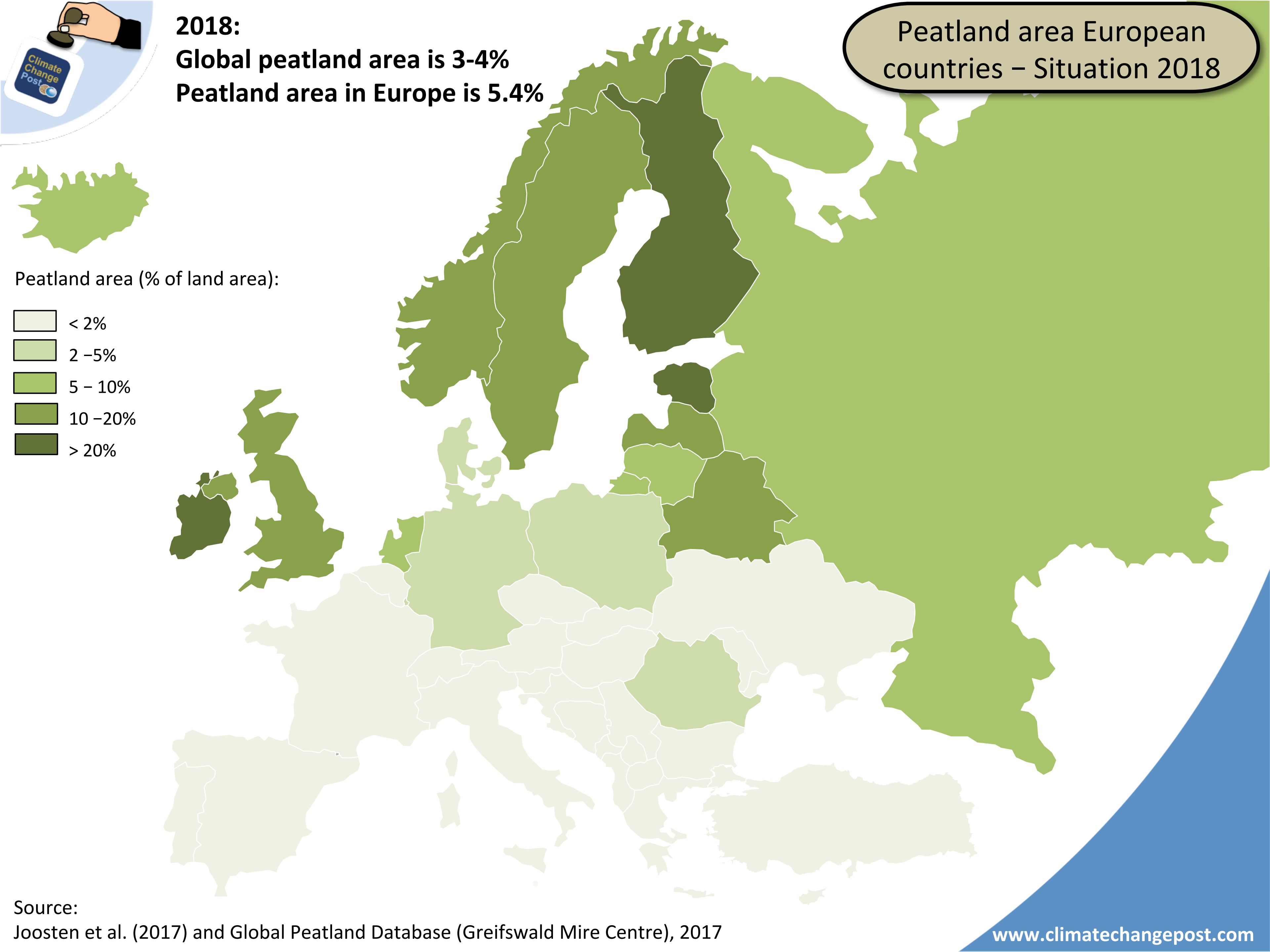
Europe's peatlands in a changing climate

www.climatechangepost.com

Latest update: 16 December 2018


Climate Change Post
2018:
Global peatland area is 3-4%
Peatland area in Europe is 5.4%
Peatland area European countries – Situation 2018
Peatland area (% of land area):
< 2%
2 –5%
5 – 10%
10 –20%
> 20%
Source:
Joosten et al. (2017) and Global Peatland Database (Greifswald Mire Centre), 2017
www.climatechangepost.com

Definitions and numbers

Peat is defined as sedentarily accumulated material of which at least 30 % (dry mass basis) is dead organic matter

Peatlands are areas with a naturally accumulated peat layer at the surface

Mires are peatlands where peat is currently being formed

Fens are nutrient rich and bogs are nutrient poor

About 80 % of the peatlands in Sweden and Norway are still mires. In countries such as the Netherlands and the UK, the contribution of mires to the total peatland area is only 1 - 7 % due to widespread drainage and intensive land use.

Globally:
Although peatlands cover only 3-4% of the earth land surface, they hold the equivalent of half of the atmosphere's carbon.
Peatland areas are decreasing worldwide.

Europe:
Peatlands (> 30 cm peat) cover 5.4% of the total surface area of Europe. In about 54% of these areas peat is now being formed (mires).
If shallow-peat lands (< 30 cm peat) in European Russia are also taken into account, the total peatland area in Europe is almost 10 % of the total surface area.

Finland is the country in Europe with most peatland (26.7 % of the land area)

The extent of mire is highest in European Russia

Peatlands are huge carbon stores

Vulnerabilities

Natural peatlands: carbon stores
A constant high water table that restricts aerobic decay is a prerequisite for long-term storage of carbon in peatlands. Natural or undamaged peatlands help to regulate the global climate by actively removing carbon from the atmosphere.

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon.

Damaged peatlands: carbon sources
Drained and degraded peatlands are hotspots of greenhouse gas emissions (CO_2, methane (CH_4), nitrous oxide (N_2O)). These emissions can be significant: their contributions to the total national greenhouse gas emissions are about 5 % in Germany and Denmark, 2-3 % in the Netherlands and about 1 % in the UK.

The development of new drainage techniques at the beginning of the 20th century has accelerated the exploitation of peatland area and altered patterns of use. In the Nordic countries between 3% and 40% of the original peatland area has been drained for agricultural purposes.

Climate change: release of carbon
Under climate change, peatland water tables may become significantly lower due to increased evapotranspiration and/or decreased summer precipitation. Also, higher temperatures will generally increase microbial peat decomposition and carbon mobilisation. As a result, peat decomposition and the release of CO_2 may be enhanced.

However, change in land use is the primary driver of changes in peatland hydrology, and probably has a stronger impact than climate change.

After 2100, decomposition of peatlands will strengthen climate change

Vulnerabilities

Good news:
Until 2100, carbon sink potential of the world's peatlands slightly increases, both under a low-end and a high-end scenario of climate change. This increase will lead to a small negative feedback to climate change.

Bad news:
This negative feedback does not persist in time. After 2100, carbon sink potential decreases and the initially negative feedback shifts to a positive feedback to climate change.

The shift results from the combined changes in the peatlands at different latitudes:

- At high latitudes the carbon sink increases continuously far beyond 2100.
- At lower latitudes, higher temperatures drive increased microbial activity and decomposition rates in the peat and surface litter, but this is not fully compensated by increases in plant productivity. As a result, carbon sequestration decreases.

Source: Gallego-Sala et al. (2018)

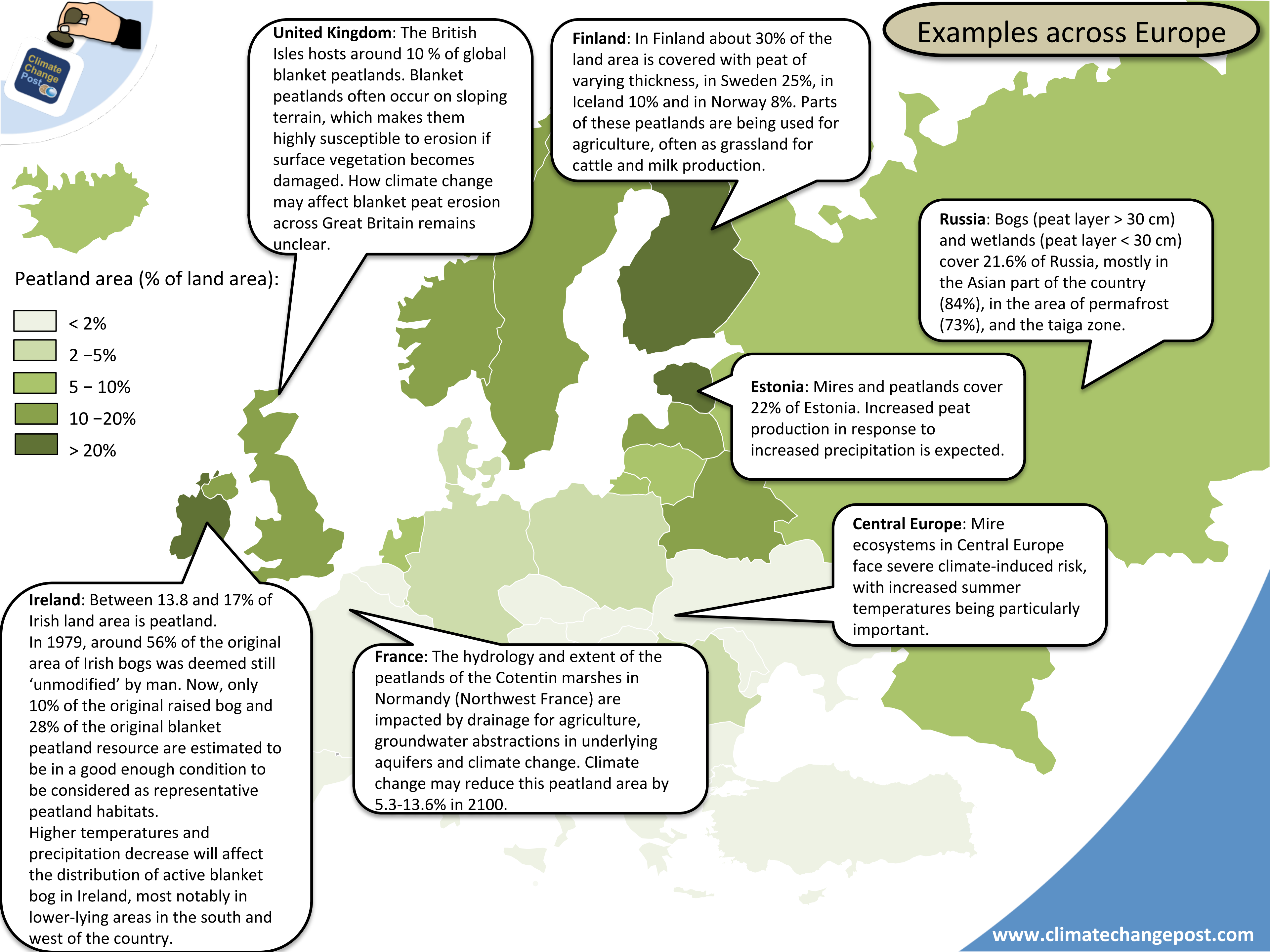
Degraded peatlands have more negative impacts than releasing carbon

Flood mitigation
Peatlands are important to mitigate regional flooding since they store water from heavy rainfall. Draining peatlands may therefore negatively impact flood protection.

Land subsidence
Peat soil degradation causes land subsidence by a combination of peat oxidation and compaction after drainage. Historical subsidence, caused by drainage since medieval times, often combined with peat extraction for fuel, in coastal peatlands of the Netherlands, Germany and eastern Britain may have resulted in up to several metres of subsidence.

In Dutch managed peatlands, subsidence is ongoing at up to one centimetre per year. Under a warmer climate, peat decomposition would be even faster, particularly in drained peatlands.

Water quality
Due to drainage, water flows more vertically through the topsoil layer leaching out nutrients, dissolved organic carbon, and in some cases metals.
Peatlands are highly susceptible to erosion if surface vegetation becomes damaged. Peat erosion impacts water quality leading to high turbidity and heavy metal pollution, disturbed river ecology, sedimentation of reservoirs, and loss of carbon.



Examples across Europe
Peatland area (% of land area):
< 2%
2 –5%
5 – 10%
10 –20%
> 20%
United Kingdom: The British Isles hosts around 10 % of global blanket peatlands. Blanket peatlands often occur on sloping terrain, which makes them highly susceptible to erosion if surface vegetation becomes damaged. How climate change may affect blanket peat erosion across Great Britain remains unclear.
Finland: In Finland about 30% of the land area is covered with peat of varying thickness, in Sweden 25%, in Iceland 10% and in Norway 8%. Parts of these peatlands are being used for agriculture, often as grassland for cattle and milk production.
Russia: Bogs (peat layer > 30 cm) and wetlands (peat layer < 30 cm) cover 21.6% of Russia, mostly in the Asian part of the country (84%), in the area of permafrost (73%), and the taiga zone.
Estonia: Mires and peatlands cover 22% of Estonia. Increased peat production in response to increased precipitation is expected.
Central Europe: Mire ecosystems in Central Europe face severe climate-induced risk, with increased summer temperatures being particularly important.
Ireland: Between 13.8 and 17% of Irish land area is peatland.
In 1979, around 56% of the original area of Irish bogs was deemed still ‘unmodified’ by man. Now, only 10% of the original raised bog and 28% of the original blanket peatland resource are estimated to be in a good enough condition to be considered as representative peatland habitats.
Higher temperatures and precipitation decrease will affect the distribution of active blanket bog in Ireland, most notably in lower-lying areas in the south and west of the country.
France: The hydrology and extent of the peatlands of the Cotentin marshes in Normandy (Northwest France) are impacted by drainage for agriculture, groundwater abstractions in underlying aquifers and climate change. Climate change may reduce this peatland area by 5.3-13.6% in 2100.
www.climatechangepost.com

Rewetting

Rewetting protects organic material in former cultivated land from further mineralization by excluding oxygen, and encourages the return of peat forming plants and the ecosystem services they provide such as carbon sequestration.

In the short term (0-5 years) rewetting can lead to a net increase in the emission of greenhouse gases (CH_4). Research in the Netherlands has shown that rewetting can restore the carbon sink function of managed peatlands after 15 years.

Change in land use

New production techniques such as paludiculture (growing biomass in a wet environment) should be developed and promoted to generate production benefits from cutaway and cutover peatlands without diminishing their environmental functions (such as storing carbon).

www.climatechangepost.com