GREIFSWALD
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The contribution of paludiculture to climate change mitigation and adaptation

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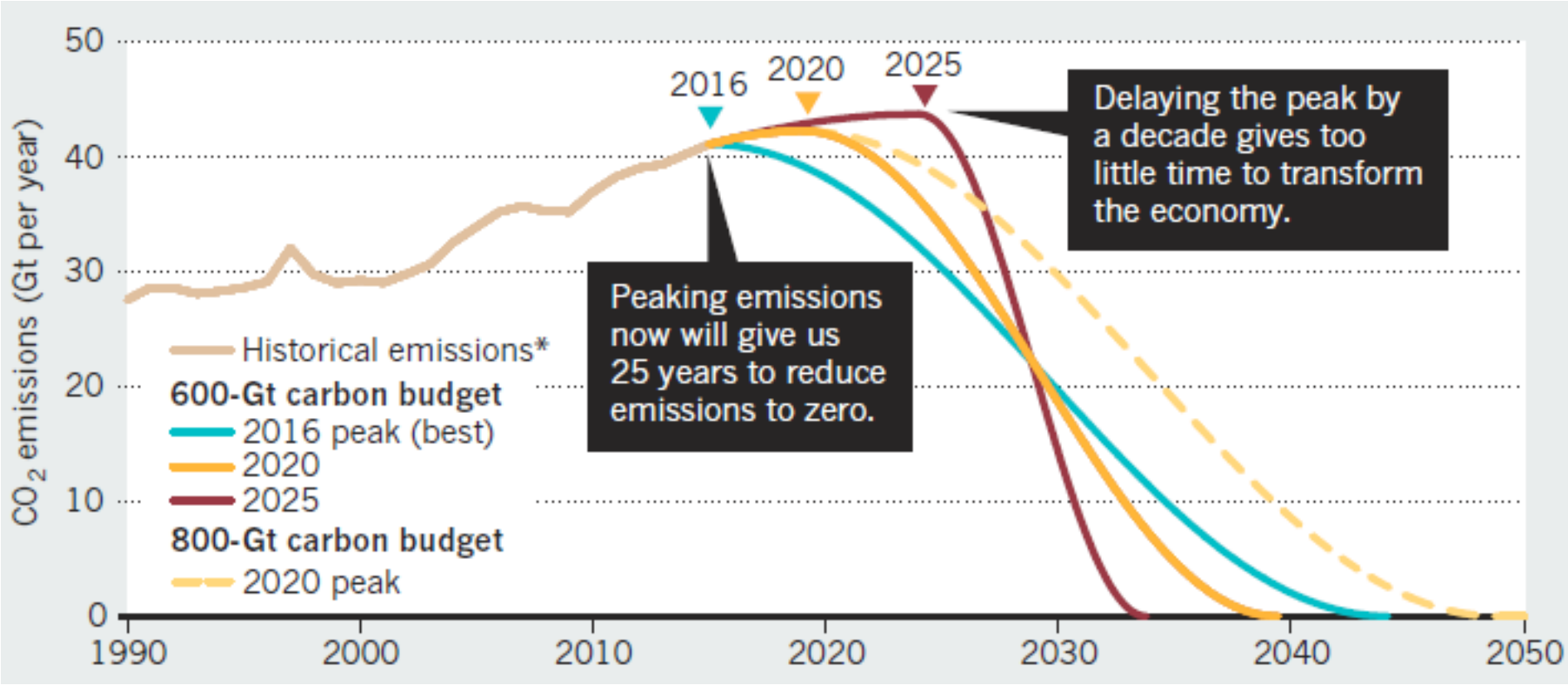
2015 Paris Agreement: „Limit global average temperature increase to 2° C, with 1.5° as more aspirational.”

Consequences: back to 0 emissions in 2050 and starting the decrease within the coming few years



HTTP://GO.NATURE.COM/2RCPCRU

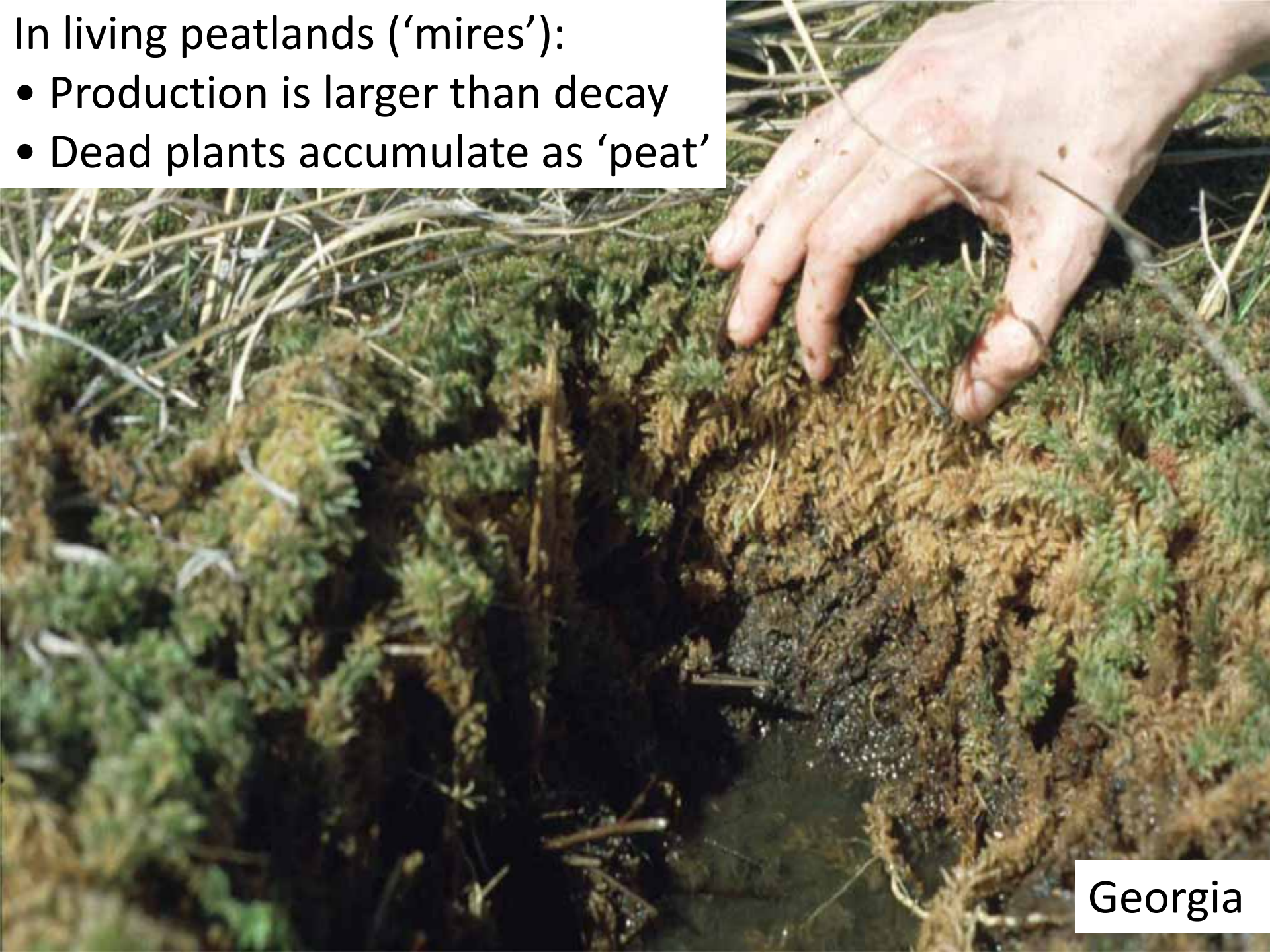
Paris agreement: "…in the context of sustainable development and efforts to eradicate poverty"…

http://unfccc.cloud.streamworld.de/webcast/us-secretary-of-state-john-kerry

→ breaking radically with wrong developments from the past, also with respect to peatlands

In living peatlands (‘mires’):

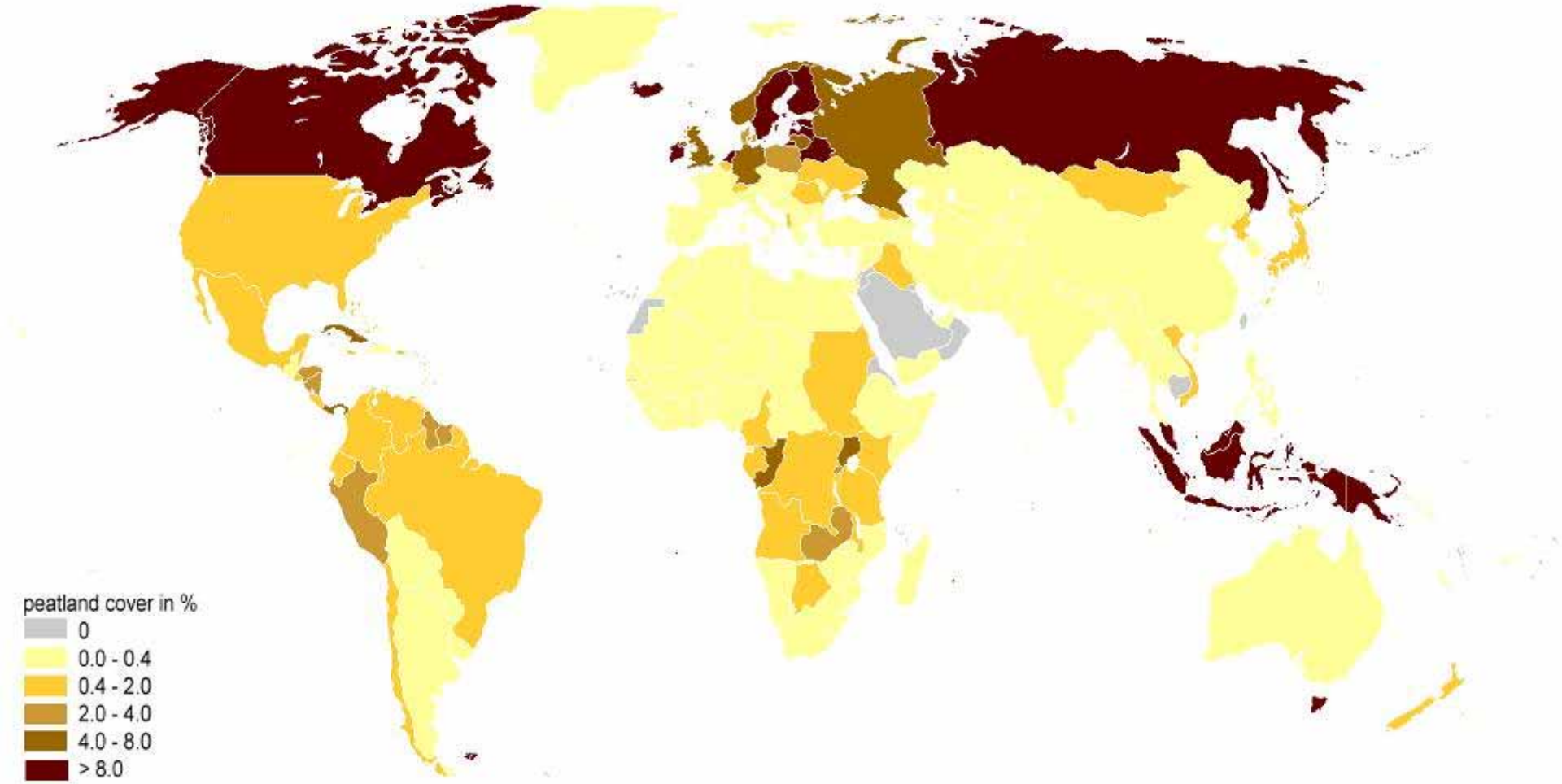
- Production is larger than decay
- Dead plants accumulate as ‘peat’



Peat accumulates through water saturation: Natural peatlands are always wetlands!

Belarus

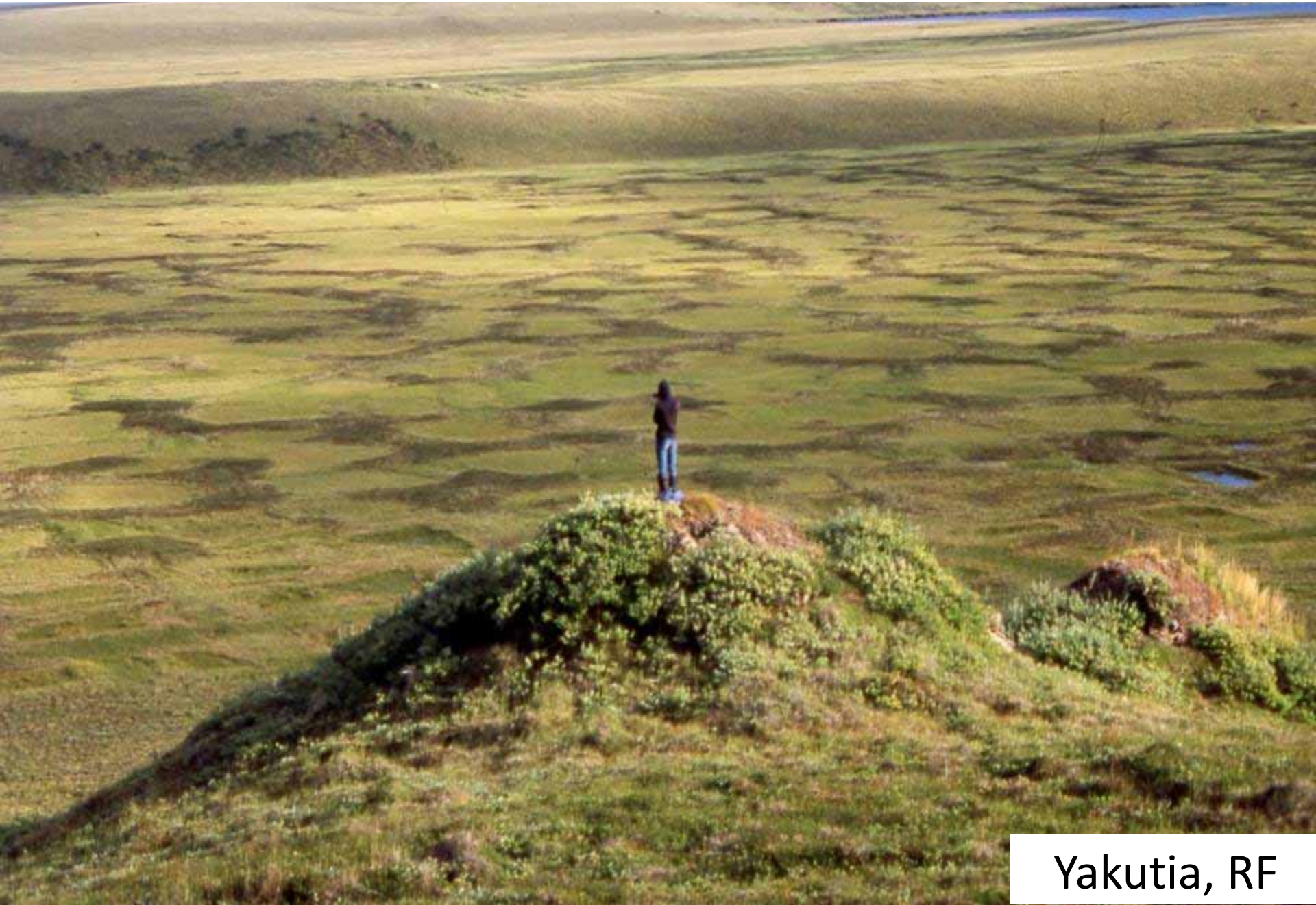
Peatlands are found in almost every country.
Worldwide: 4 million km^2



Peatlands are ‘everywhere’ and very diverse

Sichuan, China

… this is a peatland in the tundra …



Yakutia, RF

… this is a peatland in the tropics …

Brunei

…this is a peatland 1000 km from Antarctica…

Argentina

…this is a peatland in the high mountains …

… this is a peatland in the sea …

Not recognized - not appreciated: the Cinderella Syndrom

Ruoergai, China

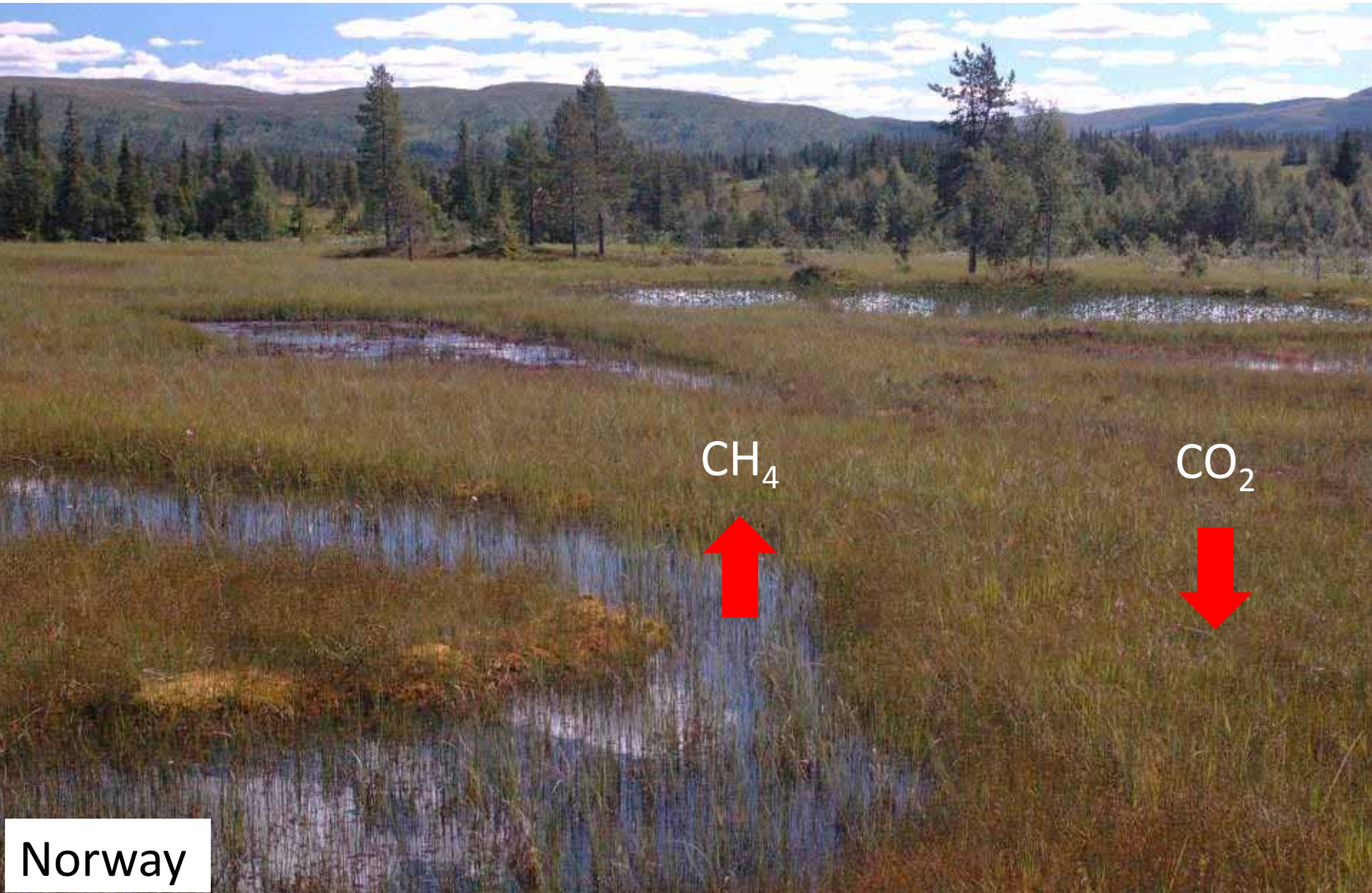
UNFCCC 2006 (Nairobi): In Kenya there is no peat…

Kenya 10 km from the Convention venue

UNFCCC 2011 (Panama): We didn‘t know we hàd peat swamps

Panama

Living peatlands are climatically ~neutral.
Globally: CO_2 sink is counterbalanced by CH_4 source



More important: carbon stock! Peatlands are the most space-effective carbon stores of all terrestrial ecosystems

Java, Indonesia

While covering only 3% of the World's land area, peatlands contain >500 Gigaton of carbon.

Germany

i.e. twice the carbon stock of the world's total forest biomass

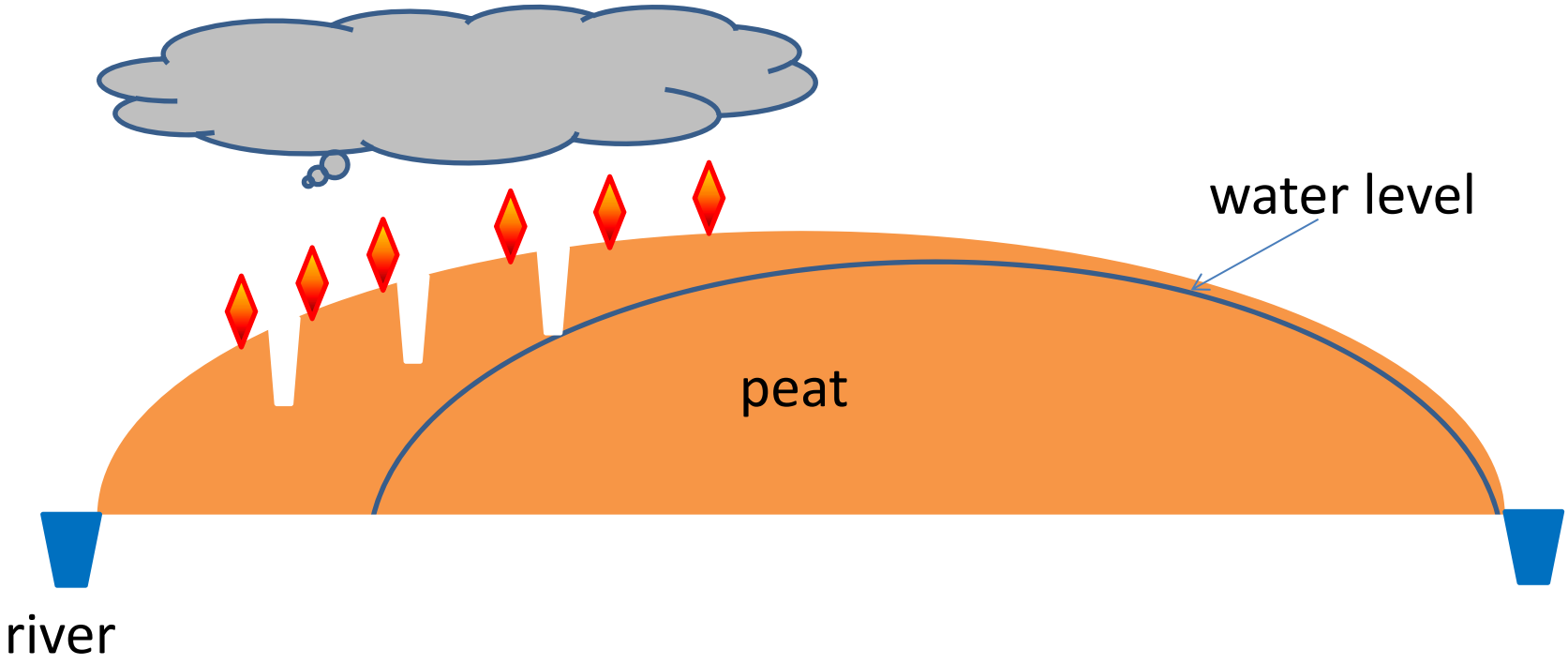
Sabah

Through a forest you can walk…

Brunei

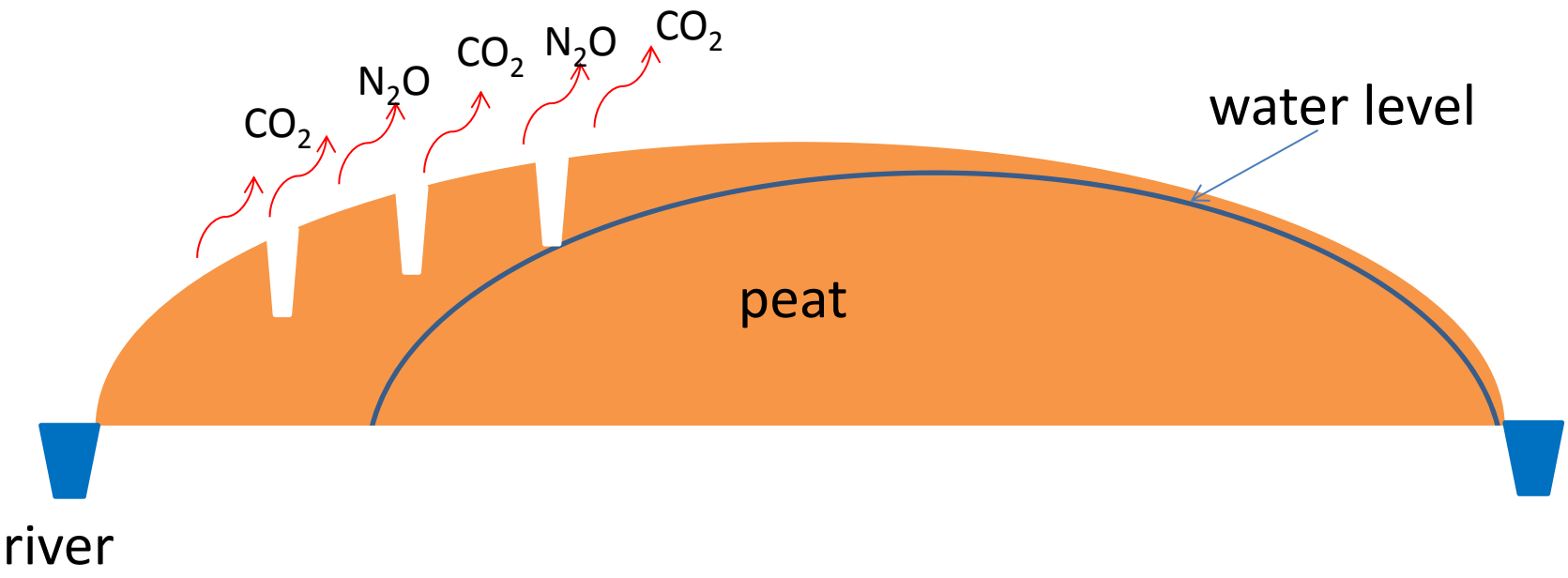
…through a peat body not…

By drainage the peat dries out and becomes prone to (catastrophic) fires (with resulting haze)



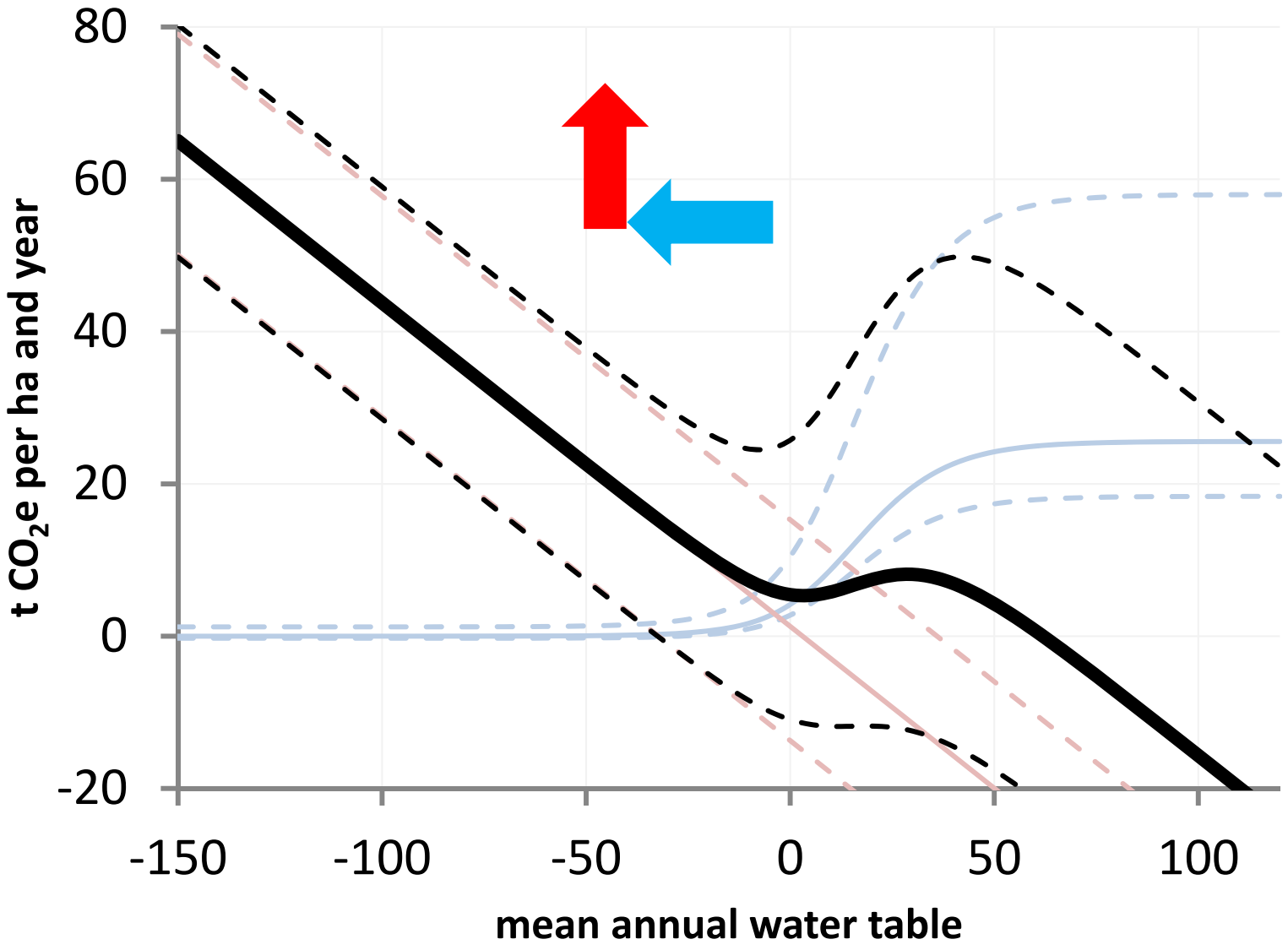
Indonesia 2015 peat fires:
100,000 people killed; >US $16 billion damage

By drainage, peat is oxidized and large amounts of greenhouse gases (GHG) are released



Peat is like atjar tjampoer or Spreewaldgurken: when you remove the acid/sweet water, the organic material rots away

Deeper water table → more greenhouse gas emissions



Deeply drained grassland on peat emits 29 T CO_2e /ha/yr = 145,000 Km with middle class car

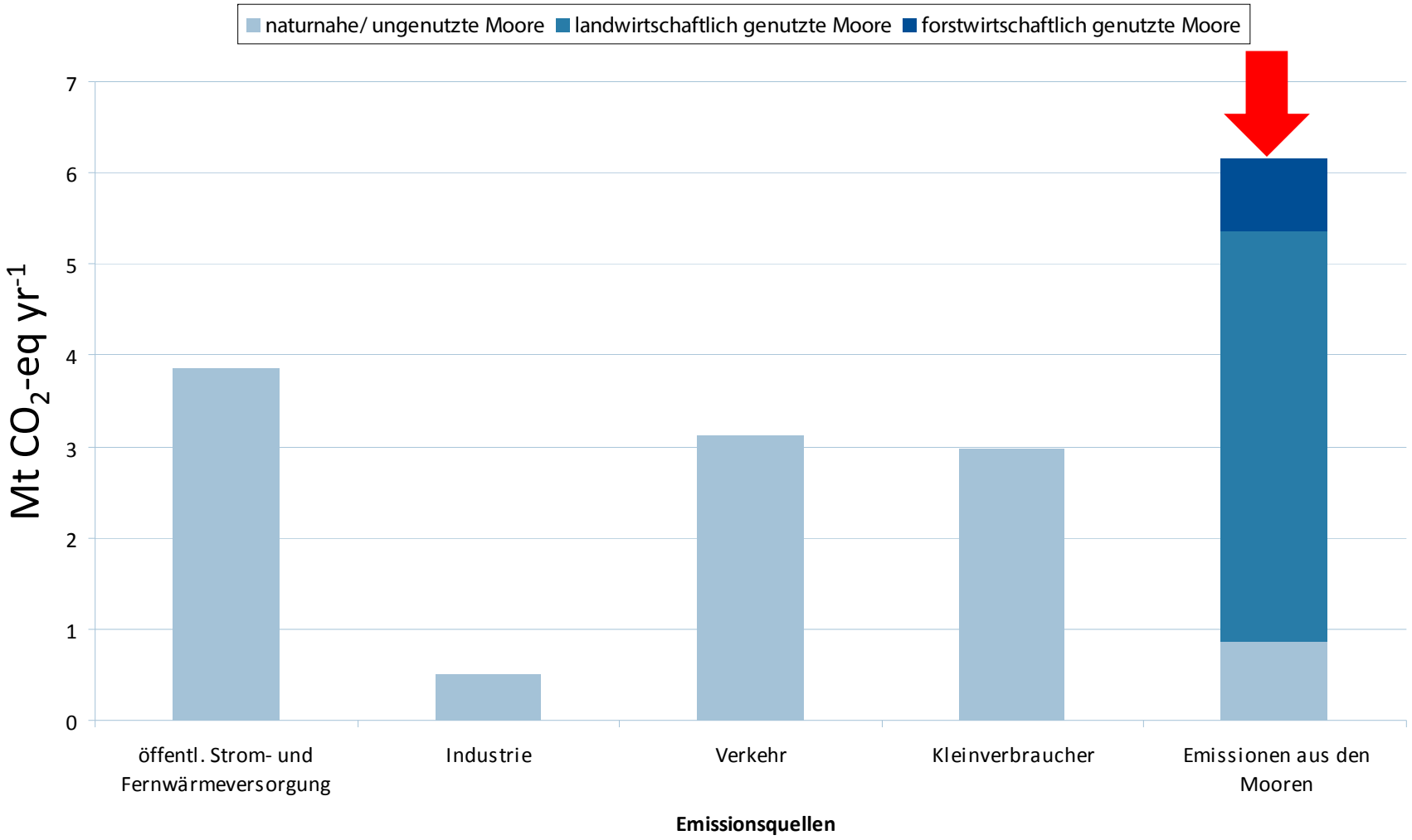
Lower Saxony

A potato field on peat in Europe emits 37 T CO_2e /ha/yr
= 185.000 km with middle class car…

Agricultural peatland in Germany emits almost 2 x more than the 7th dirtiest energy plant in the world

Brandenburg Jähnschwalde

In Mecklenburg-Vorpommern drained peatlands emit 1/3 of all anthropogenic greenhouse gas emissions



Oil palm on peat in the tropics emits 60 T CO_2e /ha/yr
= 300.000 km by car: every hectare, every year

Malaysia

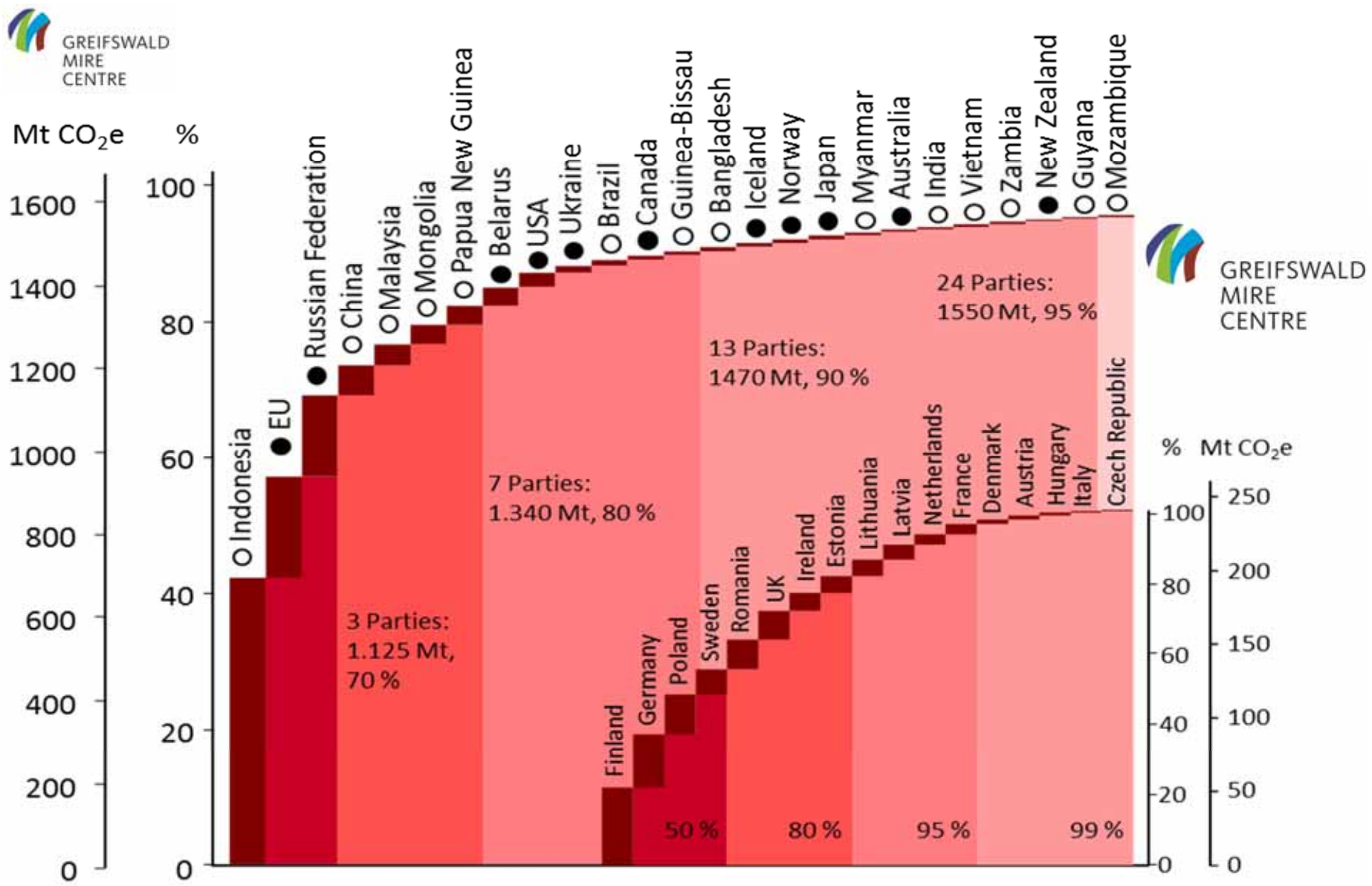
Globally, drained peatlands emit >2 Gigatonnes CO_2e /yr, i.e. 0.4 % of the land produces 5% of all global emissions

Indonesia leads the list of global top emitters, also without the enormous peatland fires…

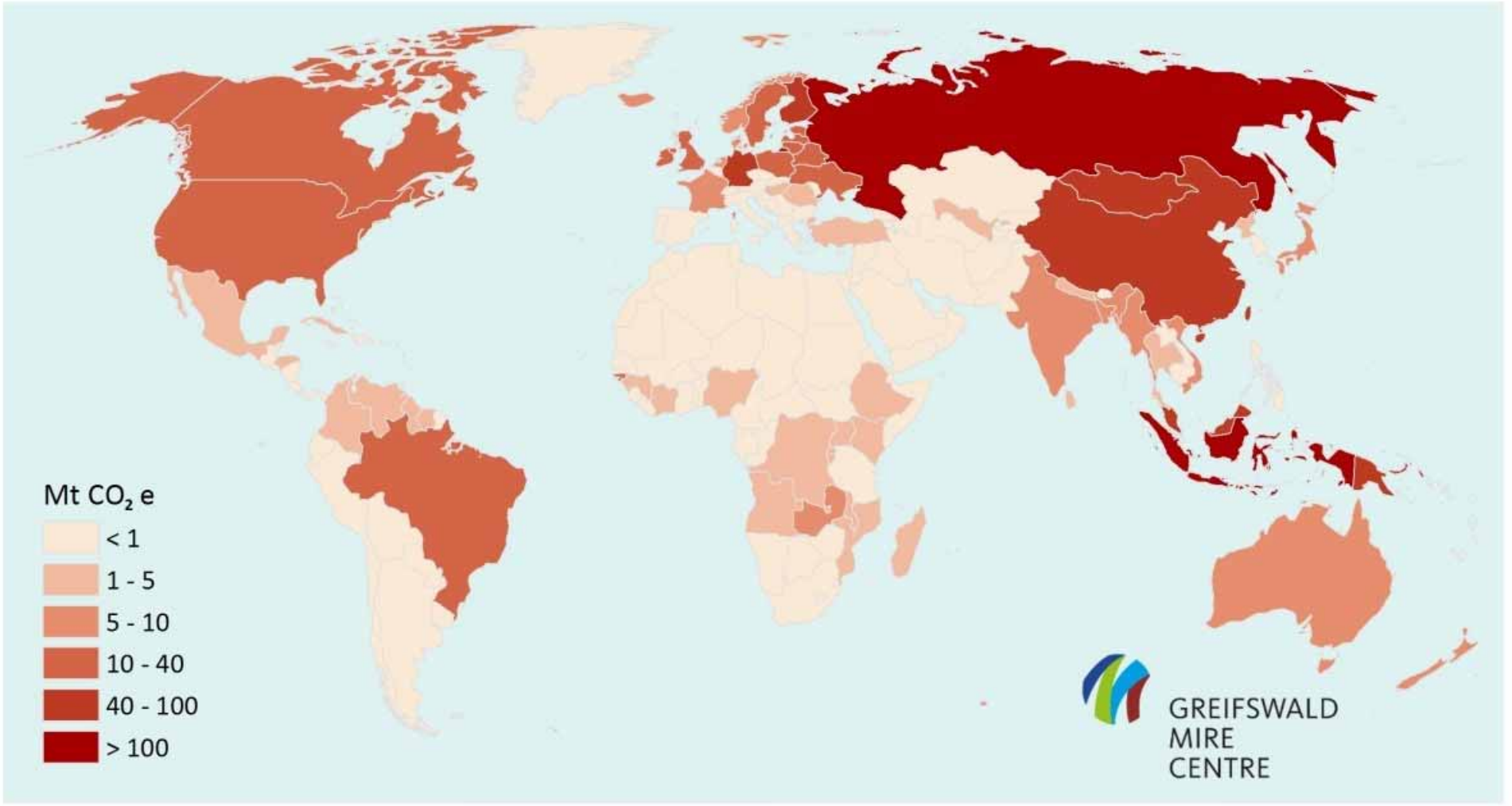
Indonesia

But the European Union is a good second …

24 UNFCCC parties, incl. 12 European and 9 EU countries are responsible for 95% of all global peatland emissions



Peatland emissions per country (in Mt CO_2e/yr): highest global urgency for peatland rewetting

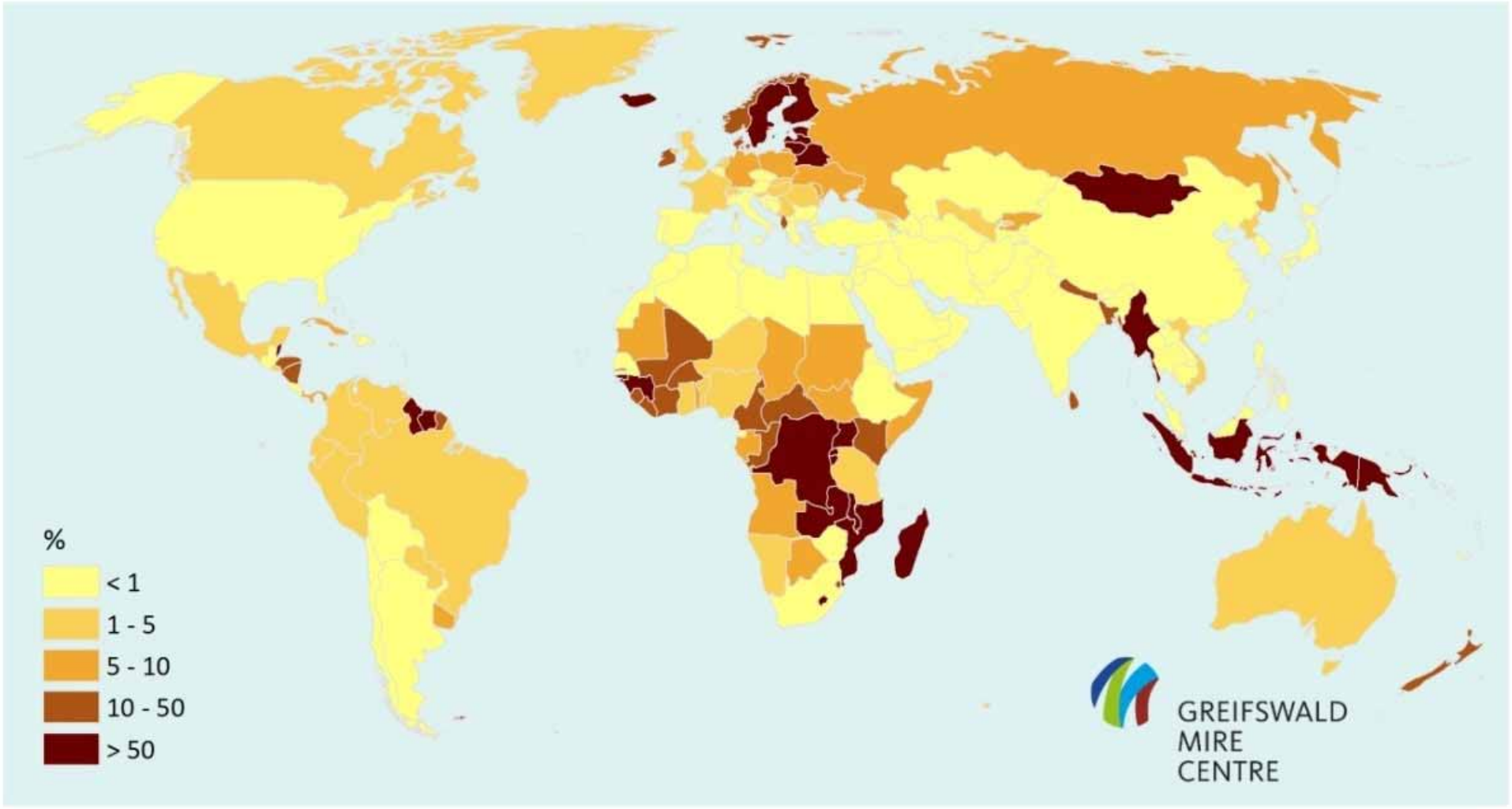


In 25 countries, peatlands emit > 50%, in 50 countries >10 % compared to their emissions from fossil fuels & cement

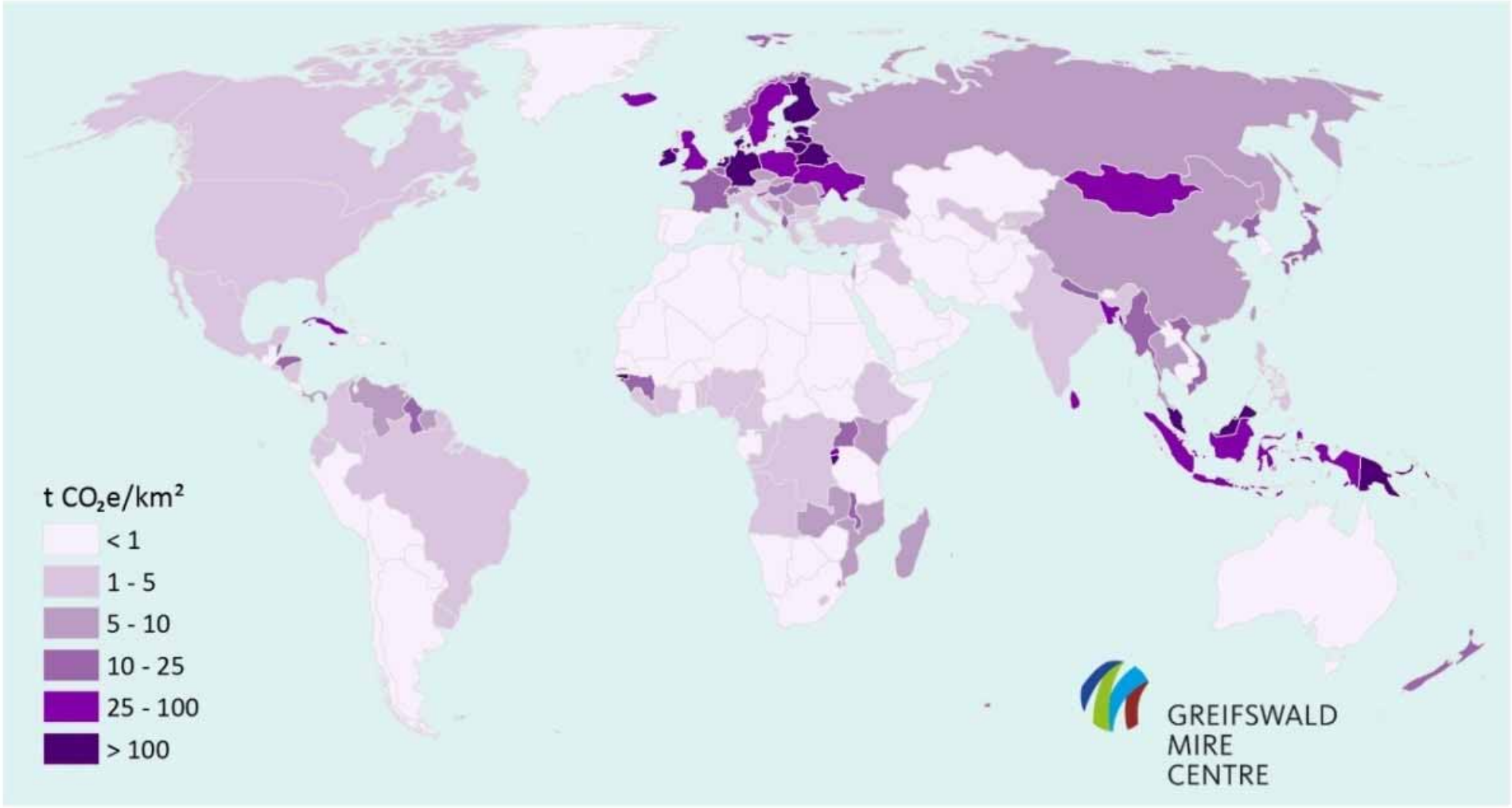
Peatlands emit in PNG 13x, Burundi 10x, Iceland 5x, Mongolia 4x, Zambia 3x and Finland 2x more than fossil fuels & cement

Iceland

Peatland emissions as % of national fossil fuel & cement emissions: highest urgency for national

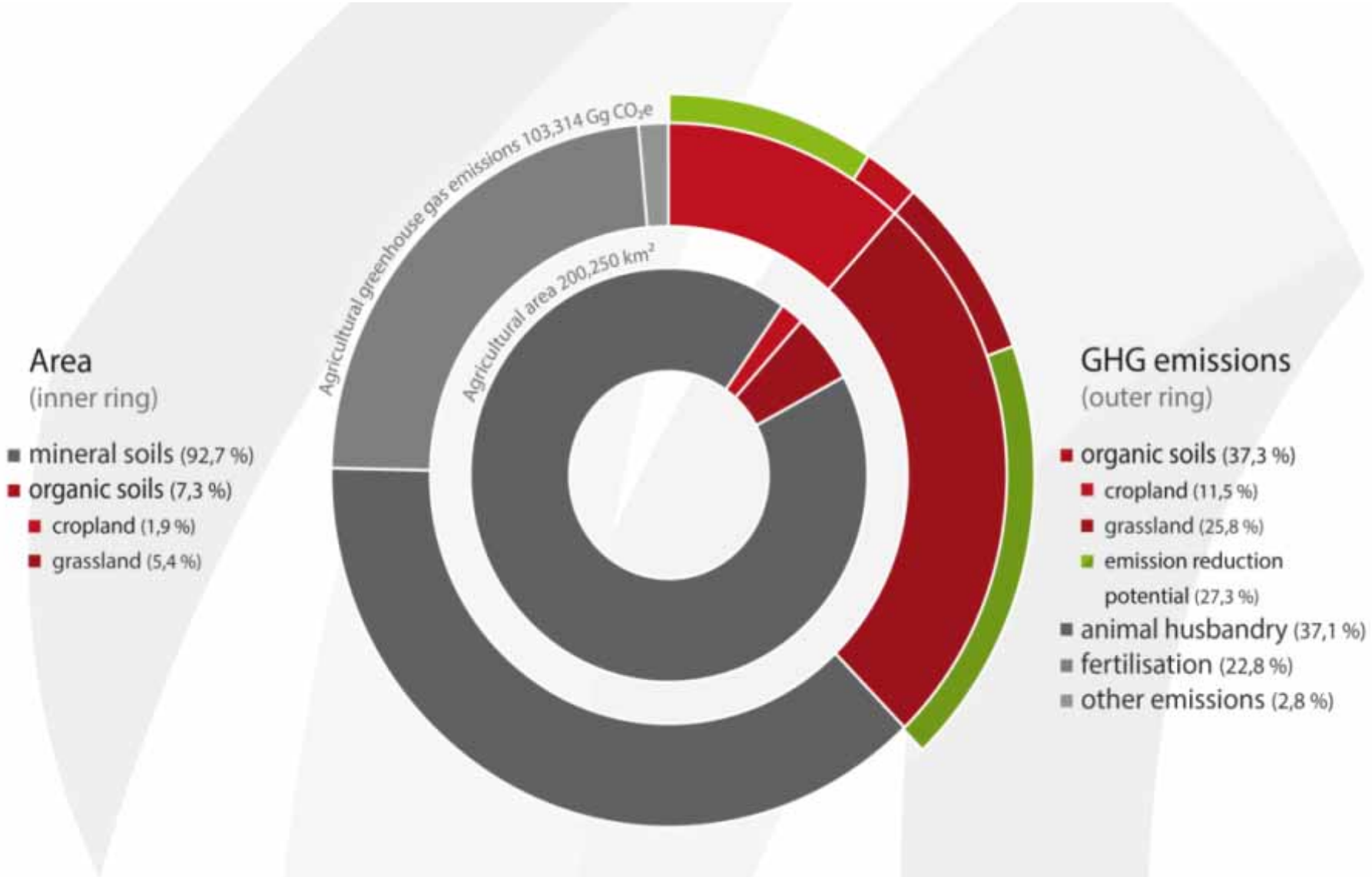


Peatlands emissions per unit national land area (tCO_2e/km^2): highest urgency for national land use policies



Peatlands produce 30 % of all emissions from agriculture

Agriculture in Germany: 7% of land causes 37% of emissions



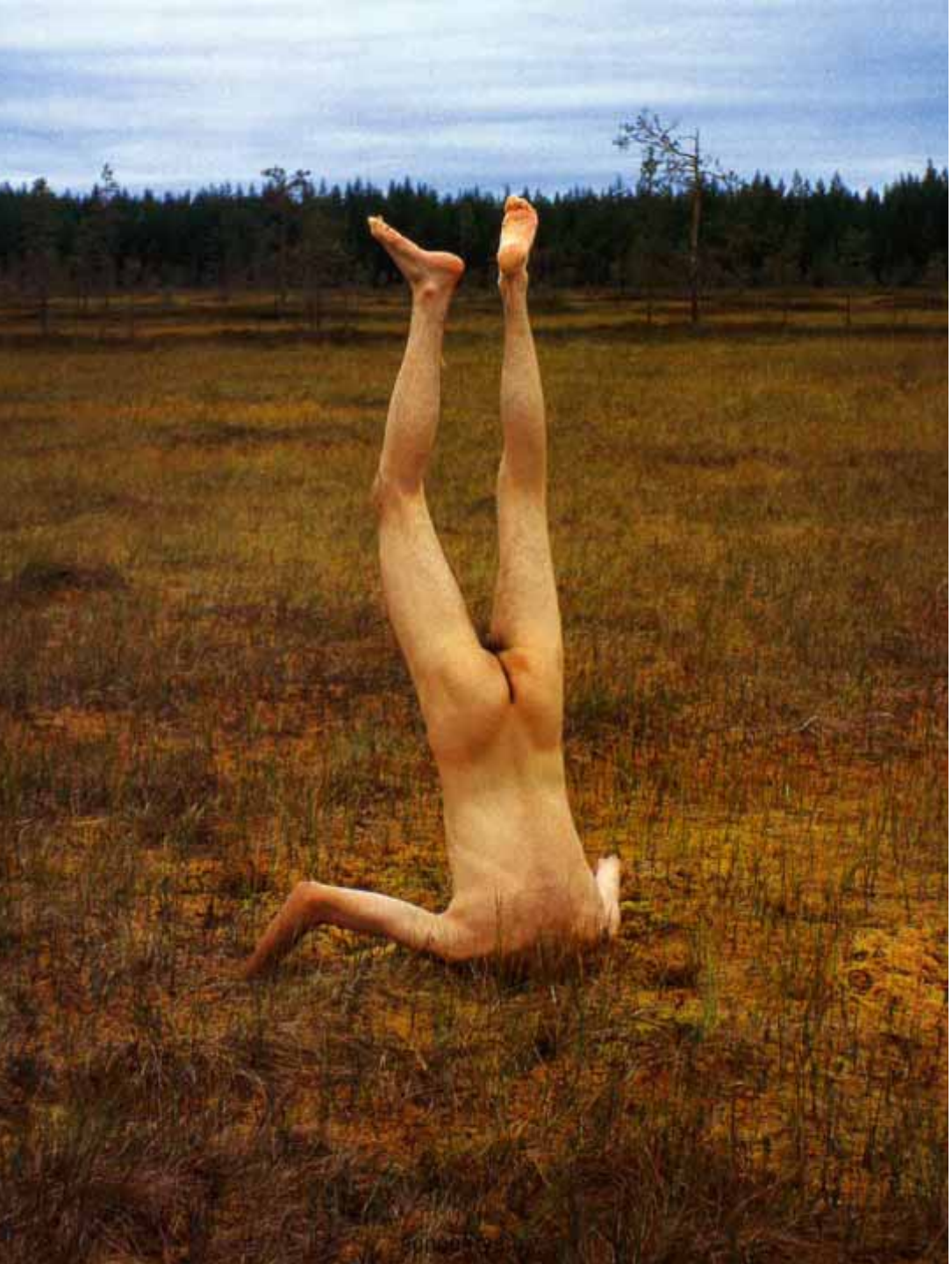
In Germany peatland agriculture causes annually a climate damage of € 3.6 billion, and gets 300 million EU-grants (CC)

Mecklenburg-Vorpommern

Maik Stegmann

“Biogas” from mays on causes 8x more climate damage than burning lignite…but receives green energy subventions

Lower Saxony

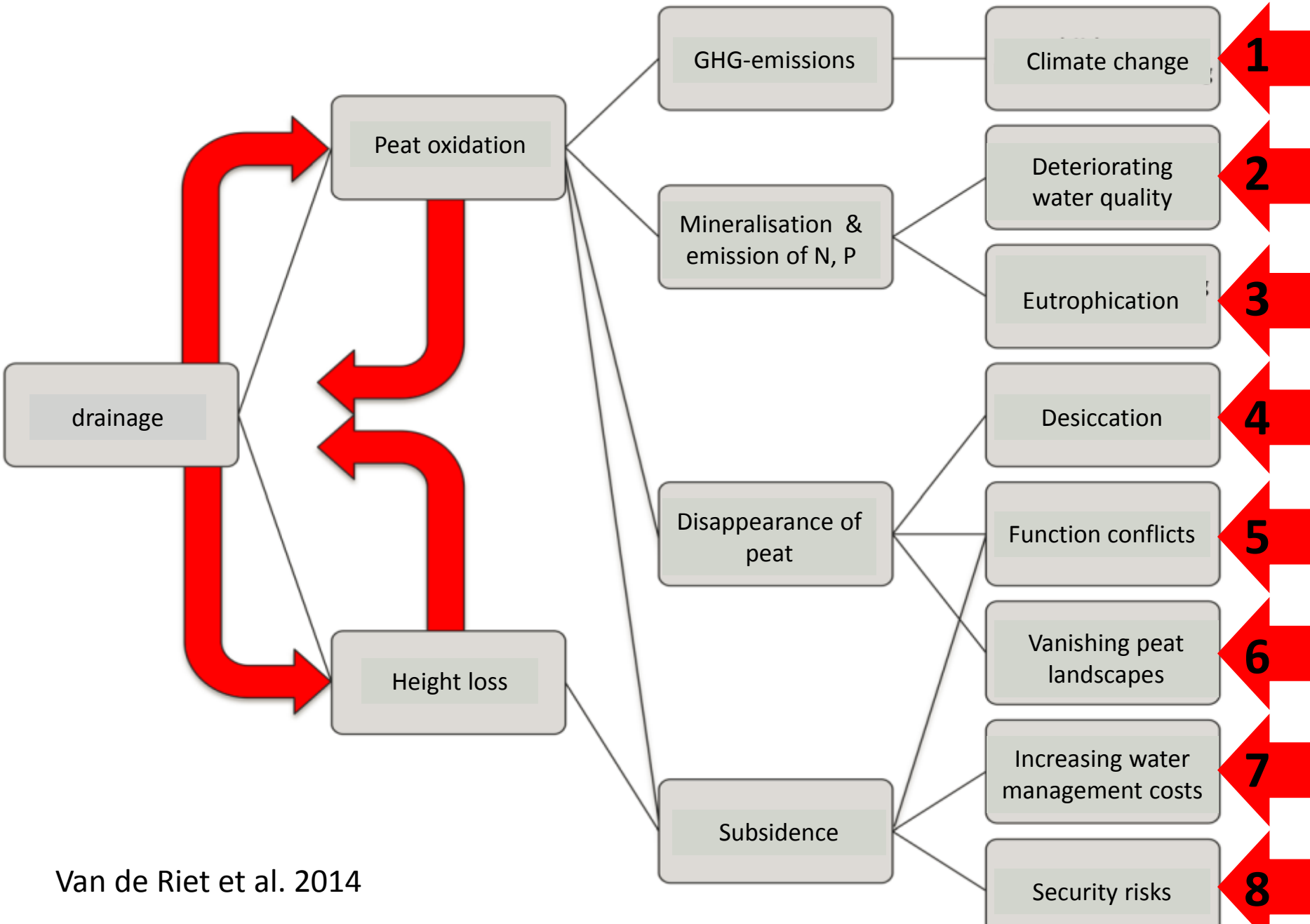


The ‘polluter pays’ principle is put on the head:

We pay peatland agriculture for causing massive climate damage

… and frustrate in this way sensible solutions

Climate damage is merely one of the societal damages

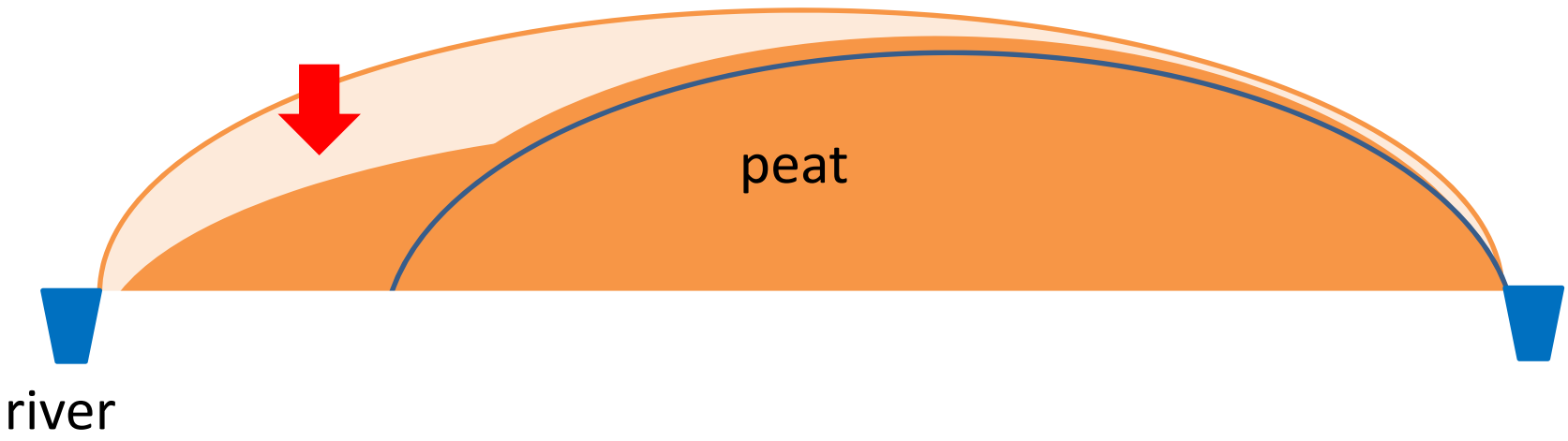


Van de Riet et al. 2014

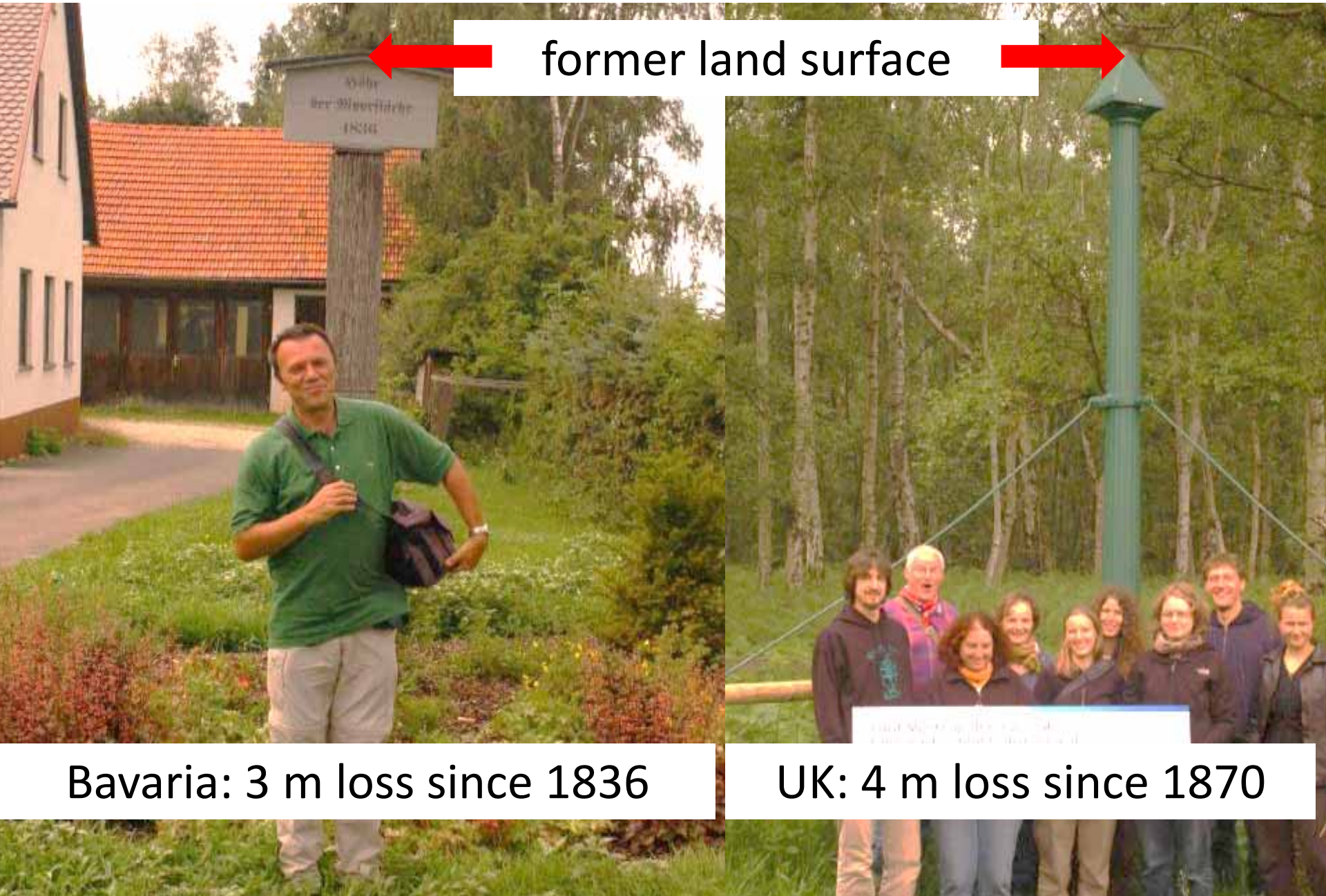
In continental regions peatland drainage creates deserts…

…and soils like made of stone…

Insufficiently recognized: drainage also causes subsidence!



Drainage→ subsidence (loss of height): 1 -2 cm annually



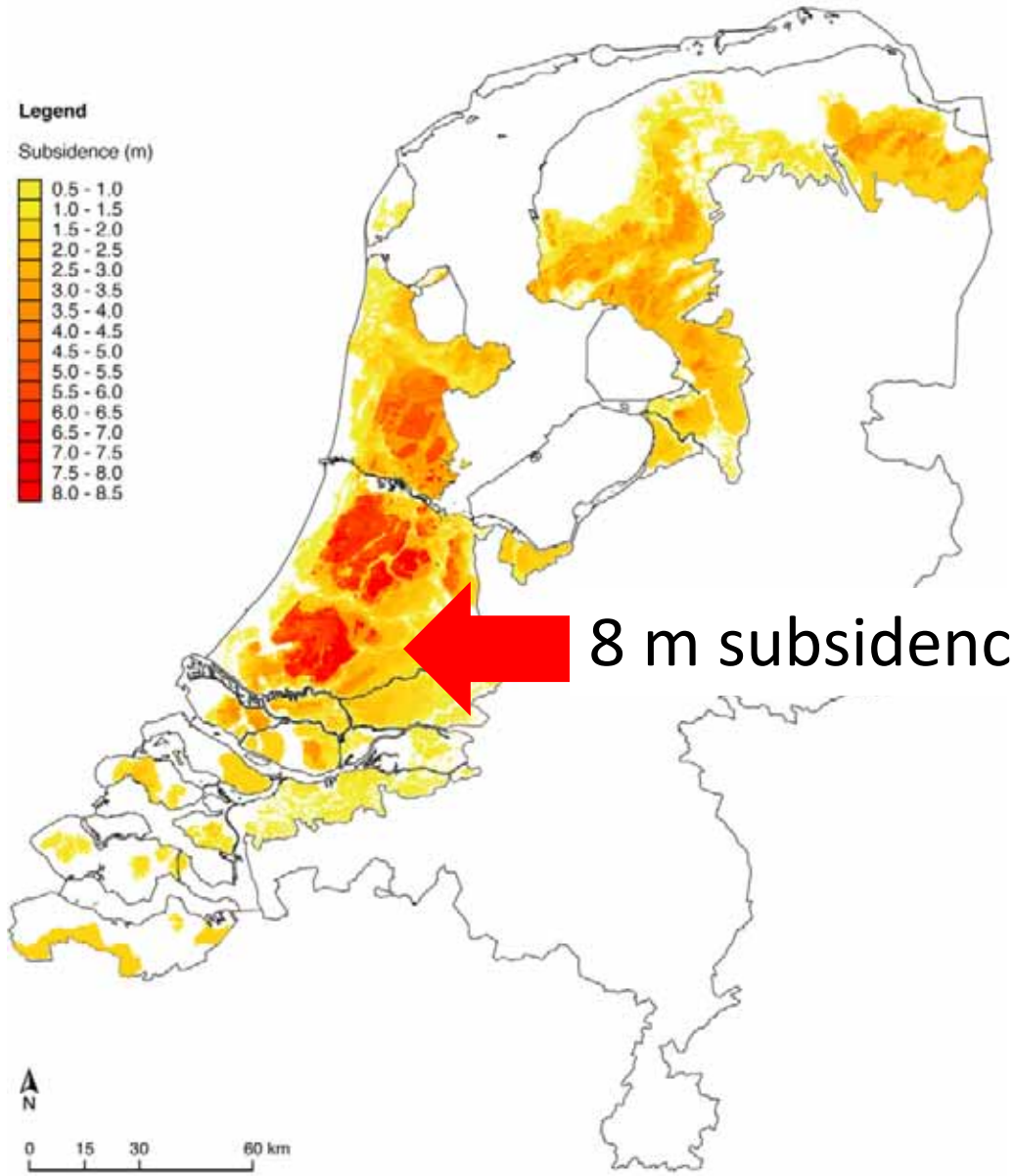
Bavaria: 3 m loss since 1836

UK: 4 m loss since 1870

In Germany 10,000s ha of agricultural peatland have been flooded because they could no longer be economically drained

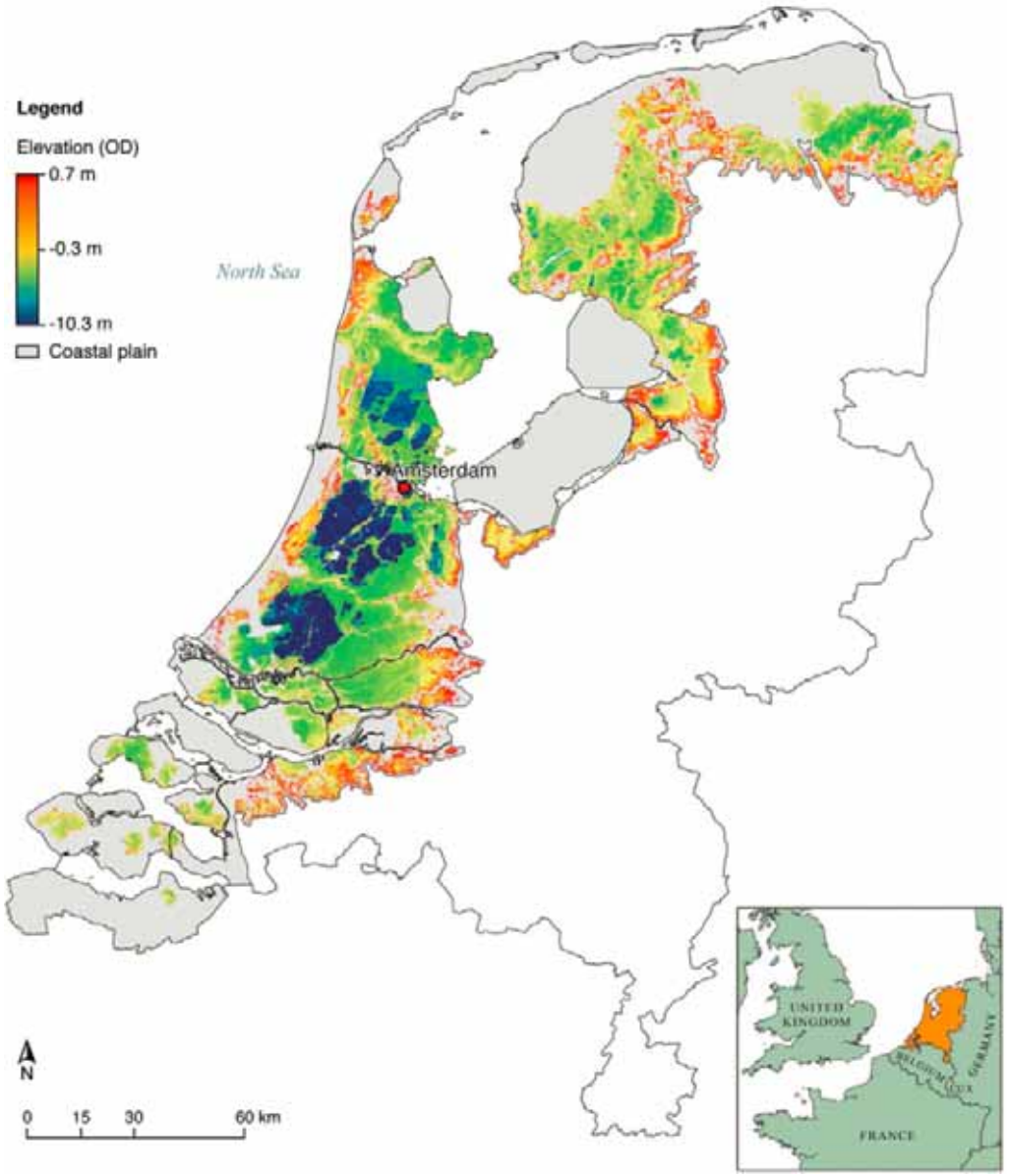
Vorpommern

…*Nether*-lands: bogged down by 1000 yr of peatland drainage and subsidence

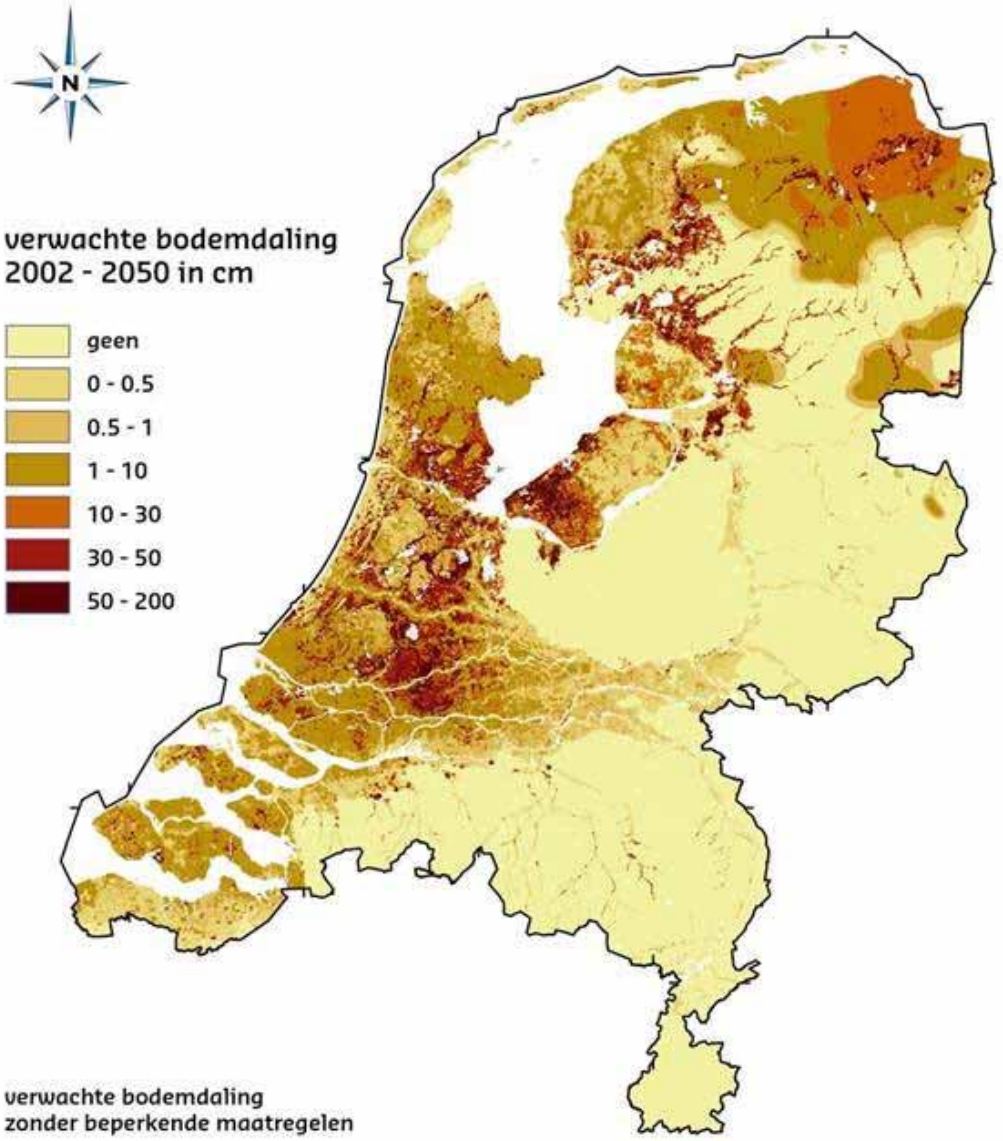


8 m subsidence

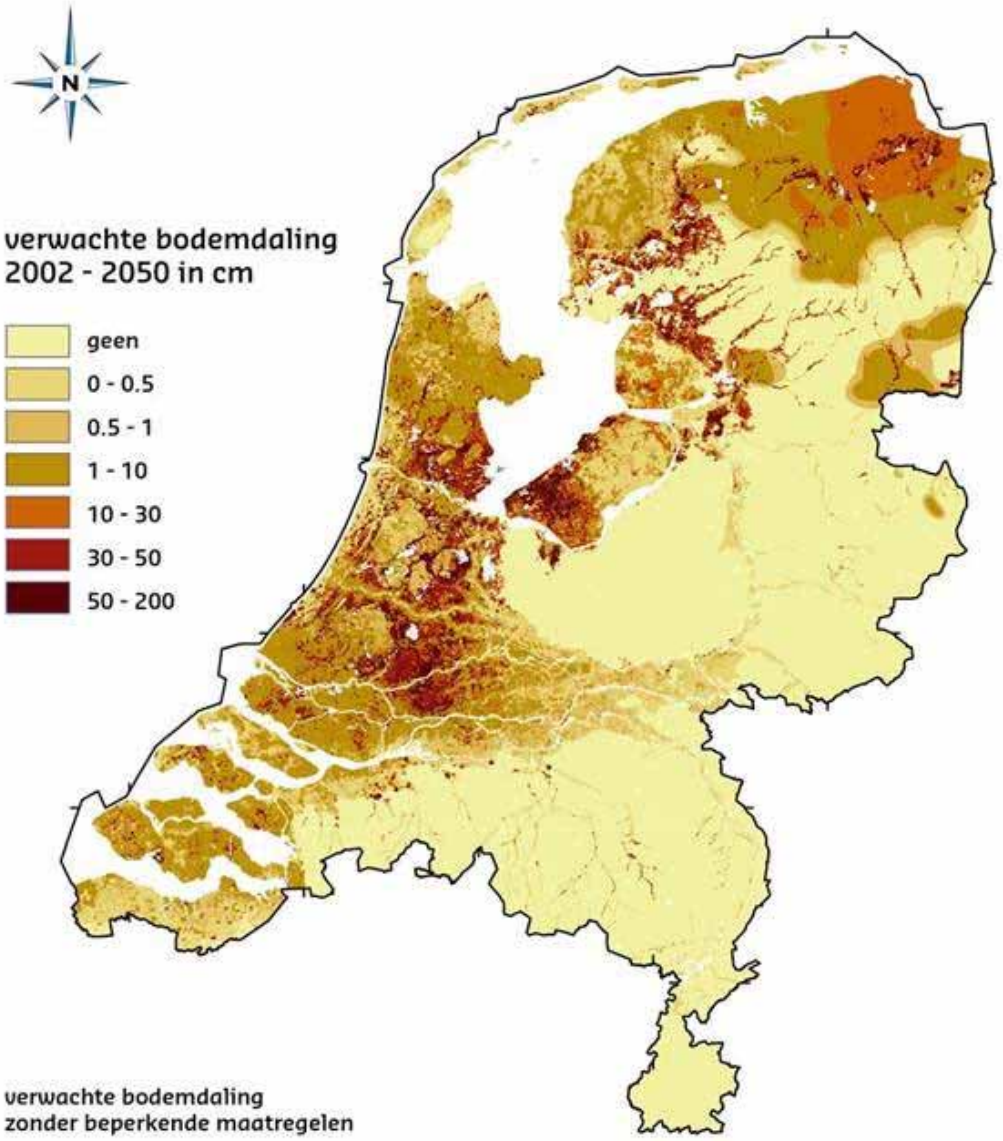
…*Nether*-lands: now half the country deep under sea level…



…and subsidence continues…

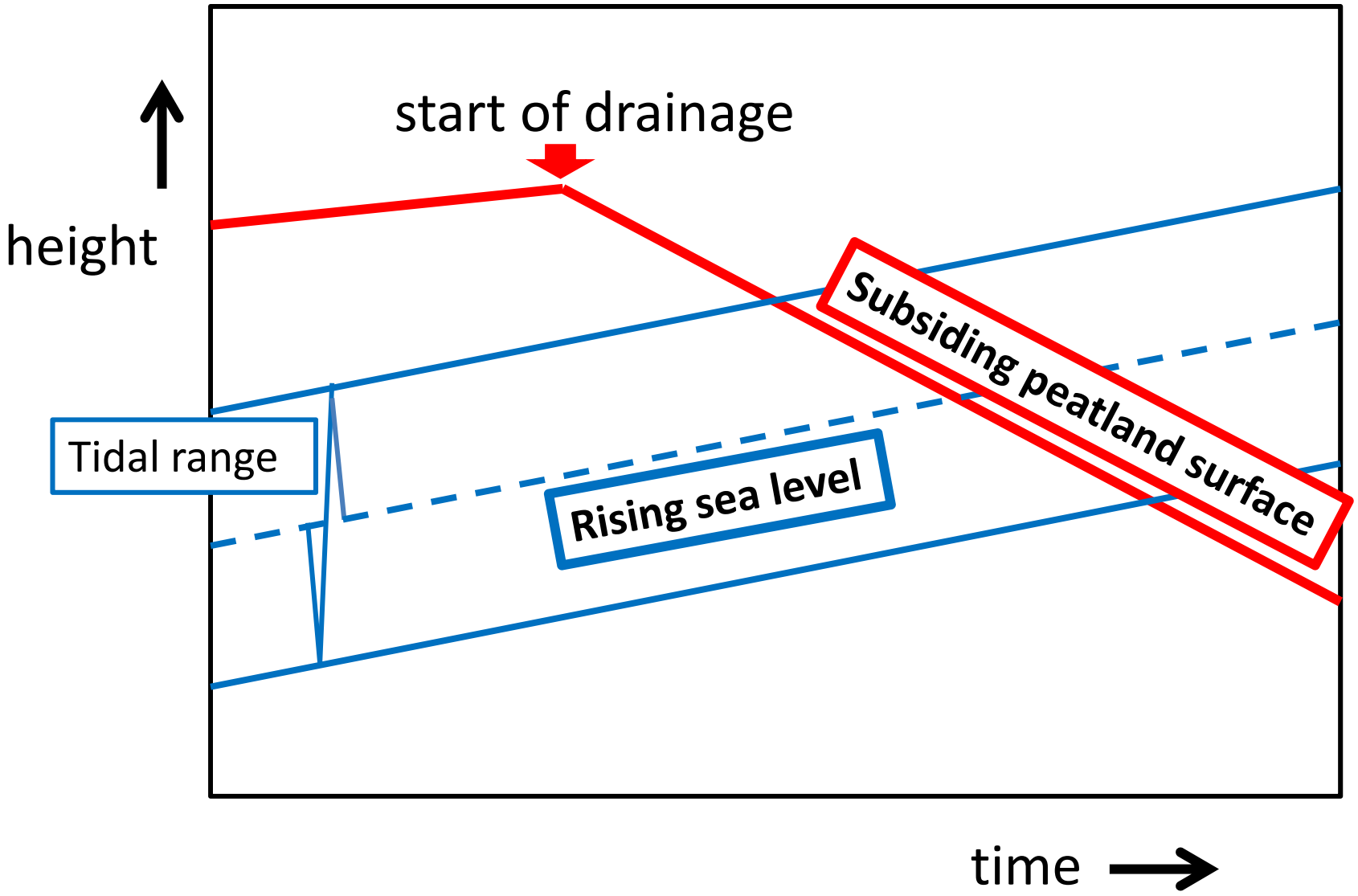


…and subsidence continues…

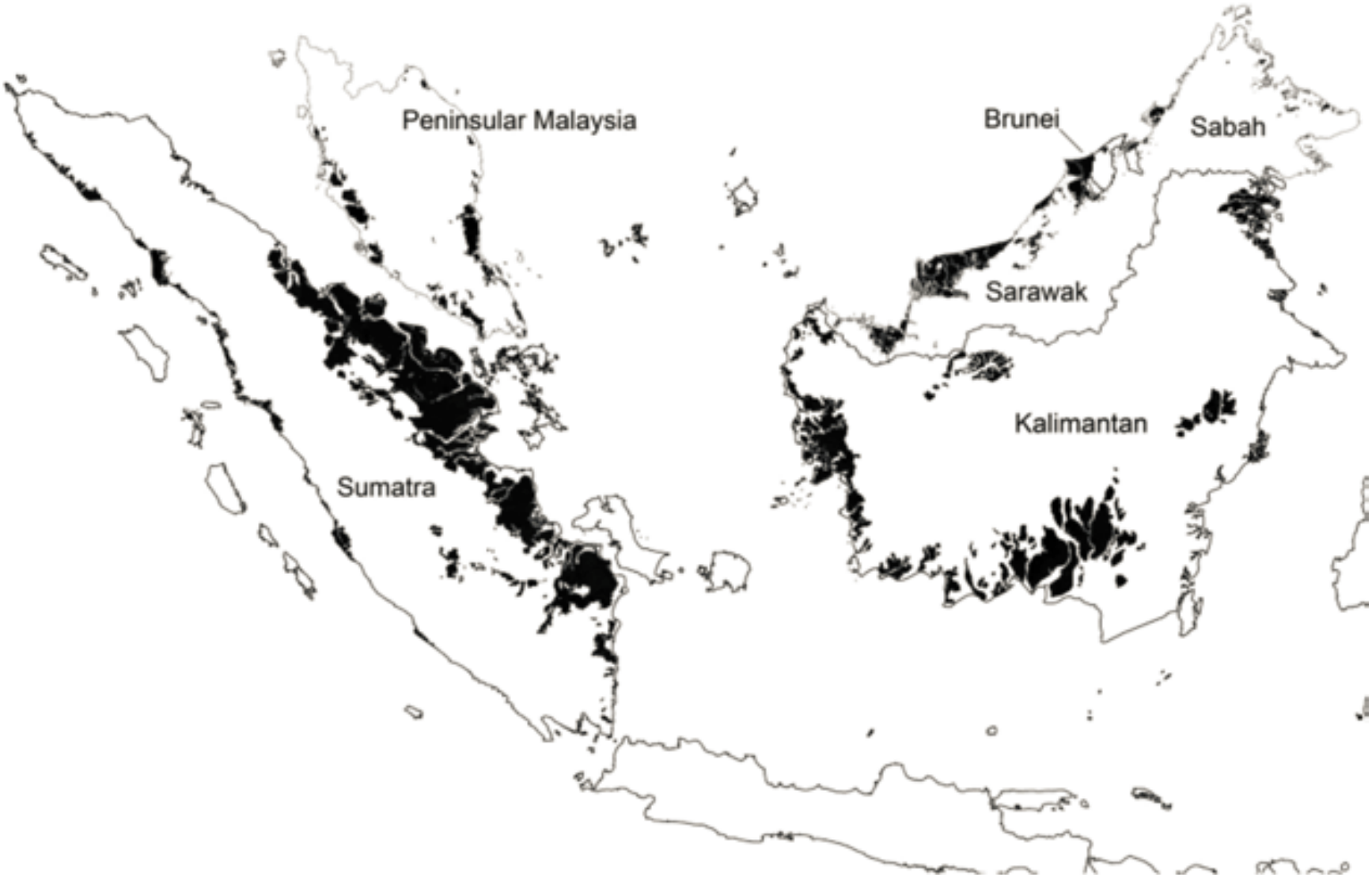


In tropics subsidence 5 times faster!

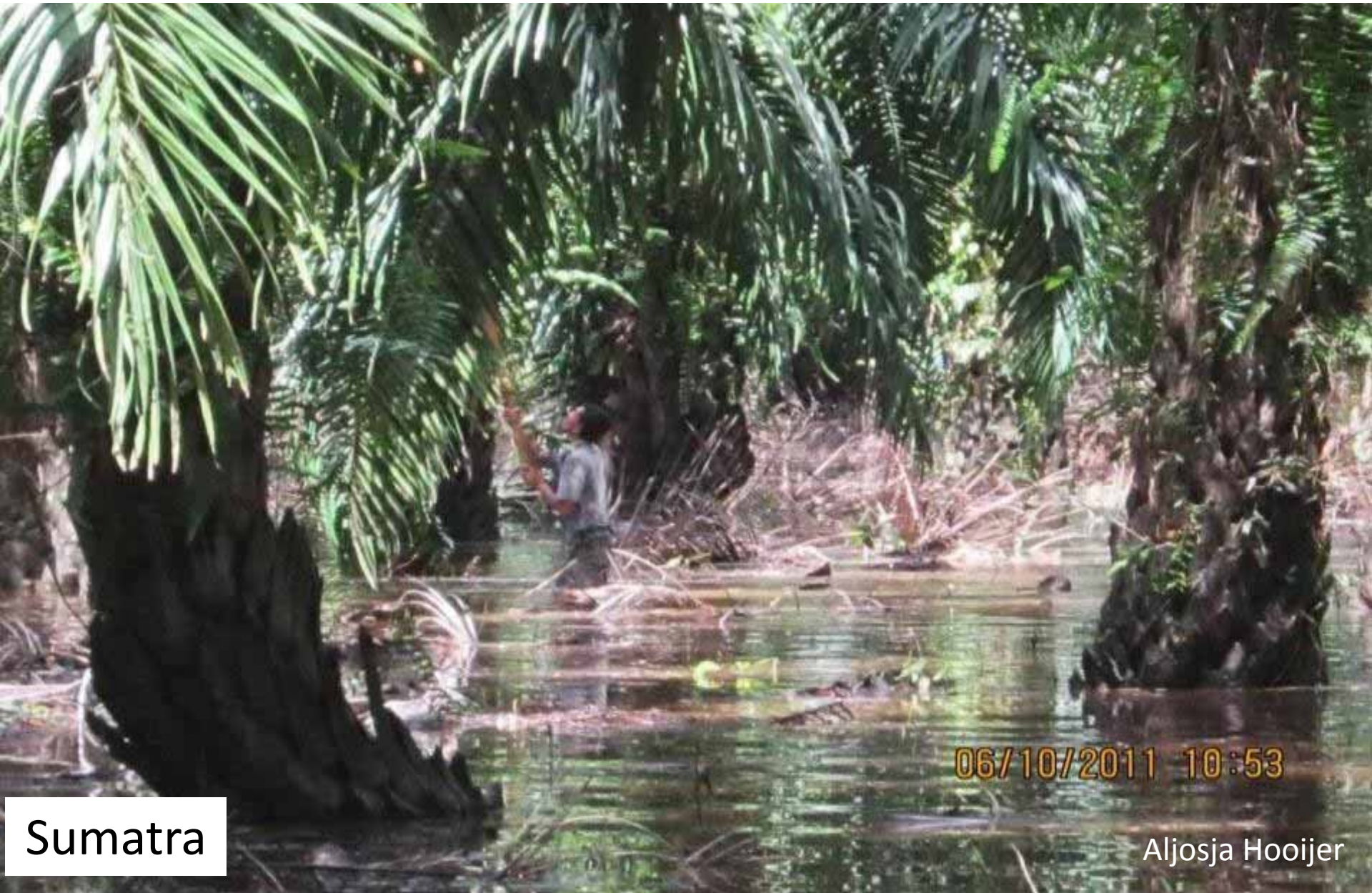
Whereas the sea level rises, we bog the peatlands down….



Many peatlands are coastal and will - with continuing drainage - be flooded…



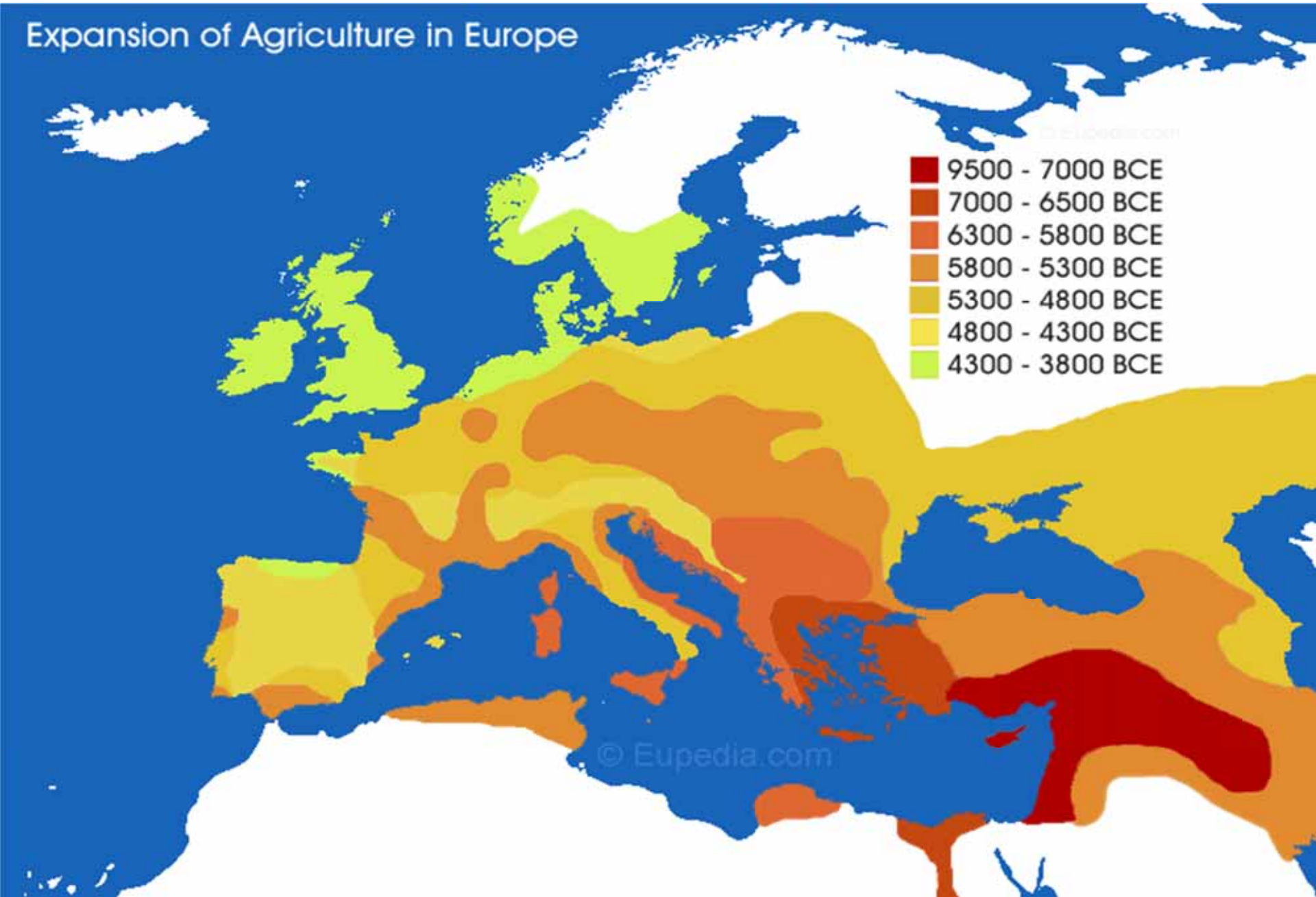
Drained land use on coastal peatland will – in the near future - lead to the loss of substantial tracts of land



We are loosing land, now that we need it most: for more people, for less poverty, and for replacing fossil resources

Kalimantan

Problem: Our land culture had a semi desert as a cradle…



…and has since the idea that productive land must be dry…

Qatar

…and soils continuously be moved…

Qatar

…illusions that we worldwide apply to wet, organic soils…

with desert plants on drained peat in Indonesia: *Aloe vera*

… or semi-arid Maize on drained peat in Germany…

Living peatlands: they still exist worldwide (>80%)….

Botswana

even in Germany  but that is not where it is all about…

When we talk about peatlands and climate, we talk about cows on drained peatland…

Denmark

…hay from drained peatland…

… potatoes on drained peatland…

… forests on drained peatland….

… oil palm on drained peatland…

Malaysia

… pulpwood on drained peatland….

Sumatra

Rewetting solves most of the problems

Rewetting to reduce haze and emissions

Kalimantan

Rewetting to reduce emissions and drainage costs

Germany

Rewetting for carbon credits and for restoring biodiversity

Belarus

But we cannot flood all drained peatland worldwide and take it out of production

We have to solve the drainage problem while maintaining the production function: i.e. with *paludiculture*

Mecklenburg-
West Pomerania

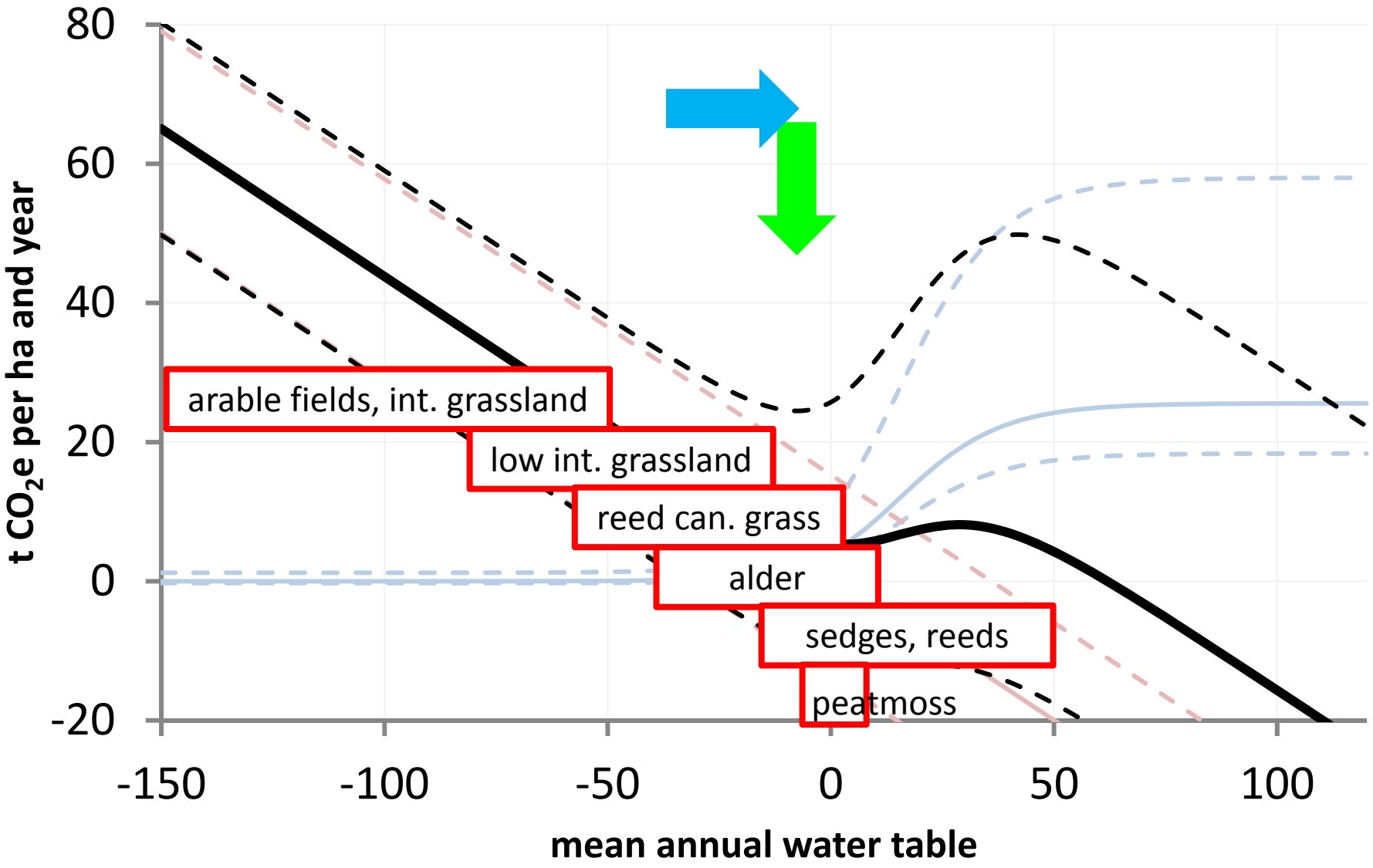
If you need to use them, use them wet!

Poland

Rewetting with paludiculture reduces emissions and produces renewable biomass resources

Germany

Paludicultures under study in Greifswald (cf. excursions)



Reed cultivation: Biomass ánd peat accumulation

Reed: demand in Europa larger than supply

Construction and insulation material from reed

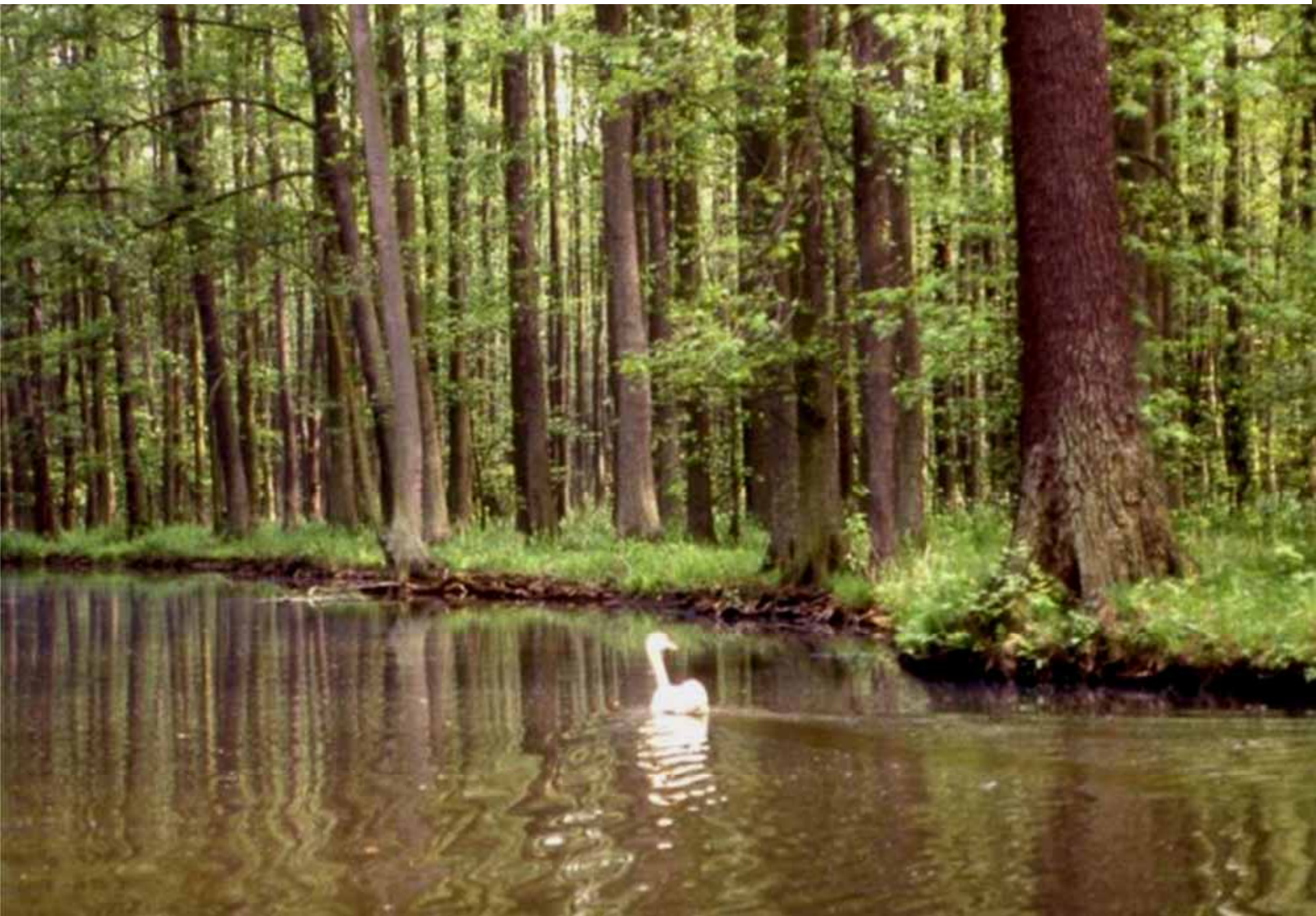
China uses 450.000 ton of reed annually for paper

Jan Köbbing

Neimongol, China

Alder cultivation on rewetted fens

Alder cultivation: biomass ánd peat accumulation



Alder wood: good for furniture and furneer

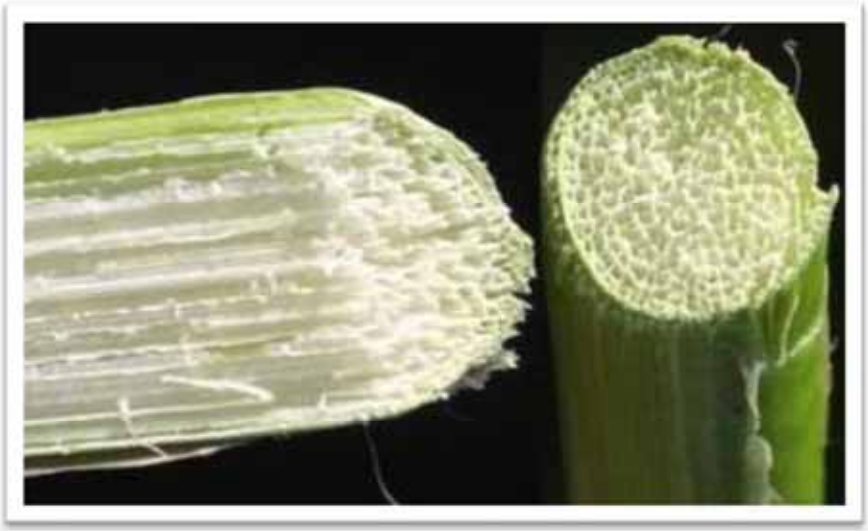
Typha cultivation on rewetted peatland

Bavaria

2017 our first mechanical harvest of *Typha*

Vorpommern

Typha: very strong and ideal for insulation



Since 2014, first city heating plant in Germany using only biomass from rewetted peatlands. More are underway

Peatmoss cultivation on rewetted bog grassland to replace fossil peat in horticulture

Lower Saxony

2016 first large scale harvest of cultivated peatmoss

Water buffalo in rewetted coastal transgression mire

Karrendorf

Cultivation of Typha in the Netherlands

Briquettage of reed in Belarus to replace peat as fuel

Indonesia orientates on paludiculture for its huge peatland rewetting program (2.8 million ha!), e.g. Jelutung

Indonesia

Rewetting provides additional local and regional benefits for climate change adaptation

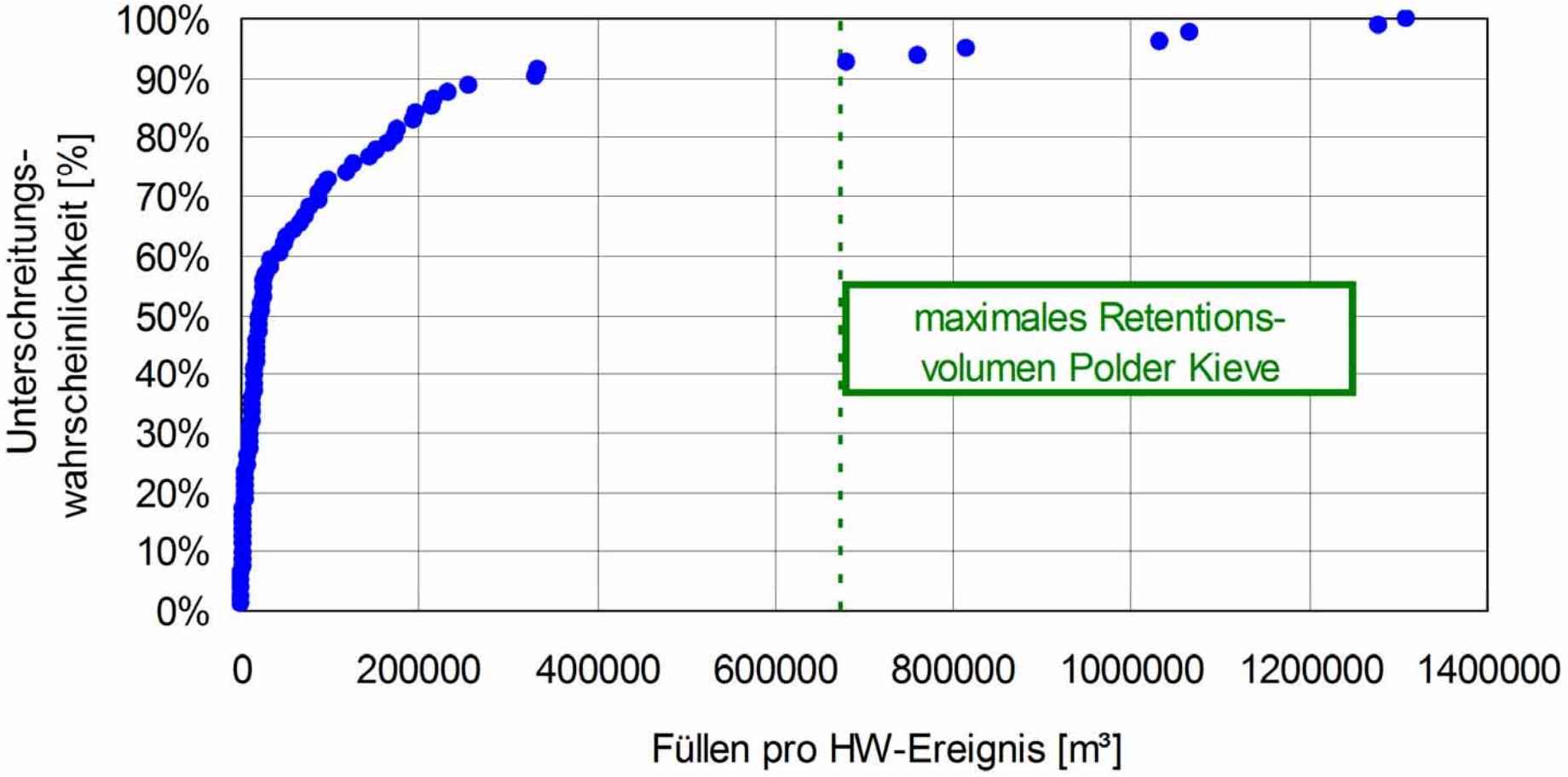
Wet peatlands are ‘cool’: they cool hot landscapes: More energy for evaporation → less for heat

Netherlands

Rewetting **Polder Kieve** cools more (3.0 W m^{-2}) than anthropogenic greenhouse effect since 1750 (2.4 W m^{-2}) has heated

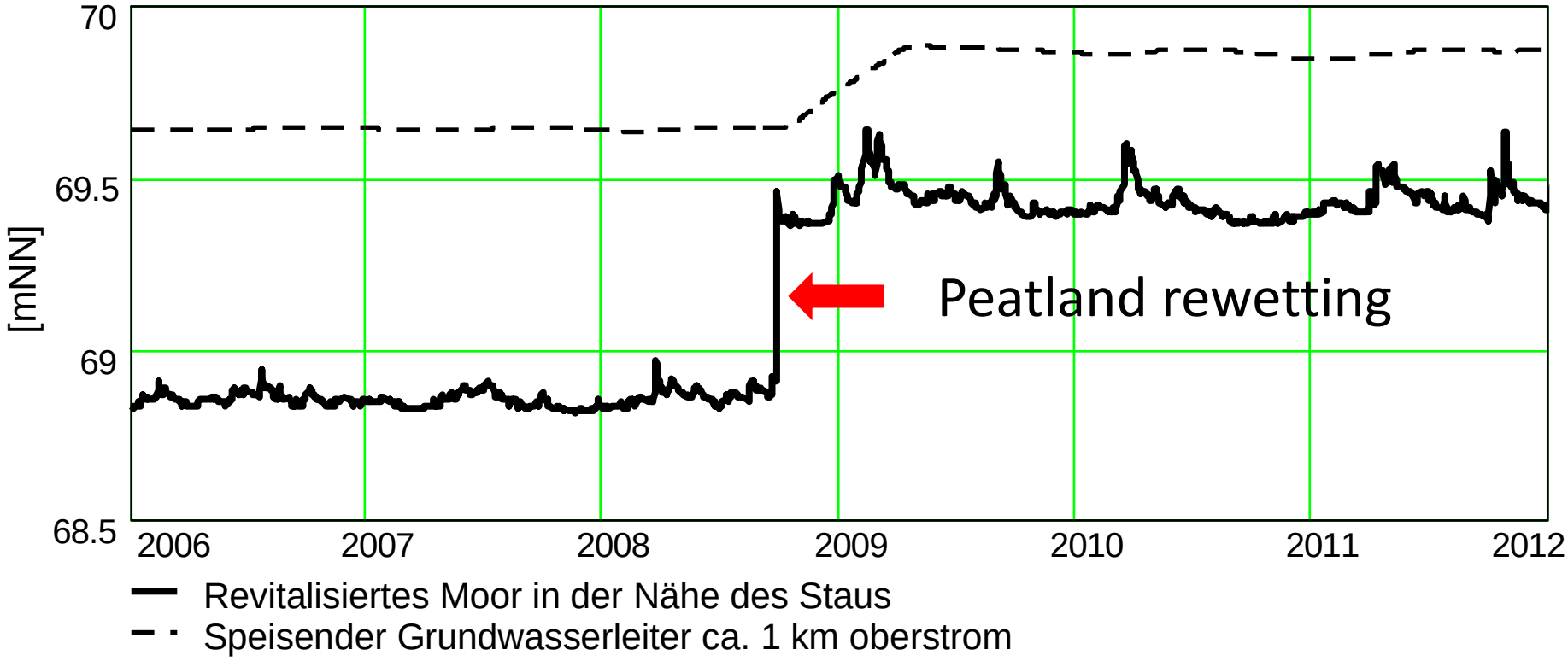
Polder Kieve could absorp 92% of all high water events (1983-2011) and strongly reduce peak flow

Adaptation!

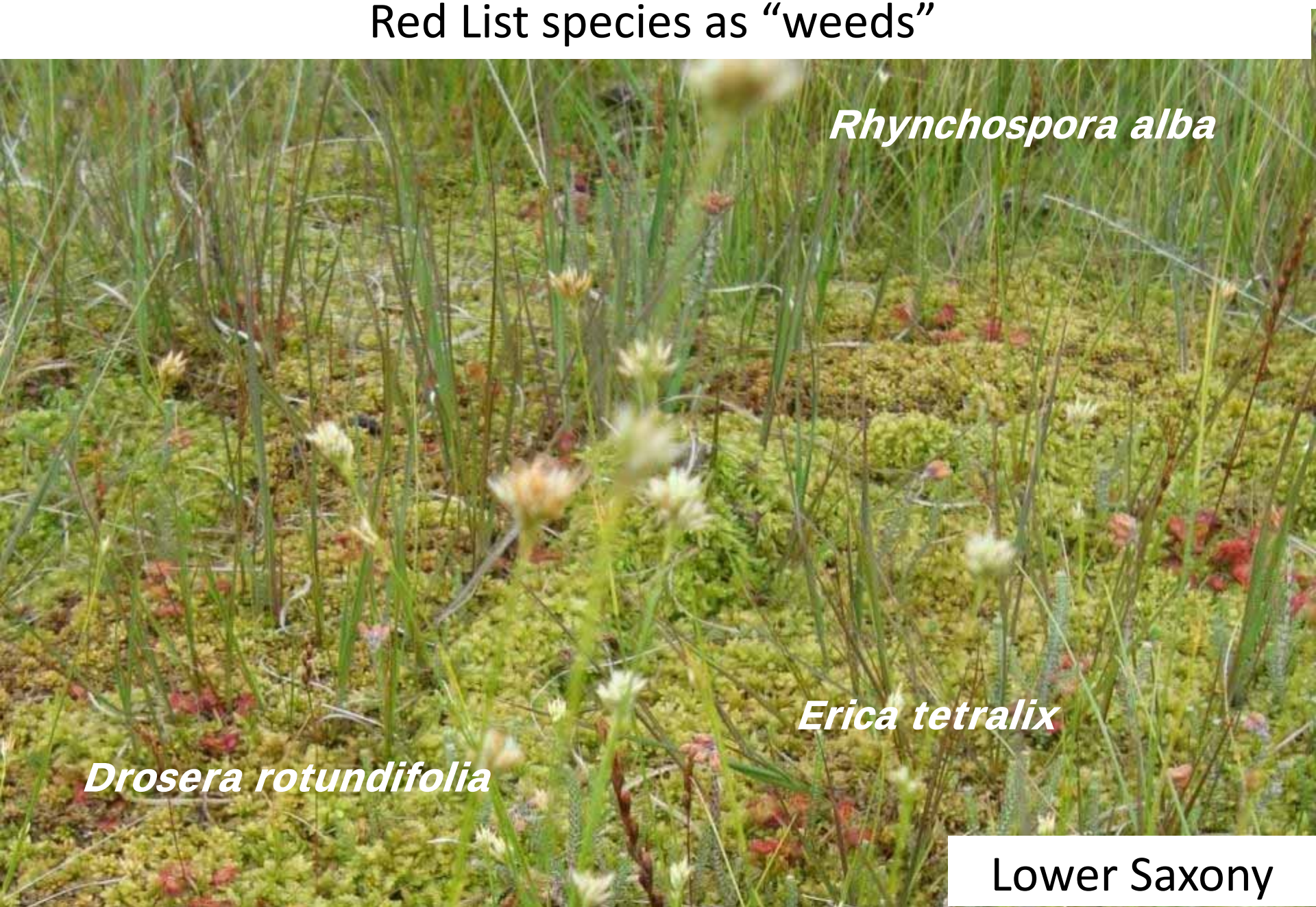


Peatland rewetting retains groundwater in the catchment : good for dry periods

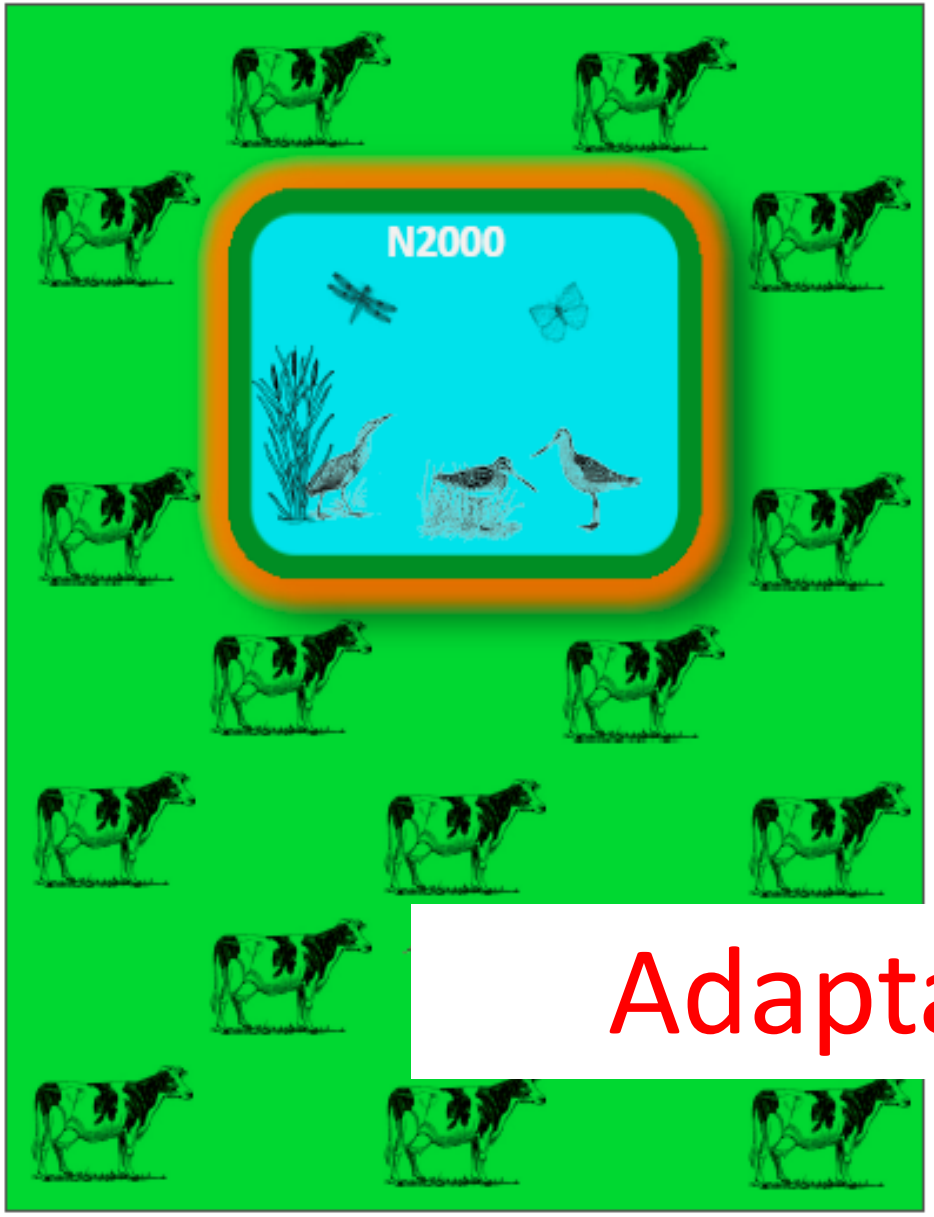
Adaptation!

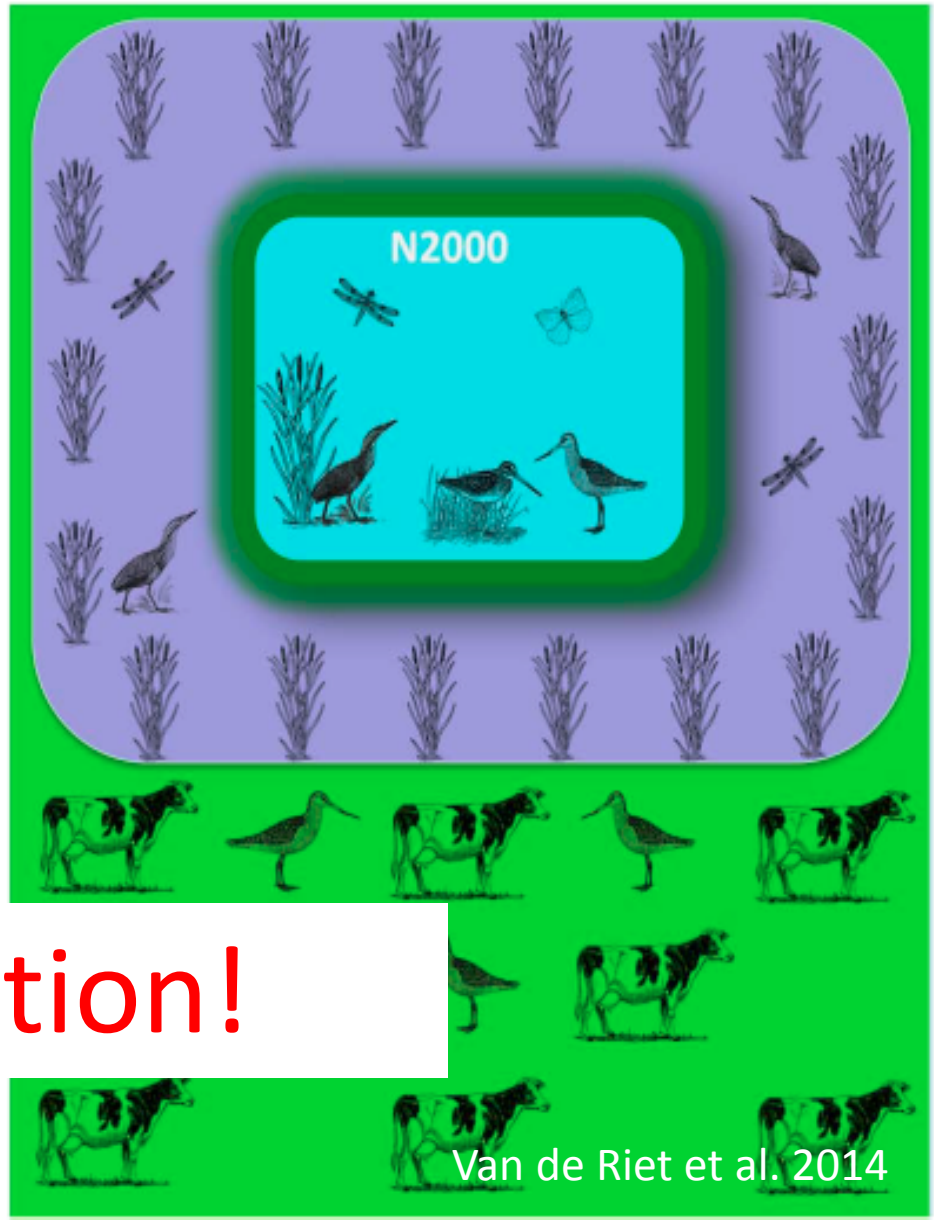


Paludiculture may support species conservation: Red List species as “weeds”



Paludiculture strengthens nature conservation by wet land use around wet conservation sites

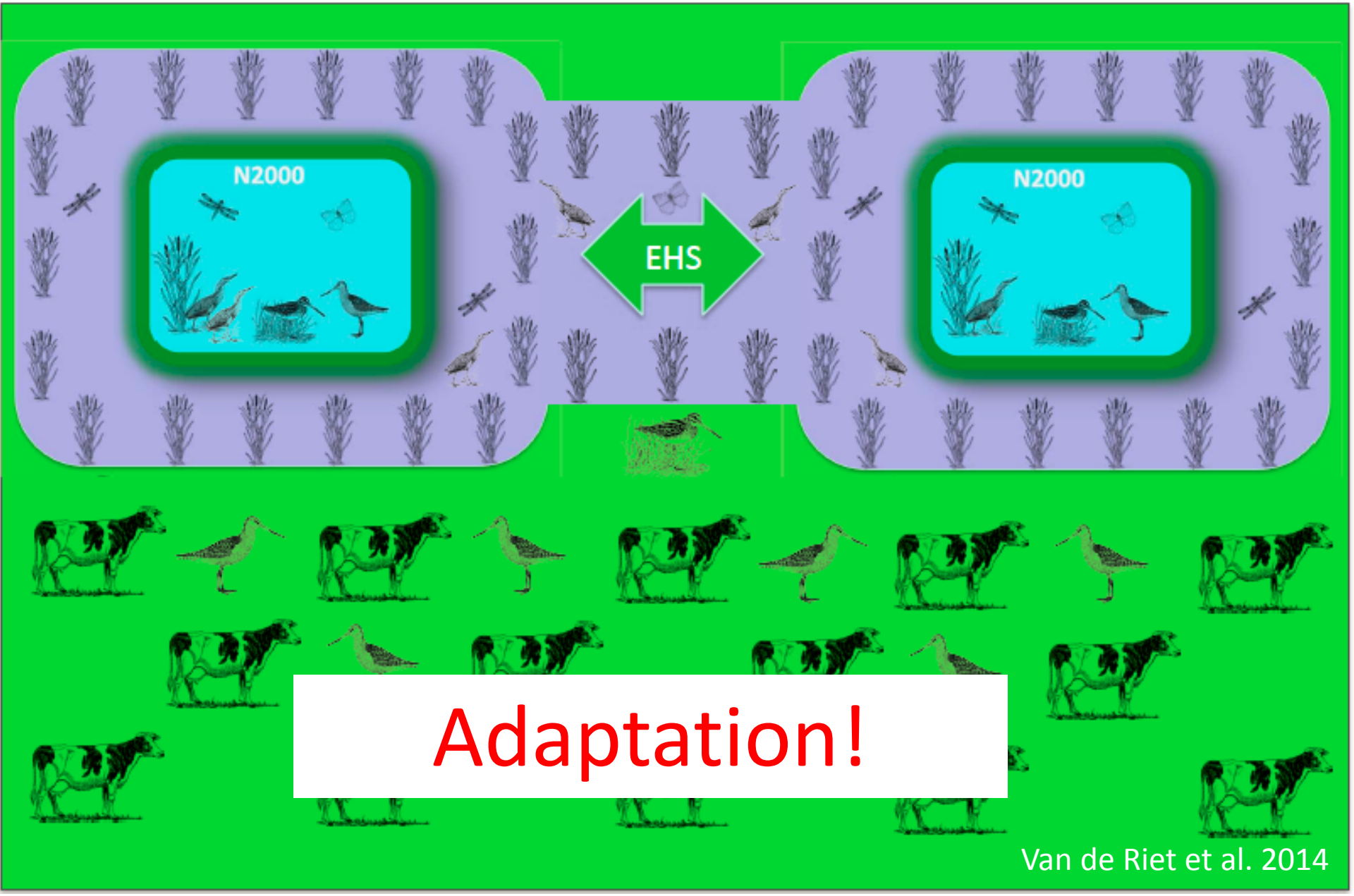




Adaptation!

Van de Riet et al. 2014

Paludiculture allows migration corridors



And coastal flood mires grow up with the rising sea level!

Karrendorf

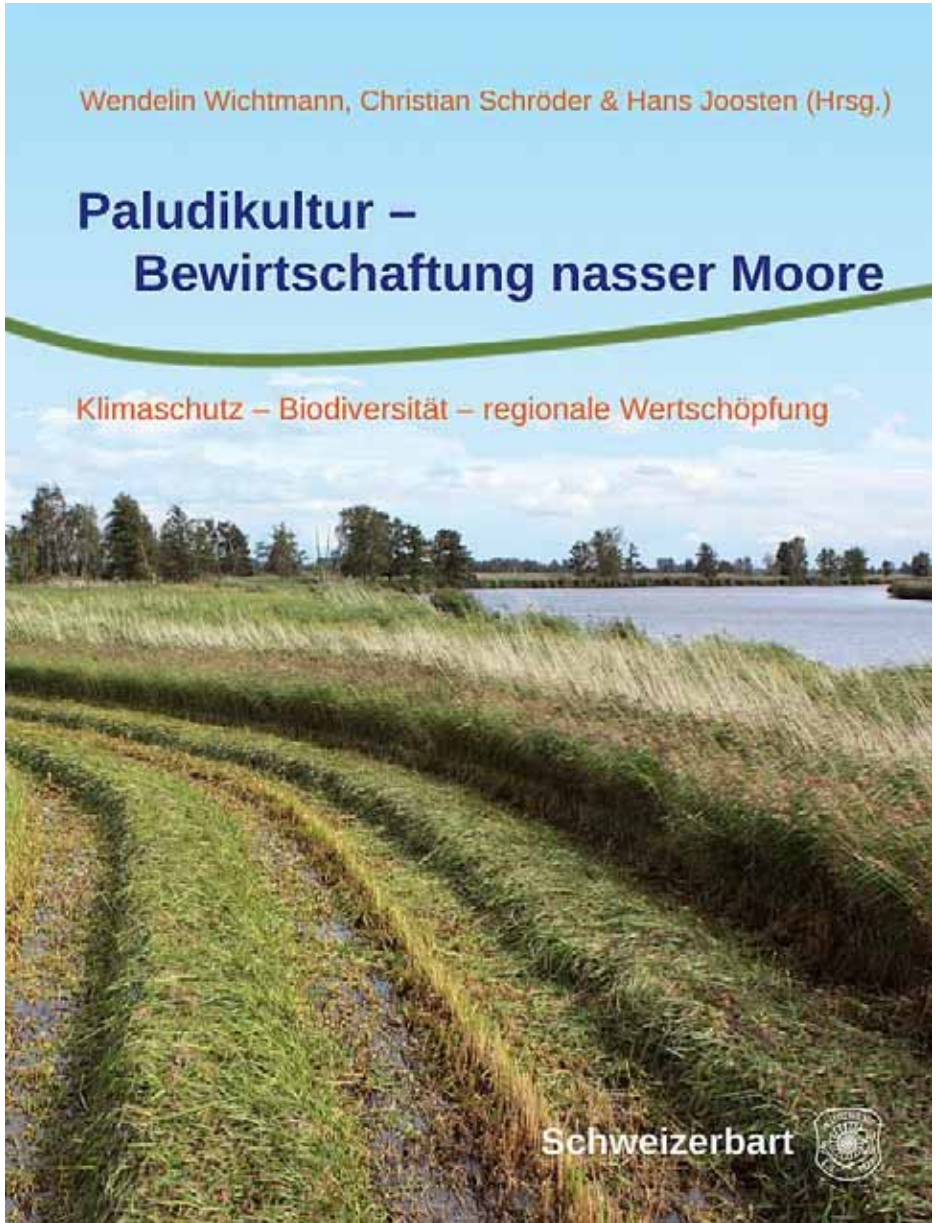
And coastal flood mires grow up with the rising sea level!

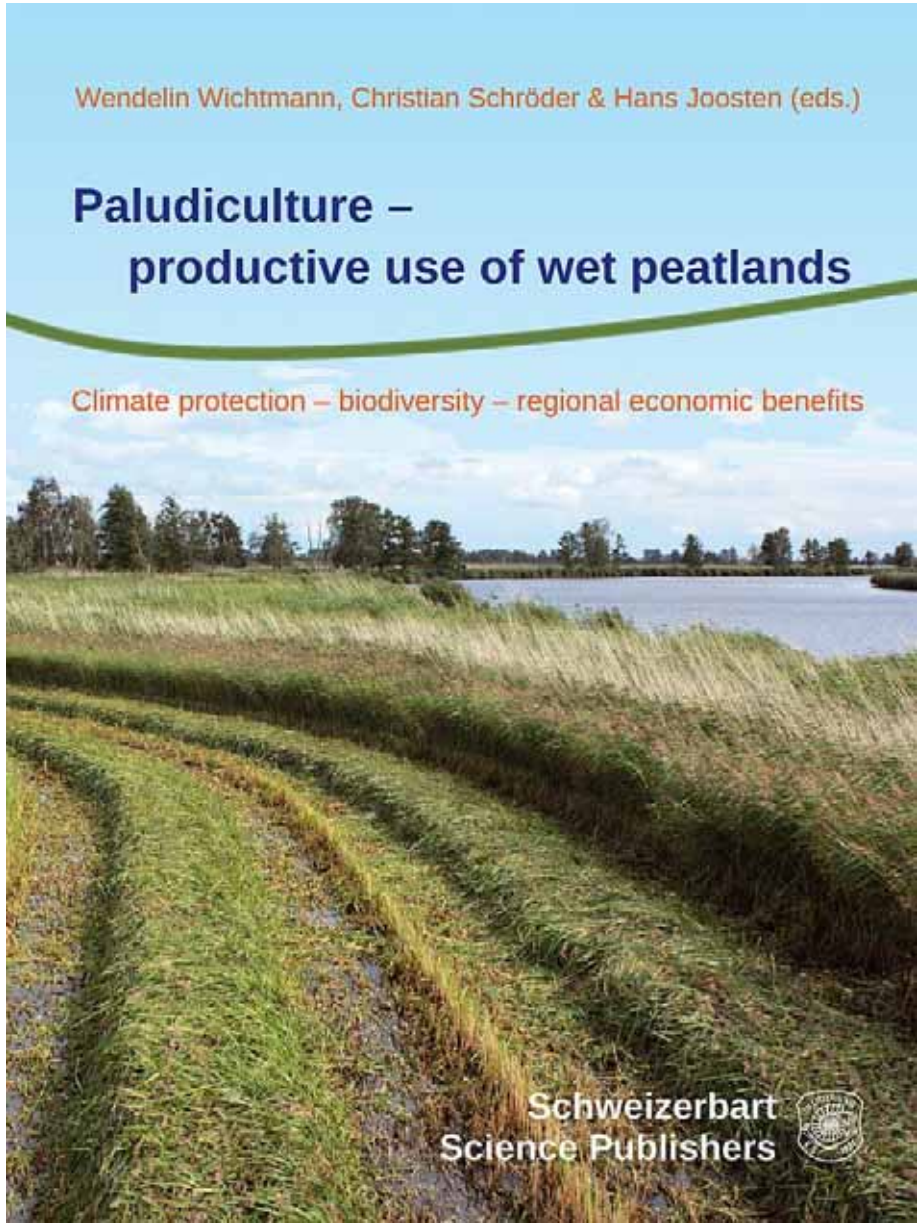
Wet peatlands connect landscapes and political targets: Green network with many synergies

Paludiculture: many advantages and synergies of mitigation and adaptation

- Cheap, effective way to reduce GHG emissions
- Land exploitation with minimal soil degradation
- Rehabilitation of degraded land
- Employment in rural area
- Raw materials for energy and industry
- Resource-political autarchy
- Better landscape hydrology and mesoclimate
- Decreased nutrient emissions to the seas
- Habitats for rare wetland species
- Improved perspectives for (eco)tourism
- Prevention of peatland fires

Knowledge summarized (2016), but large-scale implementation is still lacking…





Paludiculture: like Father X-mas:
Everybody believes in it, but it does not (yet really) exist…

?

Paludiculture: more than a change from carrots to potatoes!

We have desert land in our genes, but need wetness in our heads and in our landscapes!

:

nature International weekly journal of science

NATURE | NEWS

Ancient European genomes reveal jumbled ancestry

Mysterious peoples from the north and Middle Easterners joined prehistoric locals.

Ewen Callaway

02 January 2014

Newly released genome sequences from almost a dozen early human inhabitants of Europe suggest that the continent was once a melting pot in which brown-eyed farmers encountered blue-eyed hunter-gatherers.

Present-day Europeans, the latest work shows,

Paludiculture is ‘unknown land’

Development of the entire production chain:
Crops, infrastructure/logistics, products, machinery, ….

Skipping of perverse agricultural subventions and adaptation of old-fashioned laws and regulations

Awareness raising, pilot and demonstration sites

Research!

Research: 10,000 years behind…

Awareness raising worldwide

Global Peatlands Initiative

The Global Peatlands Initiative is a targeted effort by leading experts and institutions to protect peatlands, the world's largest terrestrial organic carbon stock.

www.globalpeatlands.org

Ramsar Convention on Wetlands

UN environment

Wetlands International

Food and Agriculture Organization of the United Nations

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GPI: south-south and triangular exchange

Aims simple and clear: no land loss, 0-emissions by 2050.
And getting the curve soon!

Karrendorf

How are we doing? UNEP-EGR: Global emissions from drained peatlands will be 300 Mt CO_2e lower in 2030 than in 2015

Wetscapes MV

>200 Mt CO_2e from SE Asia, 10 Mt from Europe (sic!)…
So we are getting the curve. But no paludiculture yet….

Brunei

After 2030 we have to massively implement paludiculture to approach the 0-emission goal by 2050

Paris + Peatland = Paludiculture

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Peatlands must be wet:
for the climate, for the land,
for the people, for ever…