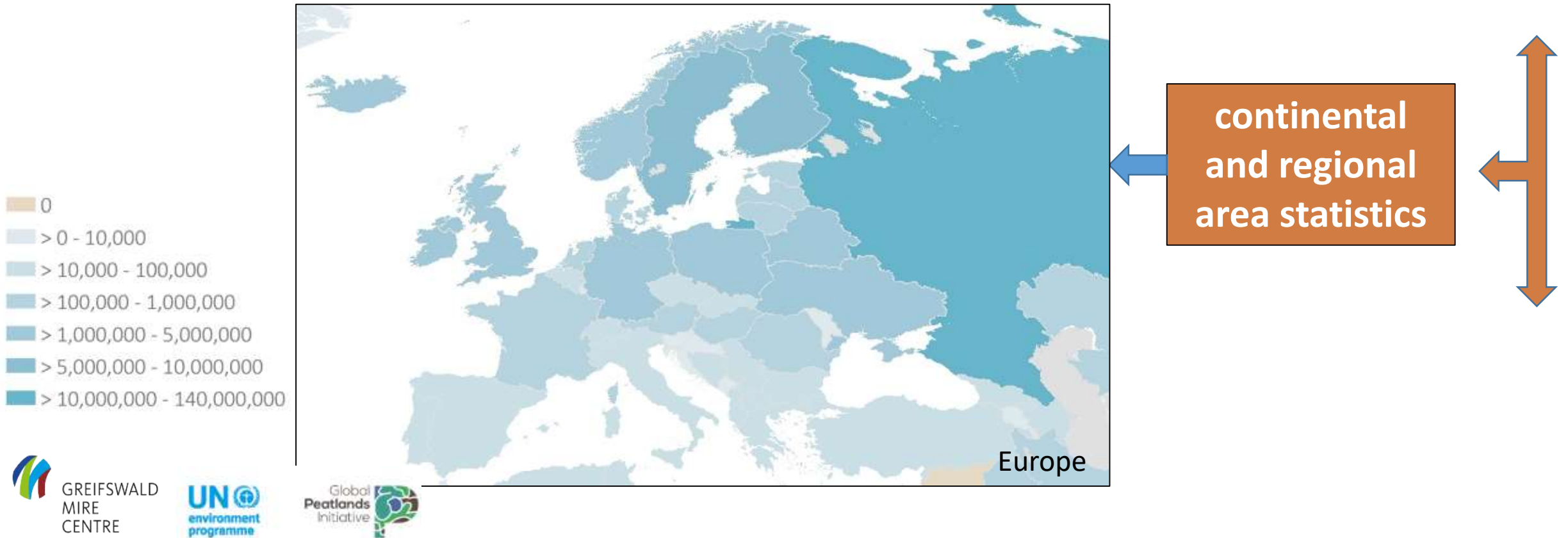
GPD & 2022 UNEP GPA

We also derived statistics on total, drained and undrained peatlands and related GHG emissions



2022 UNEP GPA
Thematic maps

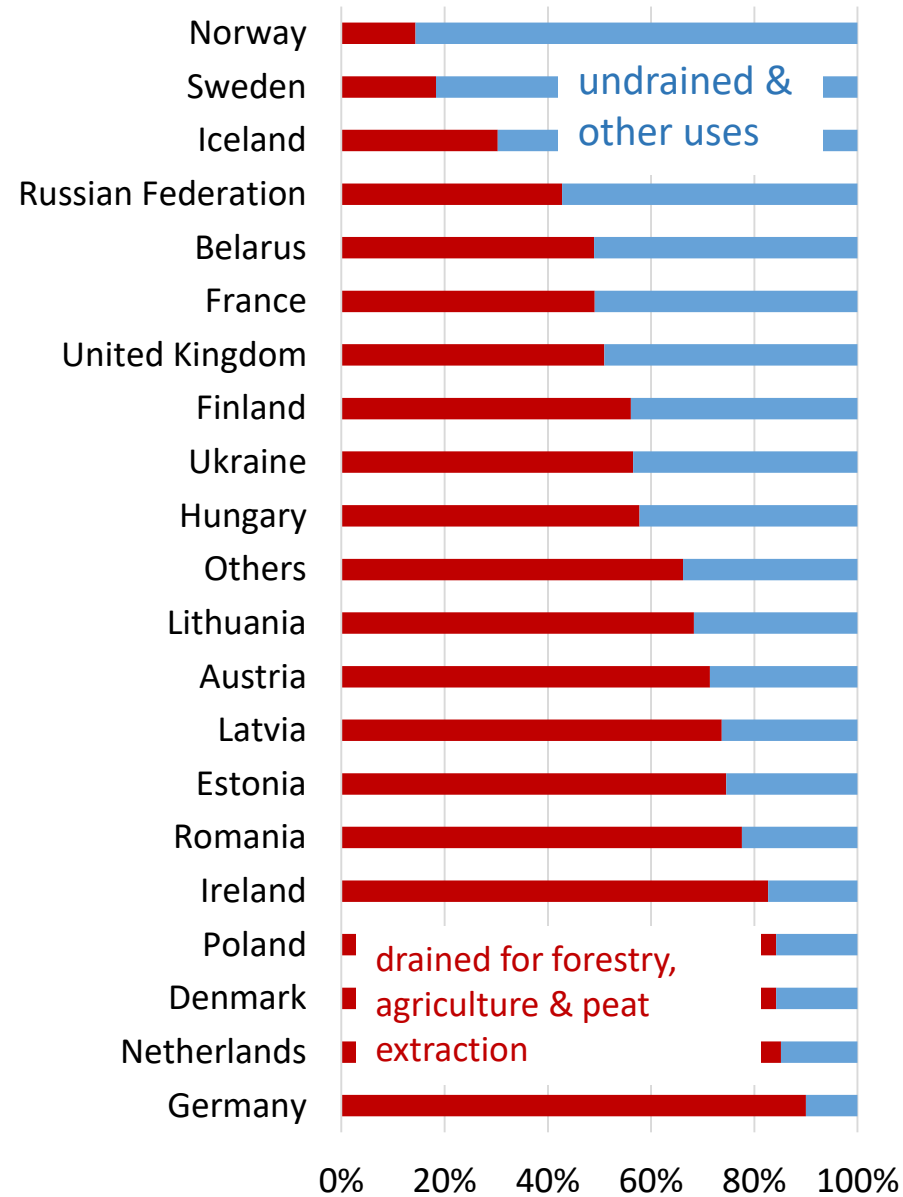
peatland extent per country (ha)



2022 UNEP GPA

Statistics

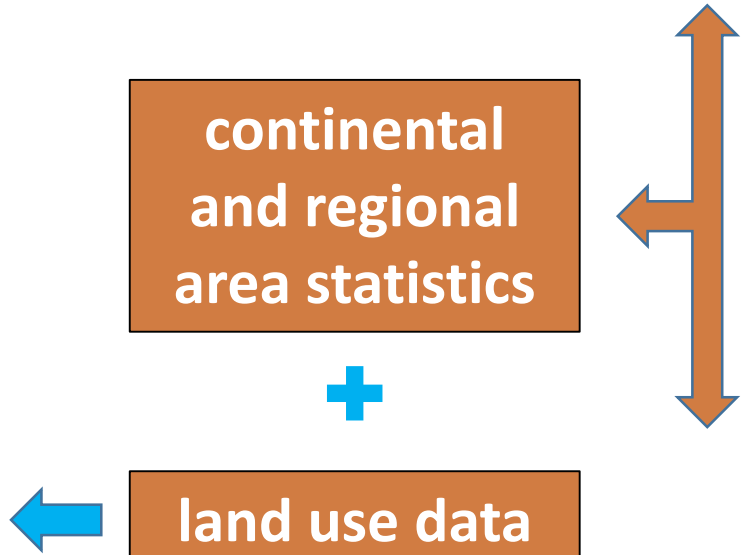
drainage status of peatlands



continental and regional area statistics

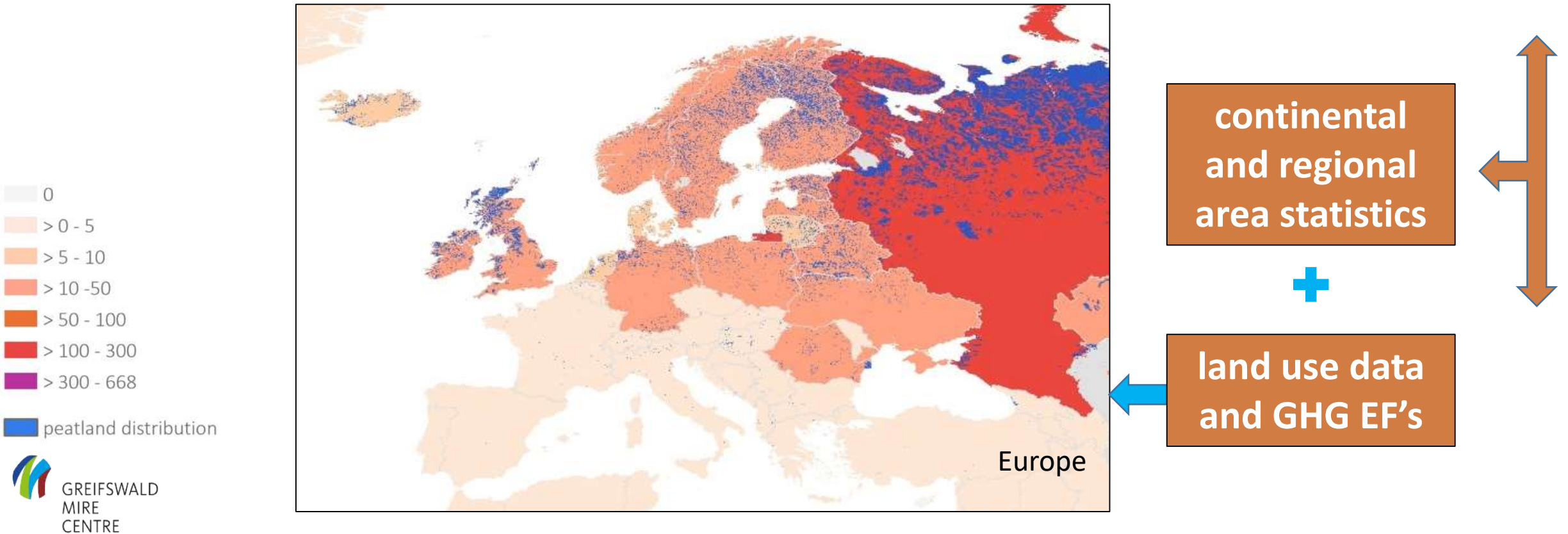


land use data



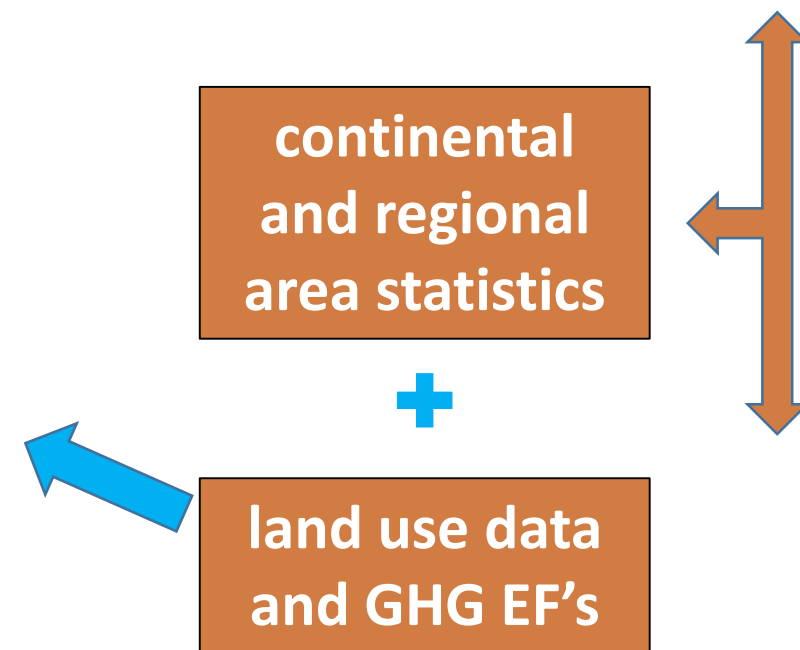
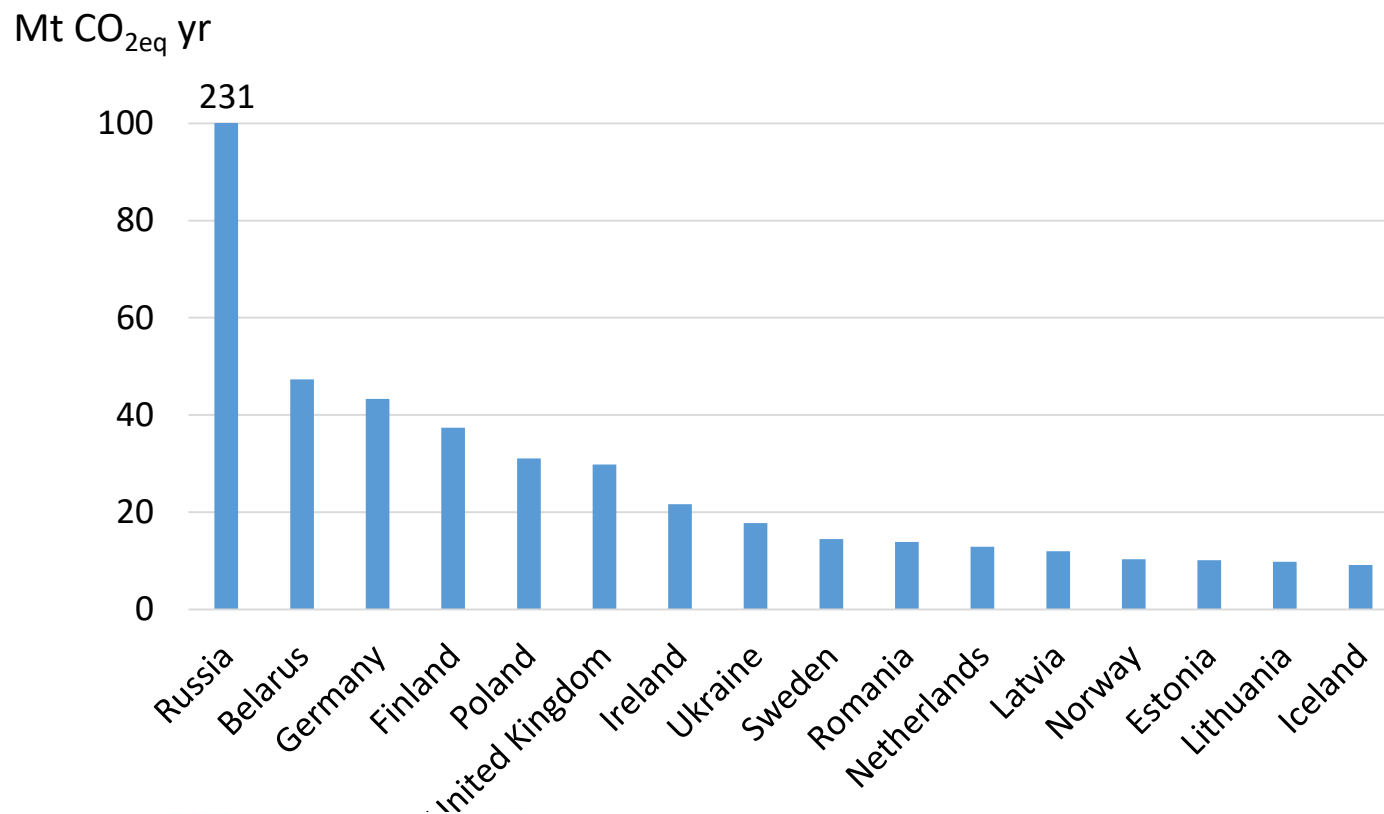
2022 UNEP GPA
Thematic maps

GHG emissions from peatland per country (Mt CO₂e / yr)

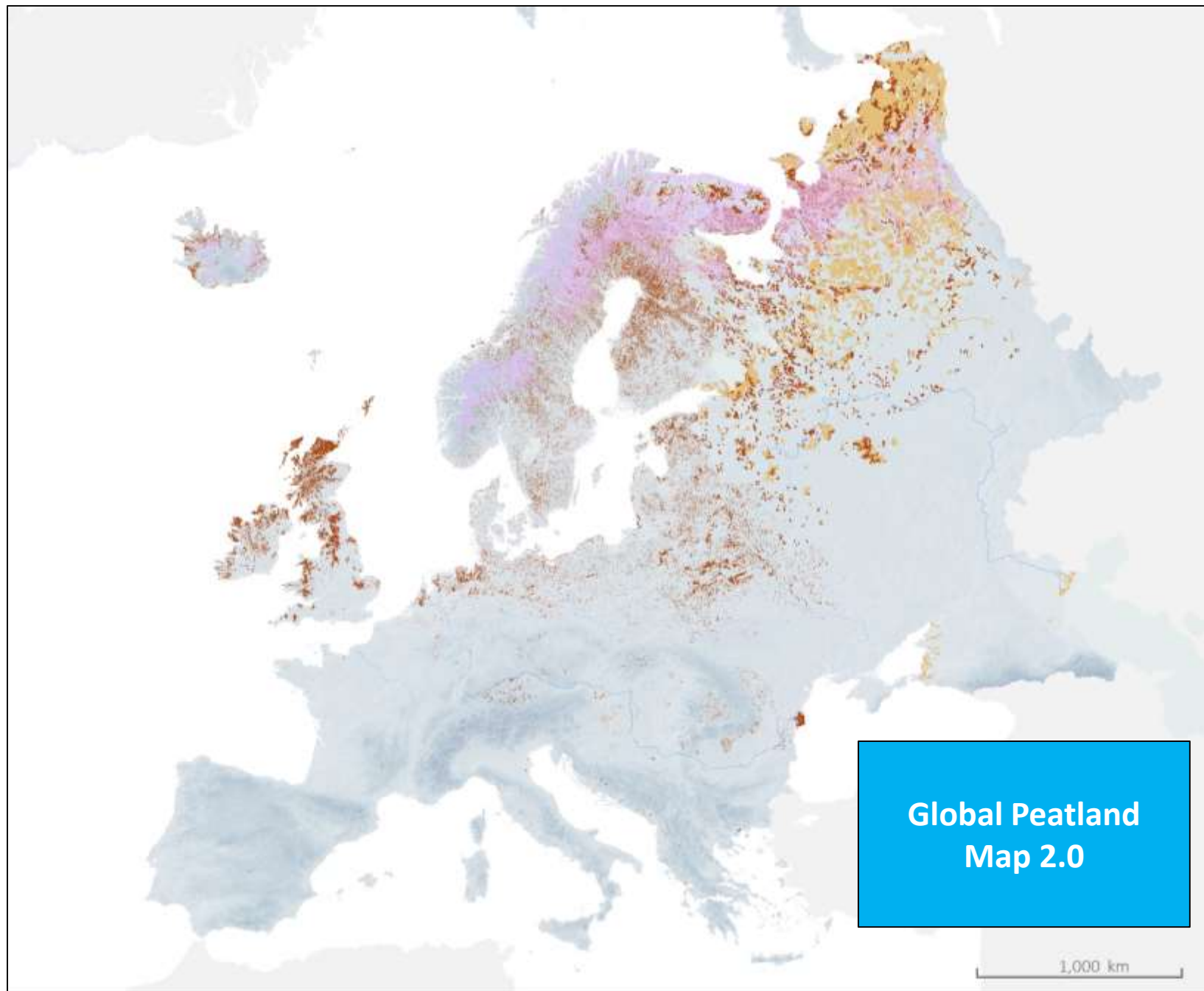


2022 UNEP GPA Statistics

GHG emissions from peatland per country (Mt CO₂e / yr)

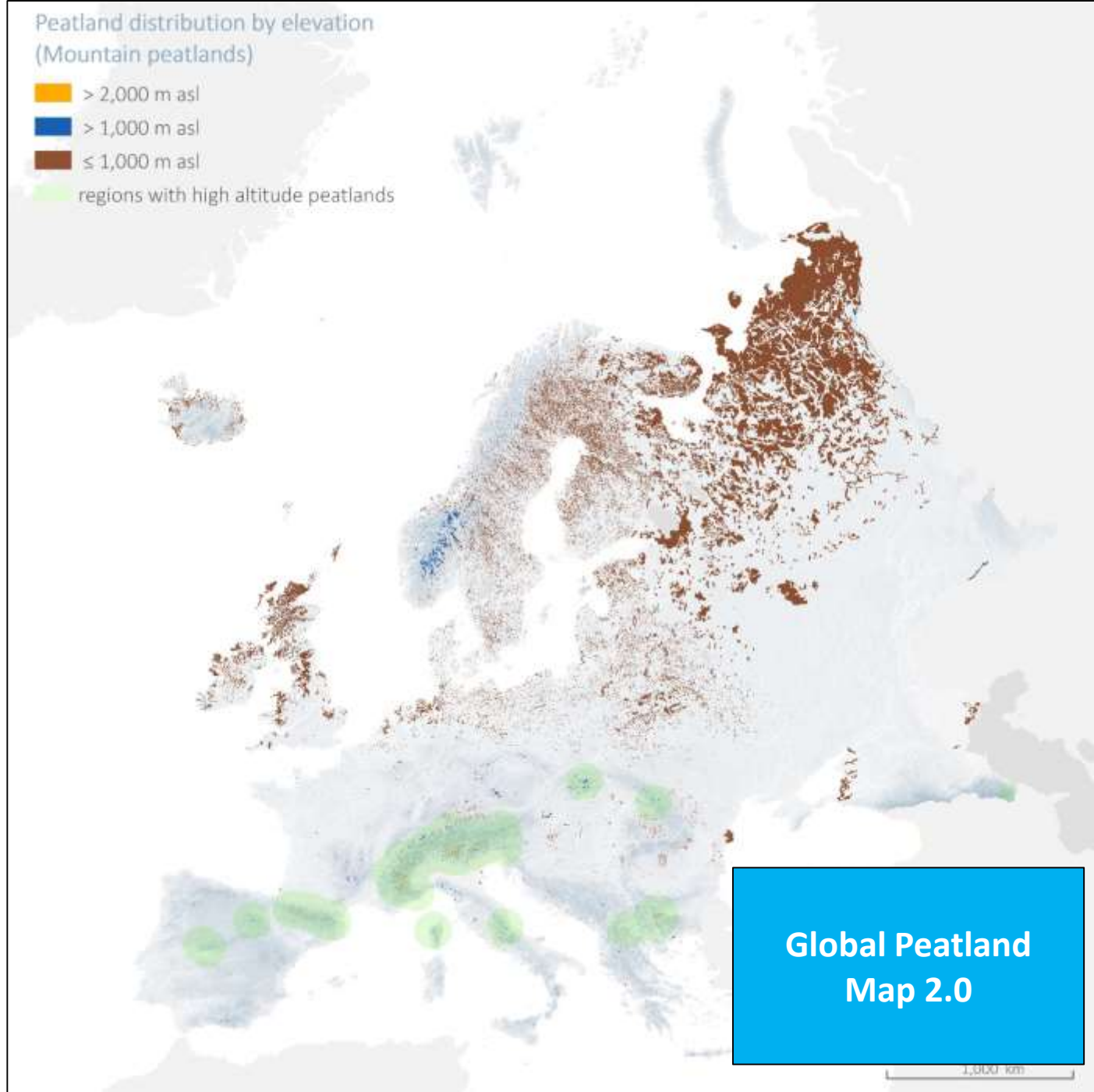


2022 UNEP GPA
Thematic maps



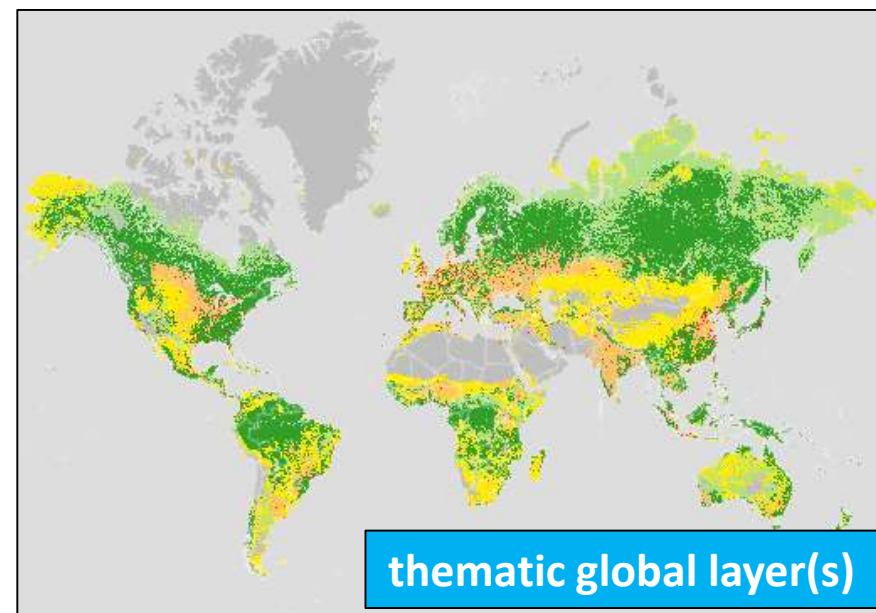
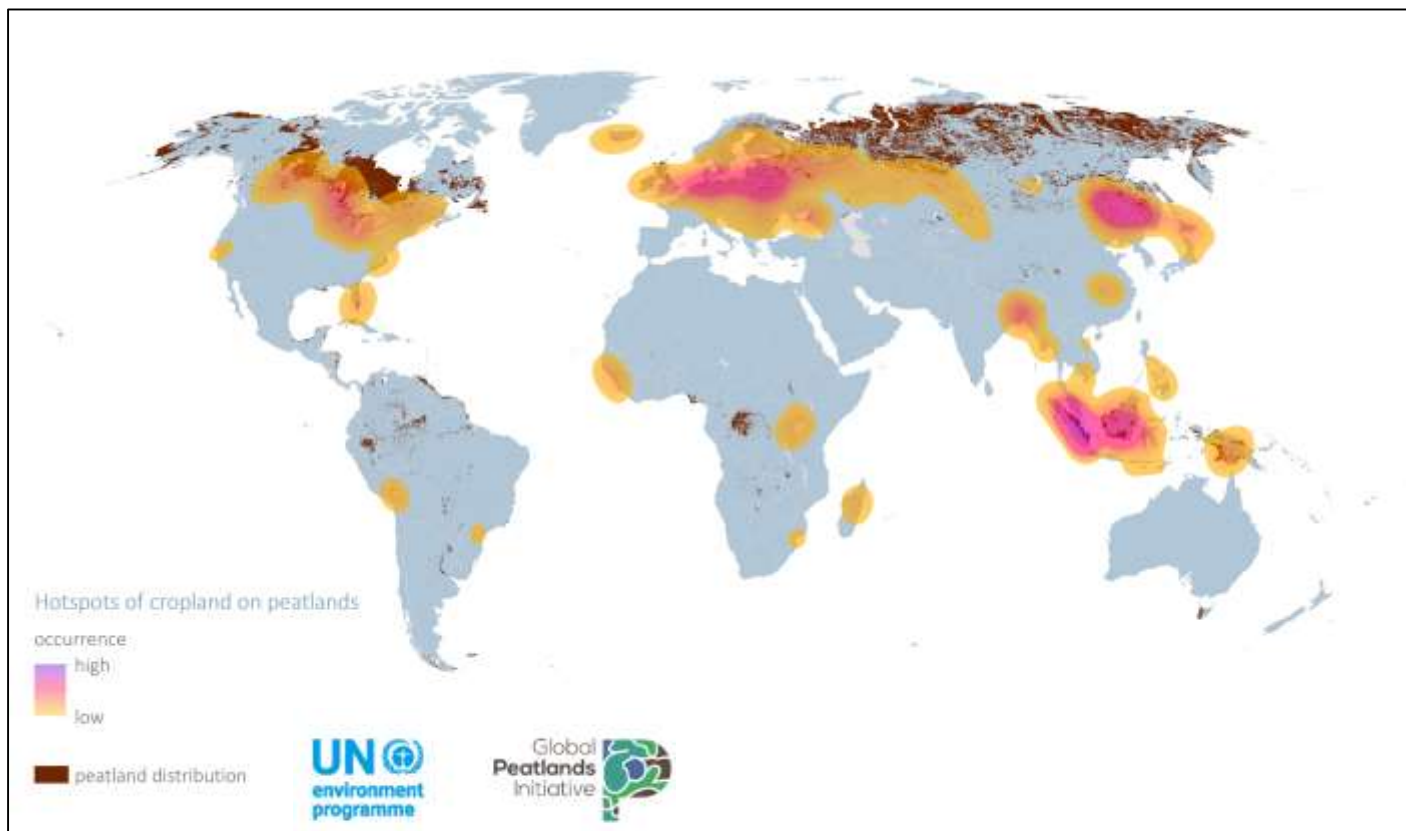
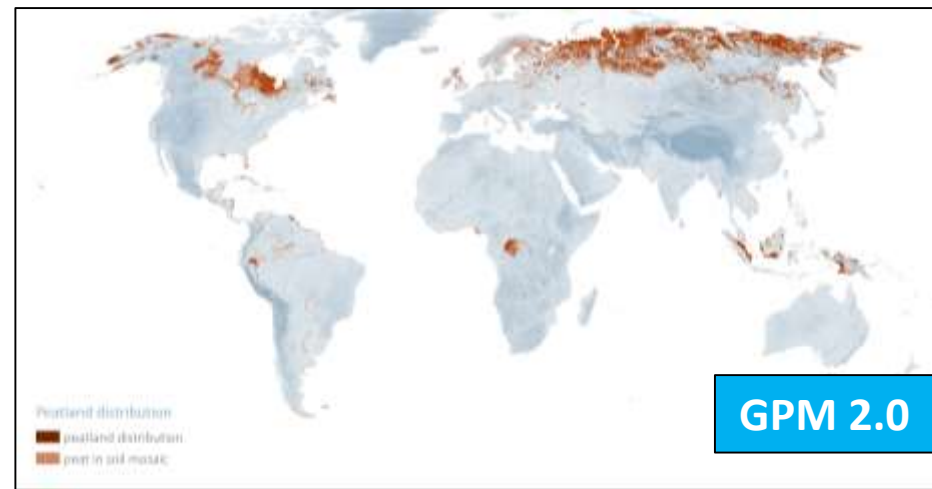
2022 UNEP GPA
Thematic maps

altitude classification in GIS



2022 UNEP GPA
Thematic HOTSPOT maps

peatland related thematic hotspot maps



2022 UNEP GPA

Thematic HOTSPOT maps

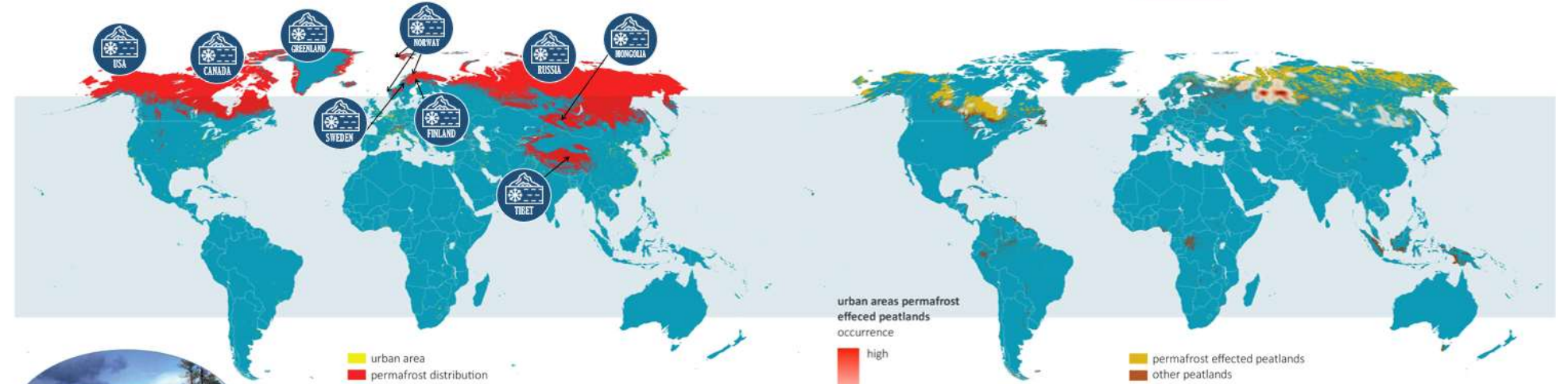
Many others have been prepared in the UNEP GPA process, e.g. for biodiversity, infrastructure, flooding, subsidence, permafrost...

Many have been revised in context of the upcoming Global Peatland Hotspot Atlas!

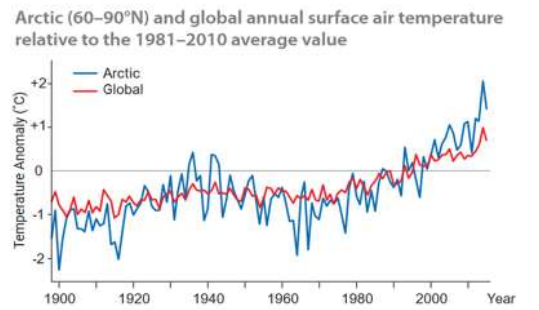
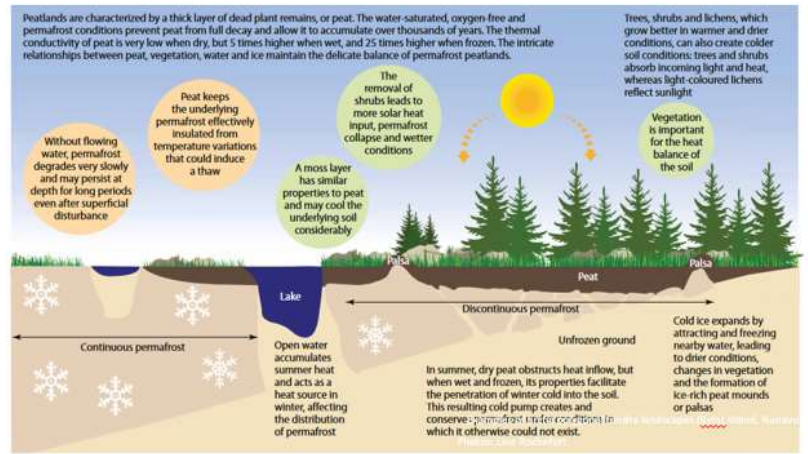


1.7. Peatlands and Permafrost

In polar/arctic and boreal regions, the dynamics and structure of peatlands are significantly influenced by permafrost conditions. These peatlands exist within the permafrost zones of several northern hemisphere countries and span over 1.4 million square kilometers with a peat layer thicker than 40 centimeters, and an even larger area has shallower peat. Additional, extensive permafrost peat deposits can also be found far outside the polar and sub-polar regions, for instance in Mongolia and on the Qinghai-Tibetan plateau, where mountain ranges prevent warm oceanic air from moving inland, and winter temperatures are very low. Hotspots of urban areas on permafrost peatlands occur in the Western Siberian lowland, and weaker on the Canadian shield, in Northeast China, and the East European Plain. Climate change and permafrost thawing probably will have a destabilising effect on the infrastructure there.



Permafrost and the role of peat, plants and water
 The presence of a permanently cold climate with frost, natural thawing and freezing at the soil surface influences the hydrology, structure, peat formation and vegetation of peatlands. Peat formation here is on the one hand dependent on permafrost conditions, and on the other hand it also stabilises and favours permafrost conditions in the soil. The ice within the peat layer provides stability and prevents soil subsidence and erosion.

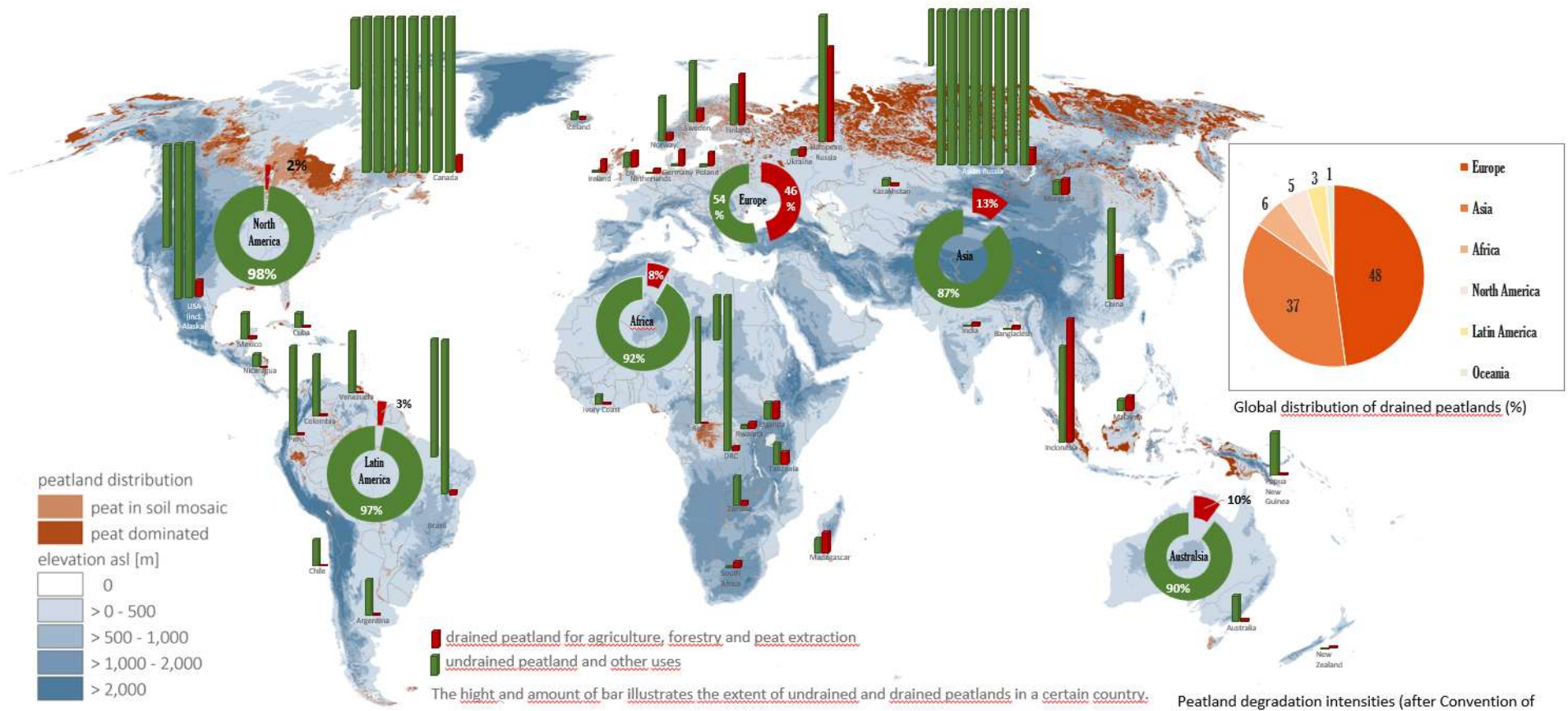


With global warming and the resulting rise in temperature, the permafrost in the soils and peatlands is increasingly thawing. This may lead to waterlogging, altered water flow patterns, drainage and eventually the decomposition of peat and the release of enormous amounts of greenhouse gases.

1) Global Peatland Database, 2022; 2) UNEP (2019), Frontiers 2018/19 Emerging issues of Environmental Concern, United Nations Environment Programme, Nairobi; Otu J., Westermann S., Grab A., Bartsch A. (2018): Ground Temperature Map, 2000-2016, Northern Hemisphere Permafrost. Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, PANGAEA, <https://doi.org/10.1584/PANGAEA.888600>
 4) Made with Natural Earth. Free vector and raster map data (©: 5) naturaleartdotcom and using free files from www.freemapbox.com

3.1. Global Peatland Drainage and Degradation

Hotspot Atlas teaser



Artificial drainage of peatlands is the most common cause of peatland degradation. Peatland degradation can be described as the deterioration of functions and ecosystem services of living peatlands. In living peatlands, there are close functional relationships between plants, peat and water. When one of these components changes, the others also change, but at different rates: first the plants, then the water and later the peat itself. The table (right) shows different stages of peatland degradation that alters these peatland components with different inertia. When components with higher inertia are degraded (e.g. peat itself), restoration measures often need to be more sophisticated and labore intensive to be successful. For more information:

https://www.ramsar.org/sites/default/files/documents/library/rtr11_peatland_rewetting_restoration_e.pdf

Peatland degradation has its hotspots in Europe and Asia with 85% of damaged peatlands globally under temperate and tropical climates – and in SE-Asia under tropical climate. The vast, untouched peatscapes of the boreal and arctic climates have survived to this day mainly because the harsh climate has not allowed for agriculture or forestry and many people settle there. And, future peatland mapping and condition assessment will probably reveal more degrading peatland in many countries, e.g. in South America, Africa, south-eastern Europe, central and northern Asia.

Peatland degradation intensities (after Convention of Wetlands (2022))

Increasing inertia of components

Degradation intensity	Plants		water		peat	
	Fauna / flora	Vegetation	Hydrology	Hydraulics	Form / relief	Peat deposit
Minimal	not affected	not affected	not affected	not affected	not affected	not affected
Minor	not affected	not affected	not affected	not affected	not affected	not affected
Modest	not affected	not affected	not affected	not affected	not affected	not affected
Moderate	not affected	not affected	not affected	not affected	not affected	not affected
Major	not affected	not affected	not affected	not affected	not affected	not affected
Most	not affected	not affected	not affected	not affected	not affected	not affected
Maximal	not affected	not affected	not affected	not affected	not affected	not affected

Legend: not affected (green), moderately affected (yellow), strongly affected (orange)

Sources: 1) Global Peatland Database, 2022; 2) UNEP (2022), Global Peatlands Assessment – The State of the World's Peatlands: Evidence for action toward the conservation, restoration, and sustainable management of peatlands. Main Report. Global Peatlands Initiative. United Nations Environment Programme, Nairobi; 3) Convention on Wetlands. (2021). Global guidelines for peatland rewetting and restoration. Ramsar Technical Report No. 11. Gland, Switzerland: Secretariat of the Convention on Wetlands.

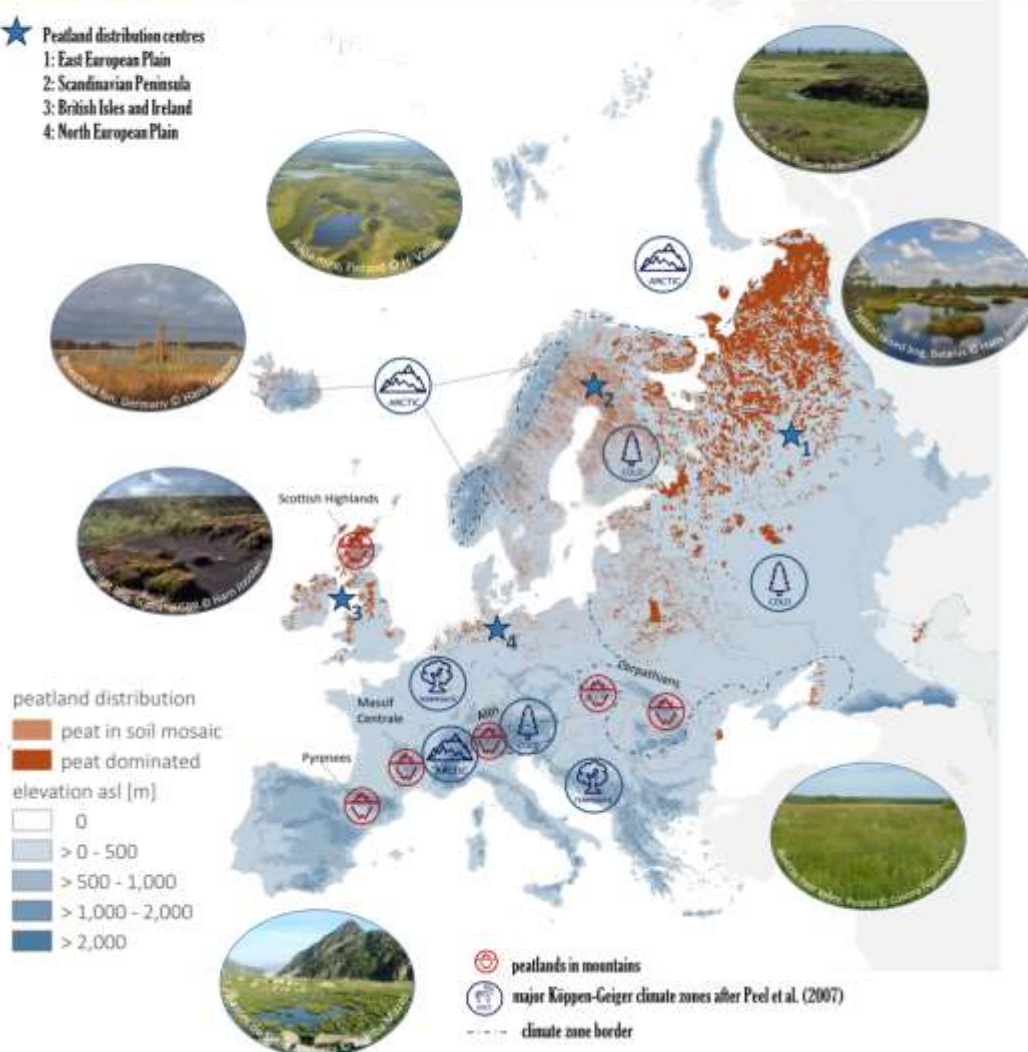


share on global peatlands

2.4. Peatlands of Europe

- extent ca. 59 million ha
- distribution centres: East European Plain, Scandinavian Peninsula, British Isles, North European Plain
- degrading peatlands: 53.6 % / GHG emissions: 582 Mt CO₂eq /yr
- peatlands within protected areas: 19.7 %
- threatened species in peatland Flora: 6=VU, 10=EN, 5=CR; in Fauna: 32=VU, 12=EN, 8=CR

- ★ Peatland distribution centres
- 1: East European Plain
 - 2: Scandinavian Peninsula
 - 3: British Isles and Ireland
 - 4: North European Plain

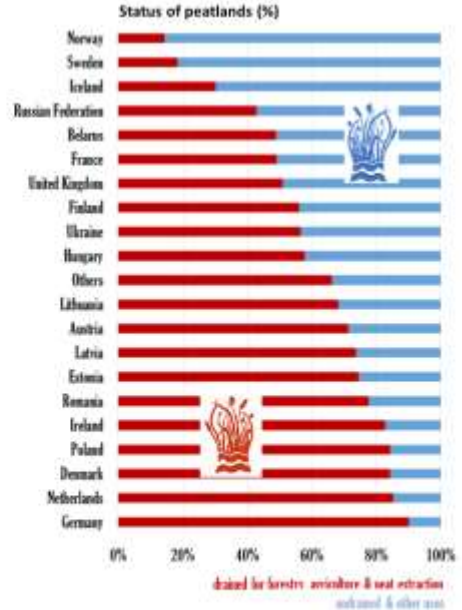


Peatlands in Europe are distributed unevenly with a higher density in the northern areas, highlands and coastal areas. They are sparsely distributed in steppe and broadleaved forest zones. Europe is the continent with the largest proportional losses of actively accumulating peatlands (mires) in the world. Even so, it still comprises significant mire diversity. The **Arctic Seepage and Polygonal Bog Region**, covering the northernmost part of Europe, is characterised by tundra seepage and polygonal bogs, while the **Palsa Bog Region**, covering large areas in the Russian Federation and northern Finland, Sweden and Norway. The **Northern peatland region**, covering the boreal vegetation zones in northern Europe, is characterised by fens and hillside bogs. The **Raised bog region** is characterised by typical raised bogs and wooded raised bogs. The **Atlantic fen region** along the western European ocean coast is defined by Atlantic raised bogs and fens, and the **Continental fen region** is characterised by a mosaic of fens and bogs. The **Nemoral submeridional fen region** covers large parts of England, France and Germany. Flat fen is the most characteristic mire type, while plane bogs and percolation fens occur here, whereas the **Colchis fen region** on the Black Sea coast in Georgia is characterised by percolating bogs.



The European mire regions (Tanneberger et al. 2017): I Arctic seepage and polygon mire, II Palsa mire, III Northern fen (oapa mires s.l.), IV Typical raised bog, V Atlantic bog, VI Continental fen and bog, VII Nemoral-submeridional fen, VIII Colchis mire, IX Southern European marsh, X Central and southern European mountain compound.

About 10% of the former European peatland area has already been completely lost through drainage for agriculture, forestry and peat extraction. About 46% of the current European peatland area is classified as degraded, in the EU even 50%. This makes Europe the world's second largest greenhouse gas emitter from drained peatlands. Climate change also induces peat loss from undrained peatlands as a result of extensive droughts and/or heatwaves, fire, vegetation change, and permafrost degradation. The large and rapid losses of old permafrost carbon have only (source: Tanneberger et al. 2022).



Sources: 1) Global Peatland Database 2022; 2) Tanneberger, F., Larmann, T., Seiv, A. (2022). Regional assessment for Europe. In: UNEP Global Peatlands Assessment – The State of the World's Peatlands: Evidence for action toward the conservation, restoration, and sustainable management of peatlands. Chapter 5, Global Peatlands Initiative, United Nations Environment Programme, Nairobi, pp. 128-154; 3) Peel, M. C., Finlayson, B. L., and McMahon, T. A.: Updated world map of the Köppen-Geiger climate classification, Hydrol. Earth Syst. Sci., 11, 1633-1644, doi:10.5194/hess-11-1633-2007, 2007; 4) UNEP GPA 2022 (icons were developed using free files from www.vectroy.com, www.flaticon.com, and www.freepik.com)



THANKS to the GPD-TEAM 2021



Thank you & looking forward to collaborate on European Peatlands!

