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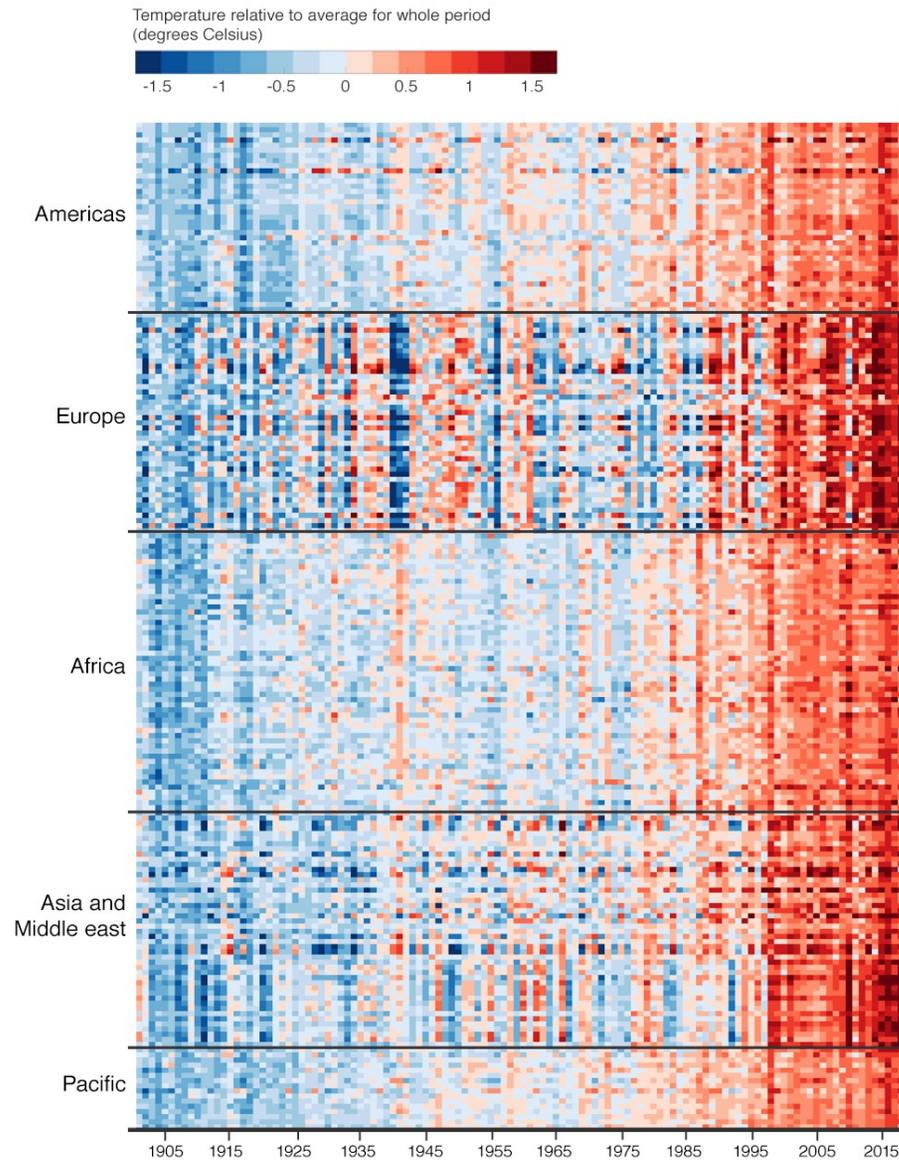
Land use on organic soils – Implications of the Paris Agreement and the way forward

Hans Joosten

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Over last decades our planet is getting warmer and warmer...

Temperature changes around the world (1901-2018)



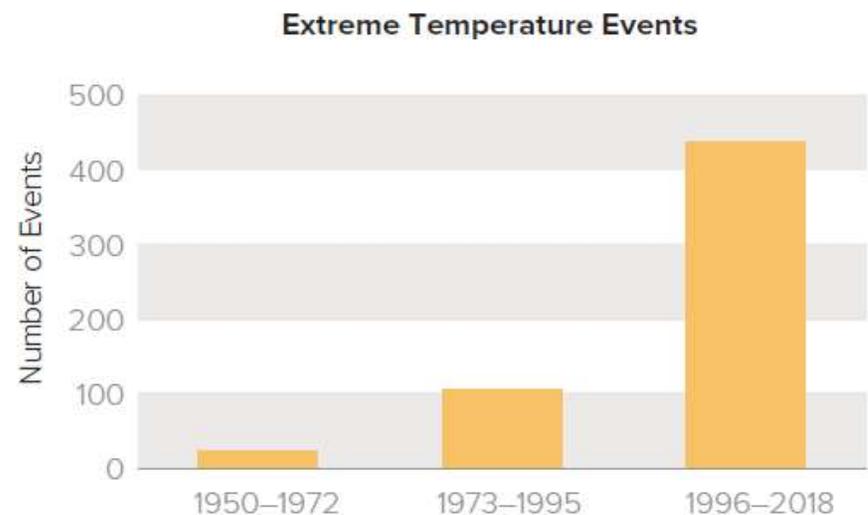
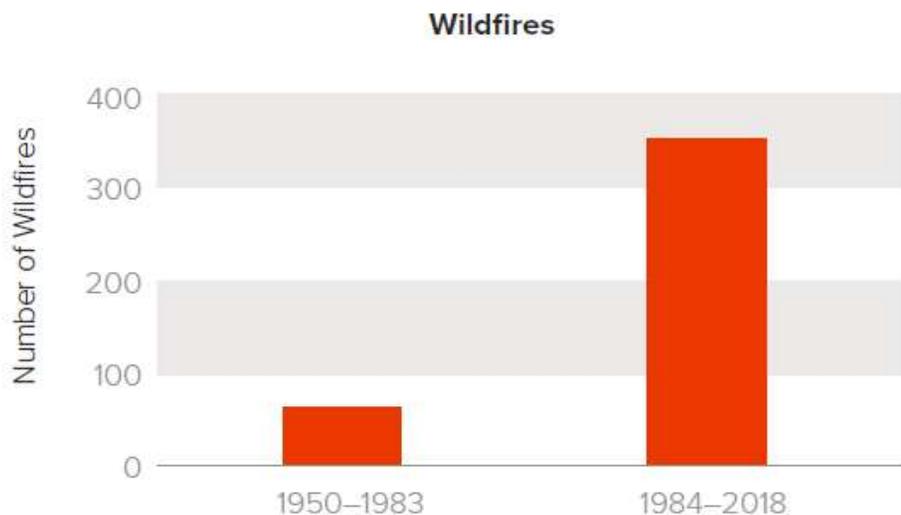
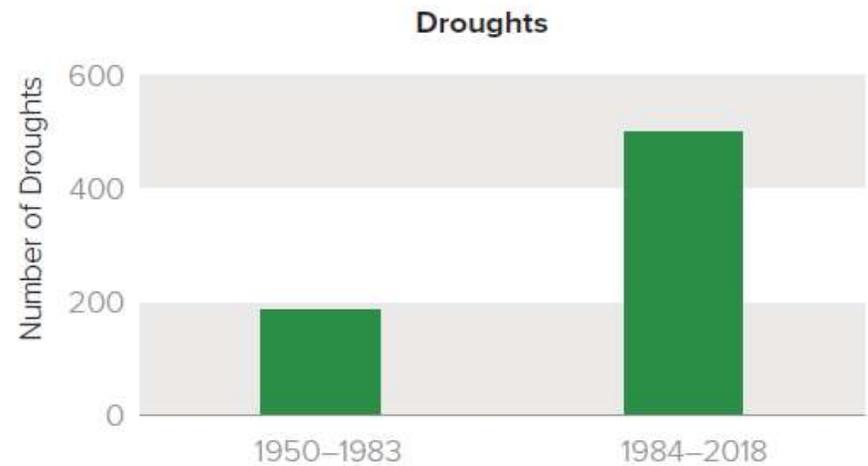
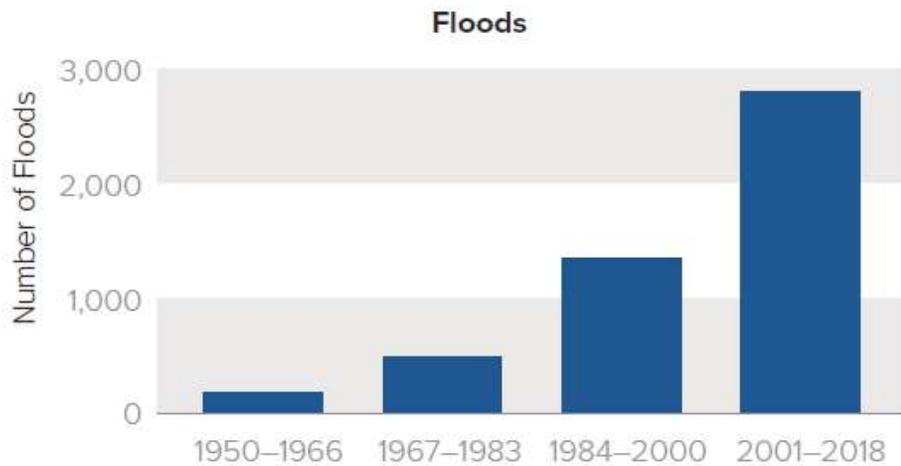
<https://www.bbc.com/news/science-environment-48678196>

...with decreasing food and water security, and growing social breakdown, conflict and migration...



Ethiopia

Frequency and severity of disasters are rapidly increasing with enormous losses of lives and money



These developments – we *all* have agreed – have to stop....

Nations Unies

Conférence sur les Changements Climatiques 2015

COP21/CMP11

Paris France

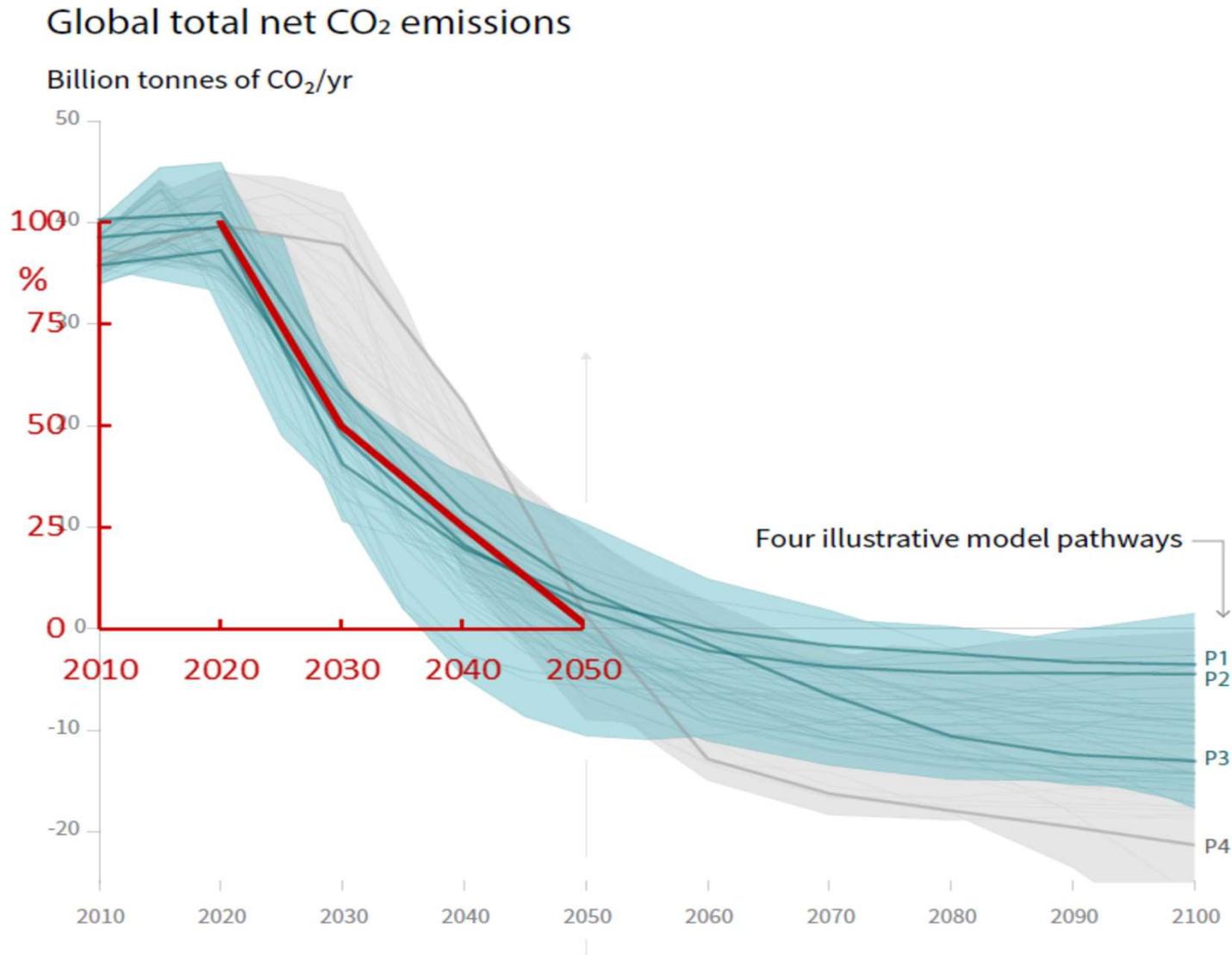


Paris has made the world simple: one common goal: $< 2^\circ$

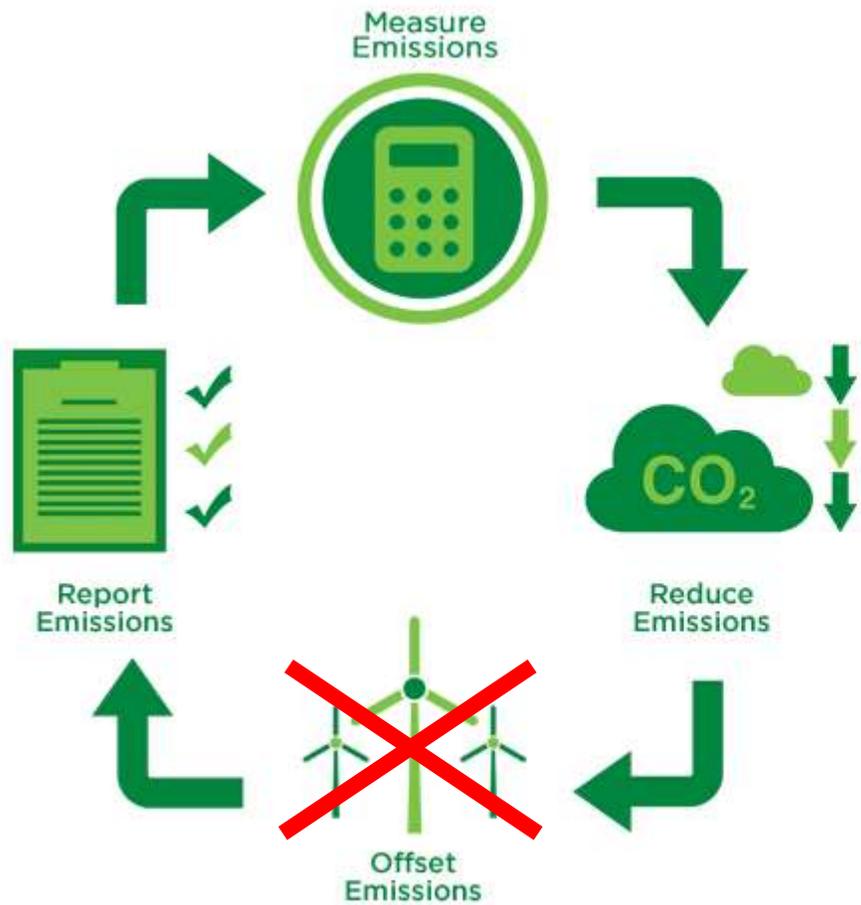


Georgia

1.5° Report (IPCC 2018): CO₂ Zero in 2050, net sink after 2050, Non-CO₂ -30% in 2030



Everybody back to **zero-C**: me, you, this city, this country, the peatlands... No excuses, eventually no offsets anymore...



1. Measure Emissions

2. Reduce Emissions

~~3. Offset Emissions~~

4. Report Emissions

Paris agreement (+ SDGs): “...in the context of sustainable development and efforts to eradicate poverty” ...



North Korea

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



Belarus

In living peatlands ('mires'):

- Biomass production larger than decay
- Dead plants accumulate as 'peat'



Georgia

Peat accumulates through water saturation...



Belarus

Peat accumulates during thousands of years and stores concentrated carbon in thick layers



North Korea

Global peat C-sink is small: compensates for only 1% of annual C-emissions from burning fossil fuels.



Germany

More important: C stock! Peatlands are most space-effective
C stores of all terrestrial ecosystems: 1 ha = $2 \cdot 10^6$ liter diesel



Ireland

A 15 cm thick layer of peat contains per hectare more carbon than a High-Carbon-Stock tropical rainforest



Gabon

On only 3% of the global land area, peatlands contain >500 Gigaton of carbon in their peat



Rwanda

i.e. twice the carbon stock of the World's total forest biomass
on 30% of the land

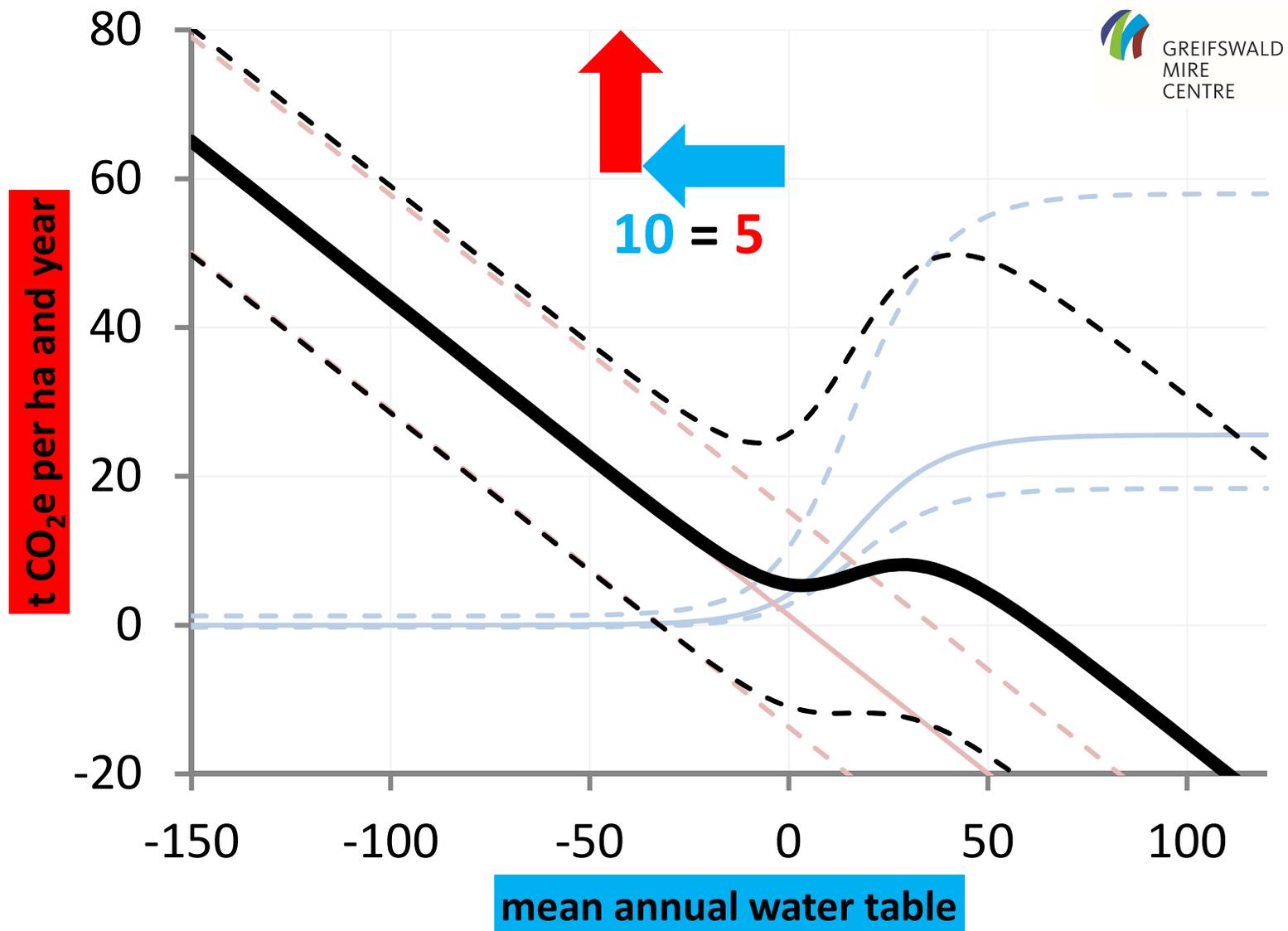


Sabah

Peat is like pickled herring or gherkins: when you remove the conserving water, the organic matter rots away



Deeper water table → more greenhouse gas emissions:
In C-Europe: every 10 cm deeper → 5 tons per ha more,



Deeply drained grassland on peat in Germany emits 29 T CO₂e per ha per year = 145,000 km with middle class car



Food print...



1 kg cheese
= 55 kg CO₂

1 l milk
= 2.4 l petrol

Germany

A potato field on peat in Europe emits 37 T CO₂e /ha/yr
= more C than the produced potatoes contain...



Vildmosekartoffel are
fossil resources...

Germany

Globally, drained peatlands emit 2 Gigatonnes CO₂e /yr,
i.e. 0.4 % of the land produces 5% of all global emissions

...by microbial oxidation and peat fires...



Indonesia

Photo by Bjorned
Palangka Raya, Sept. 2015

Indonesia leads the list of global top emitters...



Indonesia

But, and that is often forgotten:
the European Union is a good second ...



Netherlands

Worldwide, agriculture is main cause of peatland drainage



Indonesia

In EU28, organic soils produce **26 %** of all agricultural emissions (cf. 51% husb., 25% fertile., **-2% min. soils**)



Germany

In EU28, organic soils produce **26 %** of all agricultural emissions (cf. 51% husb., 25% fertile., **-2% min. soils**)

Increasing C-sequestration in mineral soils with a factor 10 will not compensate for losses from organic soils!

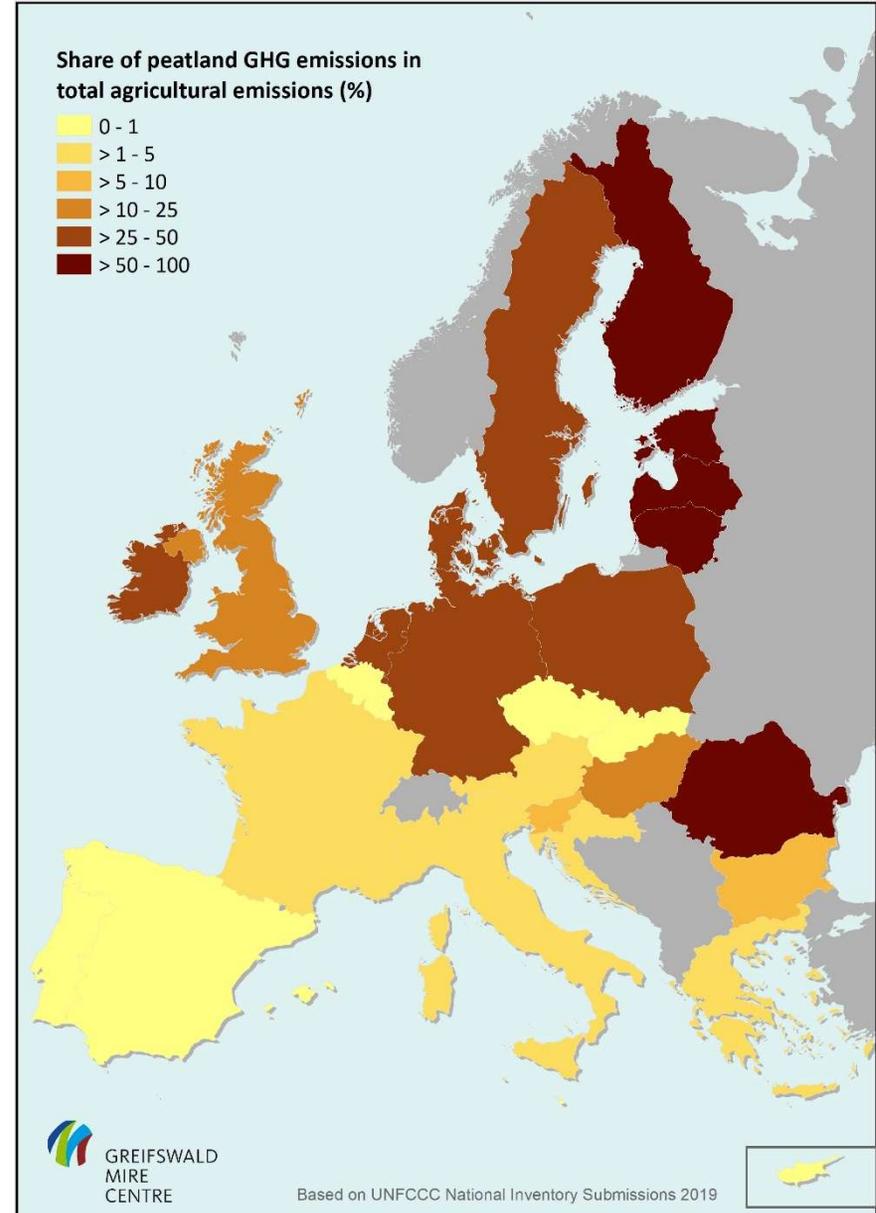
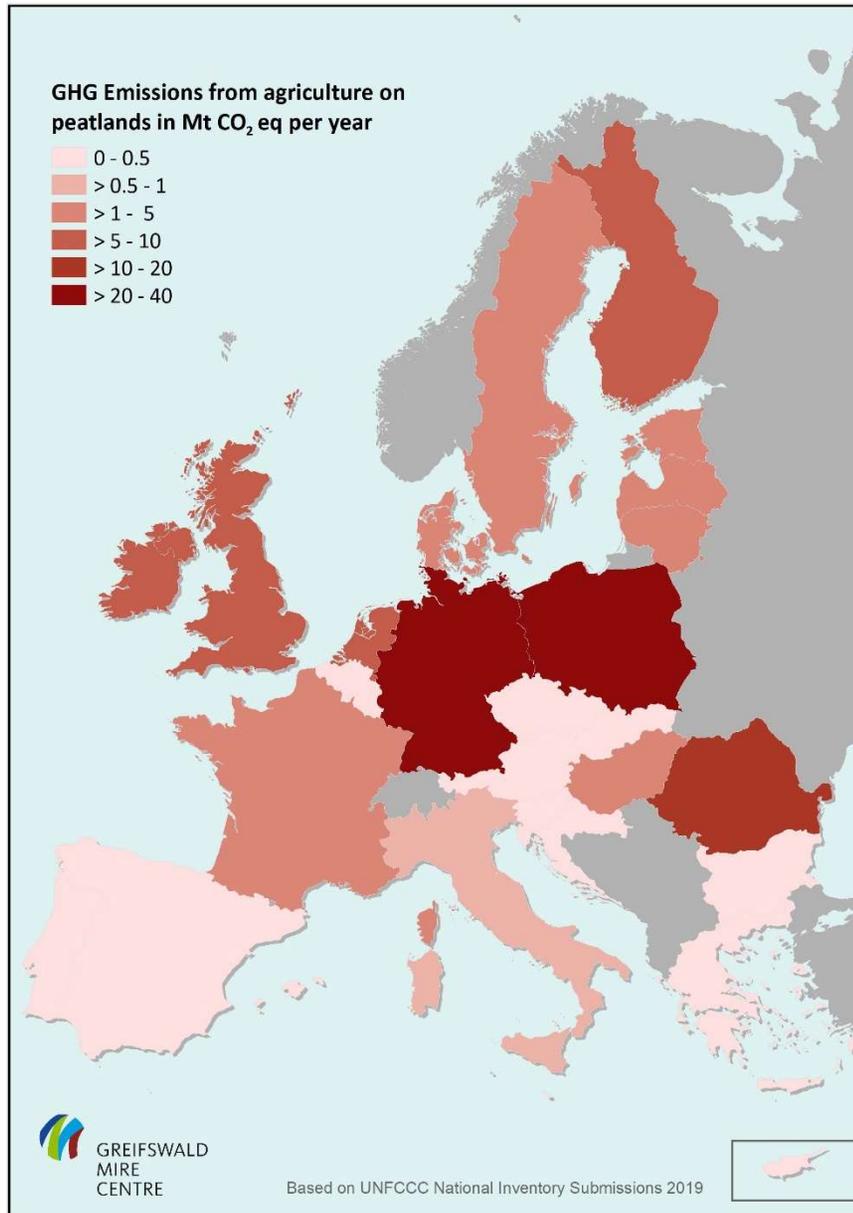


Germany

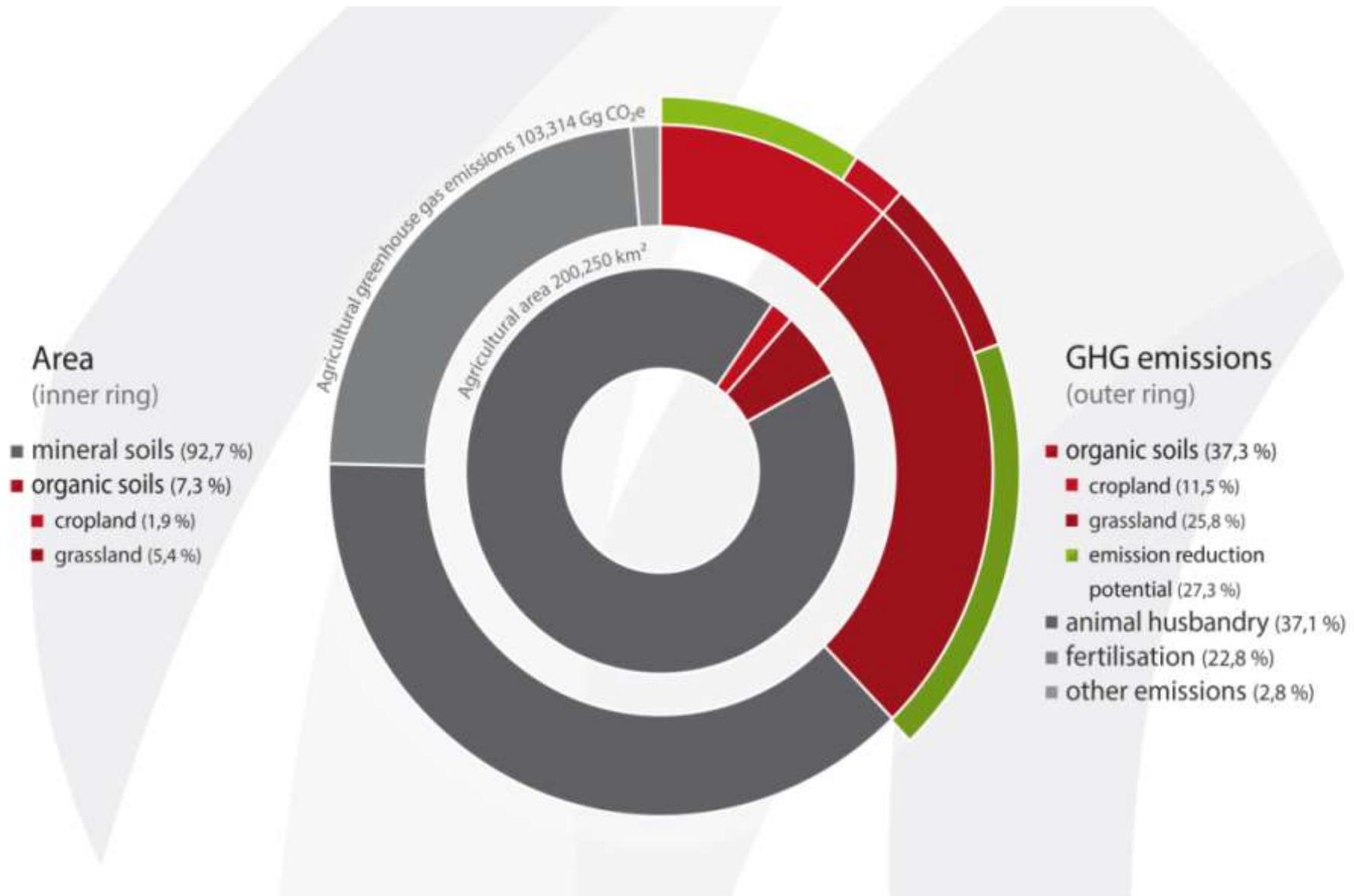
In Denmark organic soils produce **29 %** of all agricultural emissions (cf. 50% husb., 24% fertil., **-5% min. soils**)



In many EU countries agricultural peatland emissions are large, both absolute and as share of total agriculture



E.g. Germany: 7% of agr. land causes 37% of all agricultural emissions (incl. CH₄ from animals and N₂O from fertilizers)



Agricultural peatlands in Germany emit twice as much as the 3th dirtiest energy plant of Europe



Germany

In Germany peatland agriculture causes annually a climate damage of € 7.4 billion, and gets > 410 million EU-subsidies



Germany

Maik Stegmann

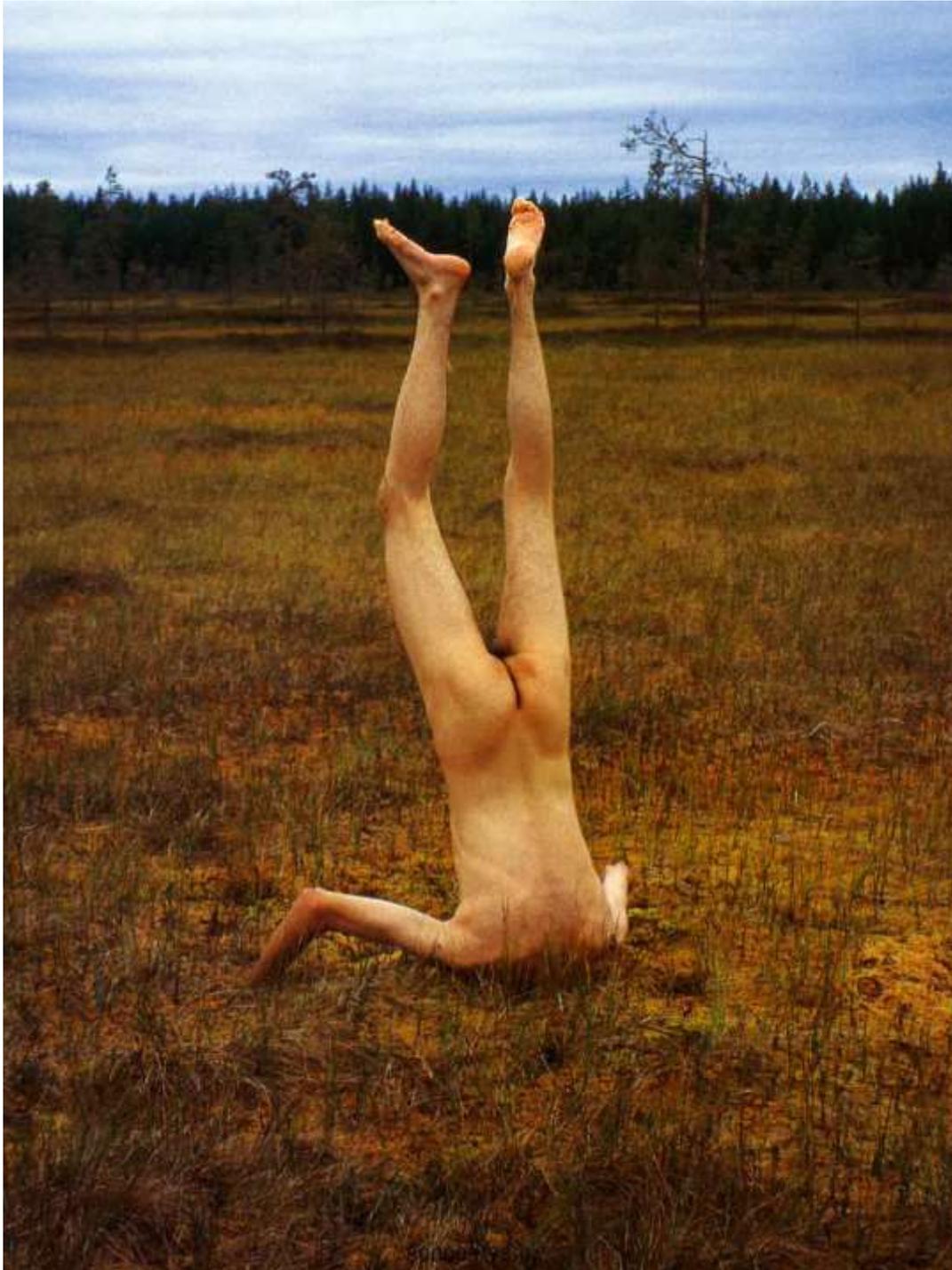
€ 7,4 billion climate damage equals the total net value-added of total German agriculture in 2018



“Biogas” from maize on peat causes 8x more climate damage than burning lignite...but is subsidized as ‘green energy’



Germany

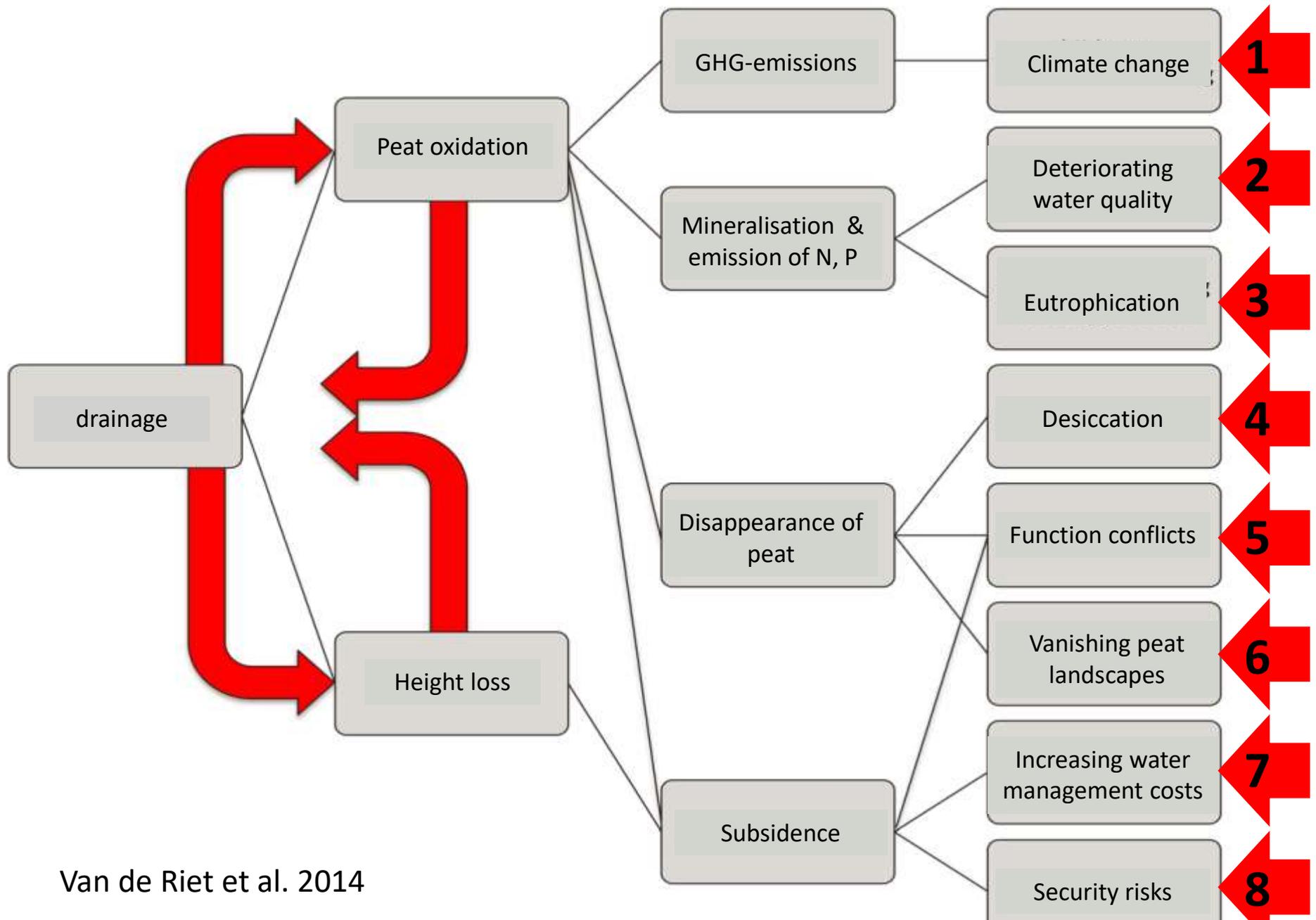


The 'polluter pays' principle is put on the head:

We pay peatland agriculture while causing massive climate damage

... and frustrate in this way sensible solutions

Climate damage is merely one of the damages of drainage



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

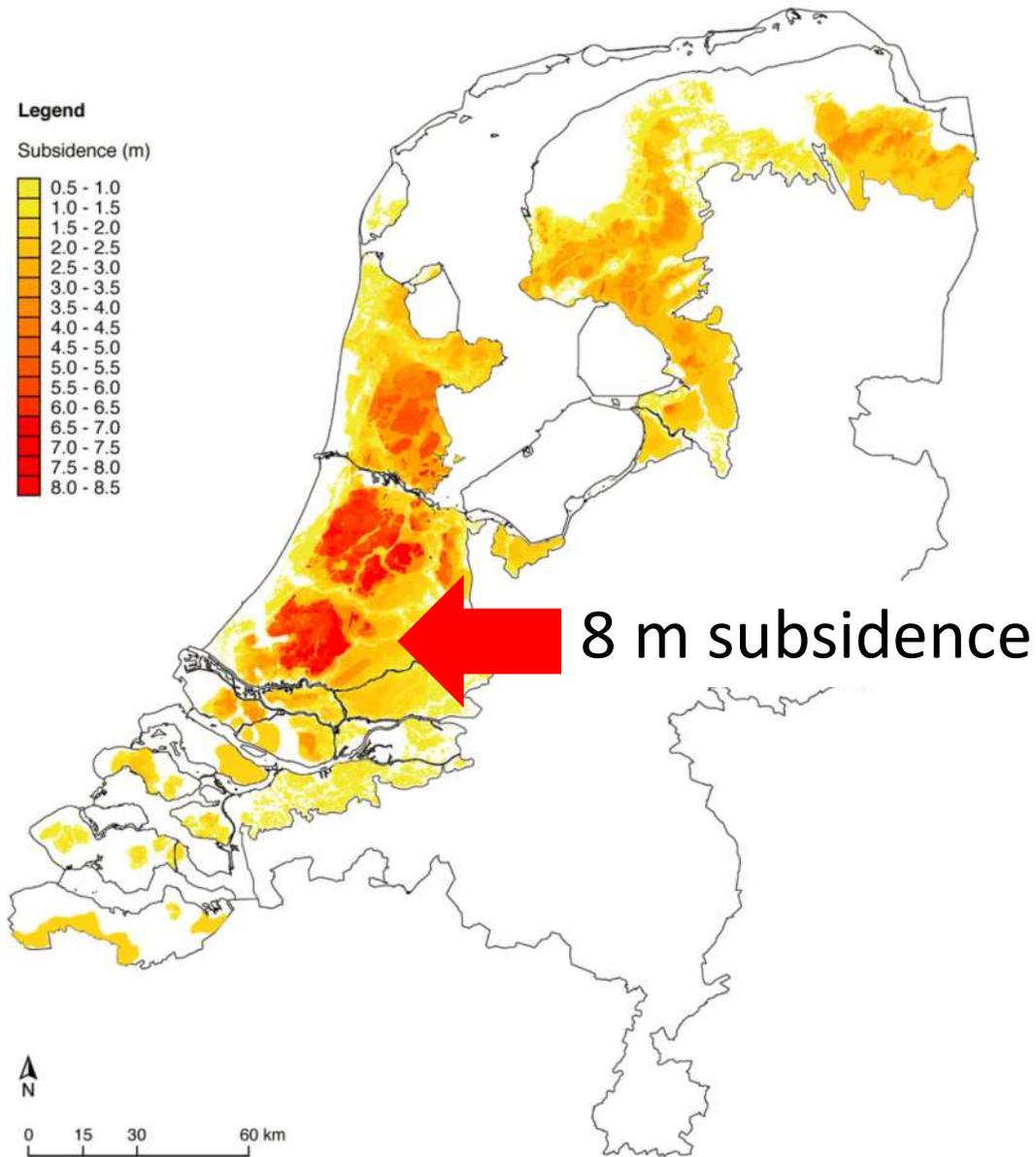


Bavaria: 3 m loss since 1836

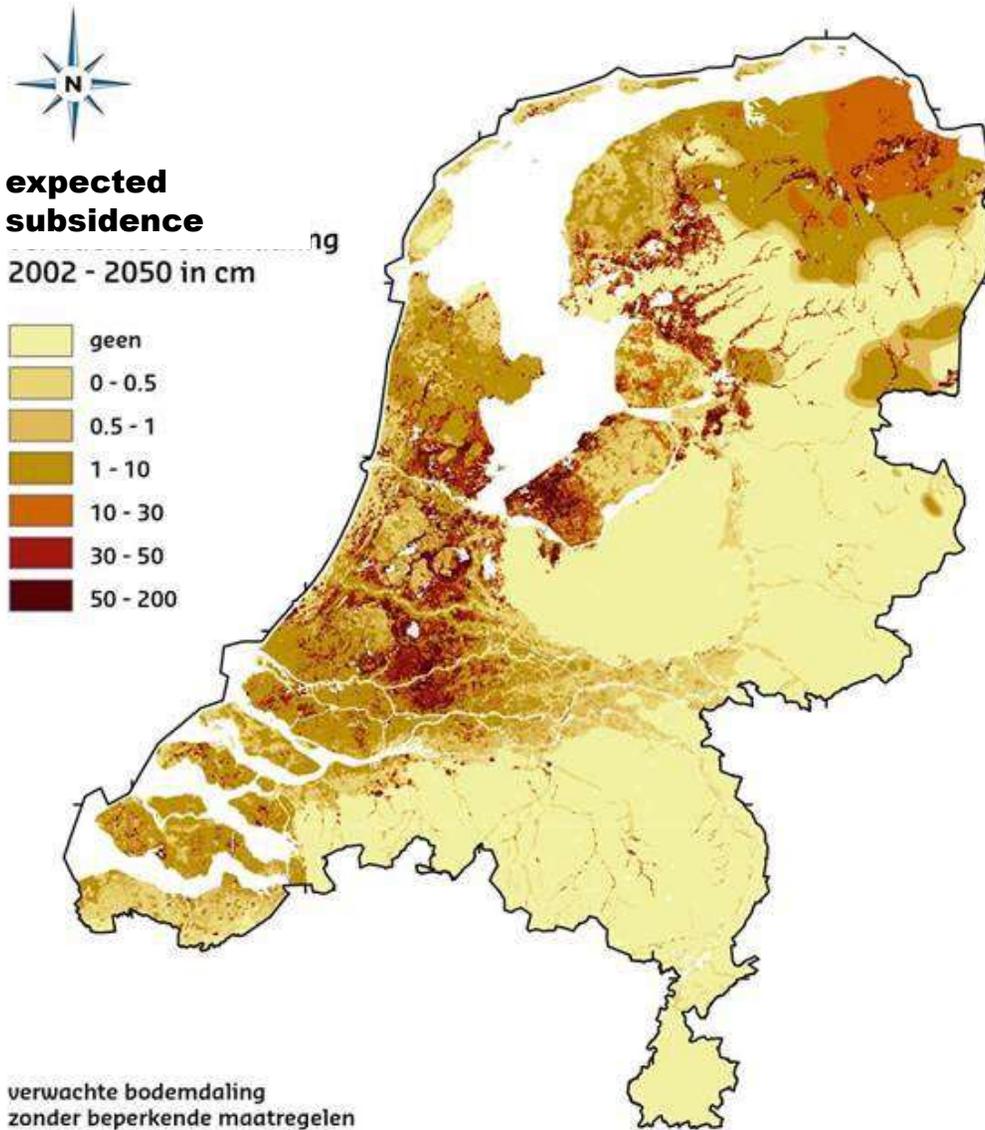


UK: 4 m loss since 1870

Nether-lands: 1000 yr of peatland drainage (1 cm per yr)

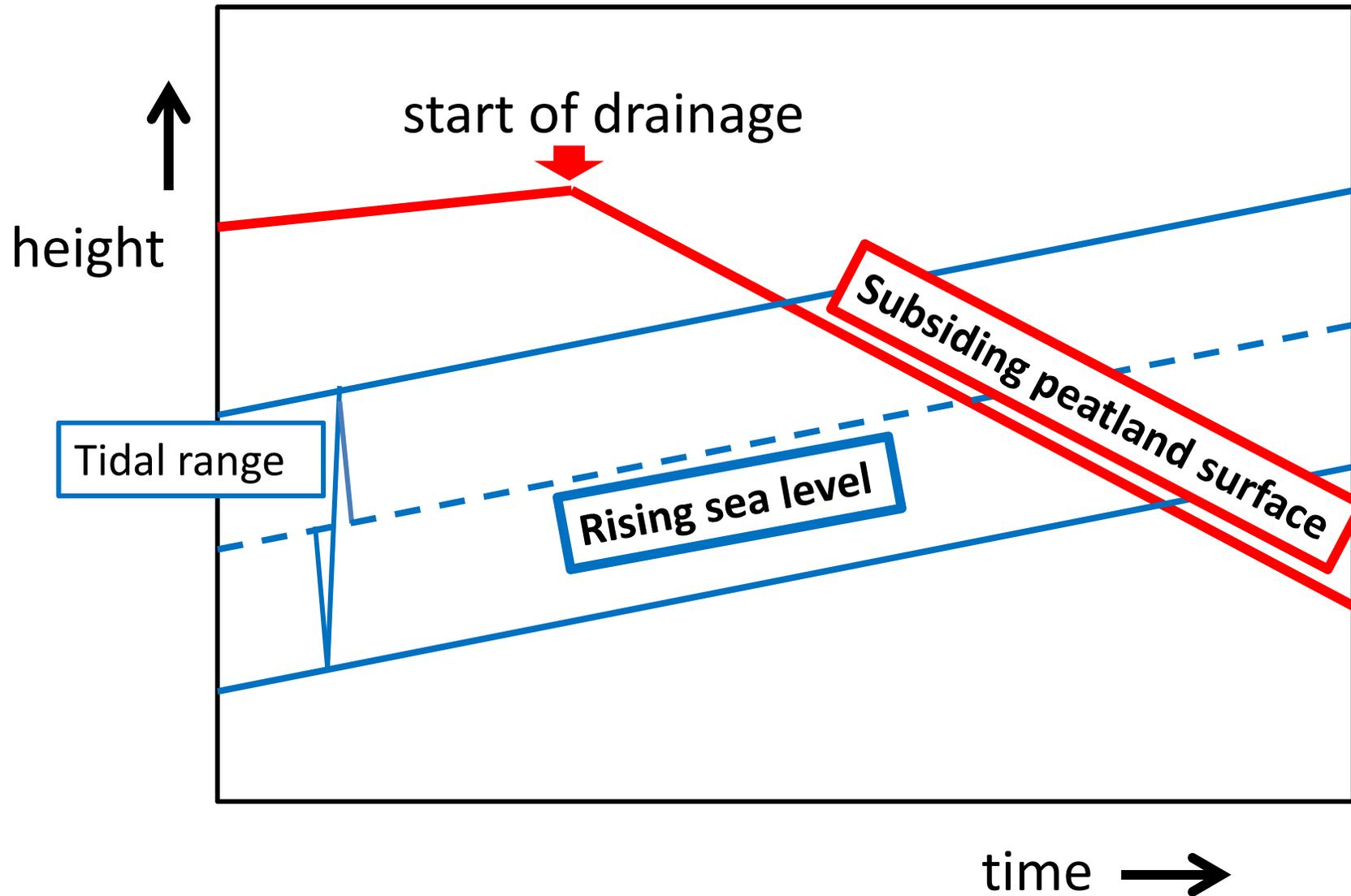


...and subsidence continues as long as you drain peat...



**In
tropics
subsidence
5 times faster!**

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



Many peatlands are coastal and low-lying and will - with continuing subsidence- be subject to uncontrolled flooding...



Germany

Irma could harm Florida's crops, especially sugar cane and citrus

BUSINESS

By Susan Salisbury - Palm Beach Post Staff Writer



USA

Netherlands: We cannot continue keeping peatland drained for farmers (27-10-2018 © Het Financieele Dagblad)

MILIEU EN KLIMAAT

We kunnen veengronden niet blijven ontwateren voor de boeren



Lars Hein is hoogleraar Milieusysteemanalyse, Wageningen Universiteit

Een controversieel element van het klimaatbeleid is de omgang met veengebieden. Deze worden gedraineerd voor de land-



Peatland subsidence will in this century lead to uncontrolled flooding of 10-20 million ha of productive land worldwide



Sumatra

06/10/2011 10:53

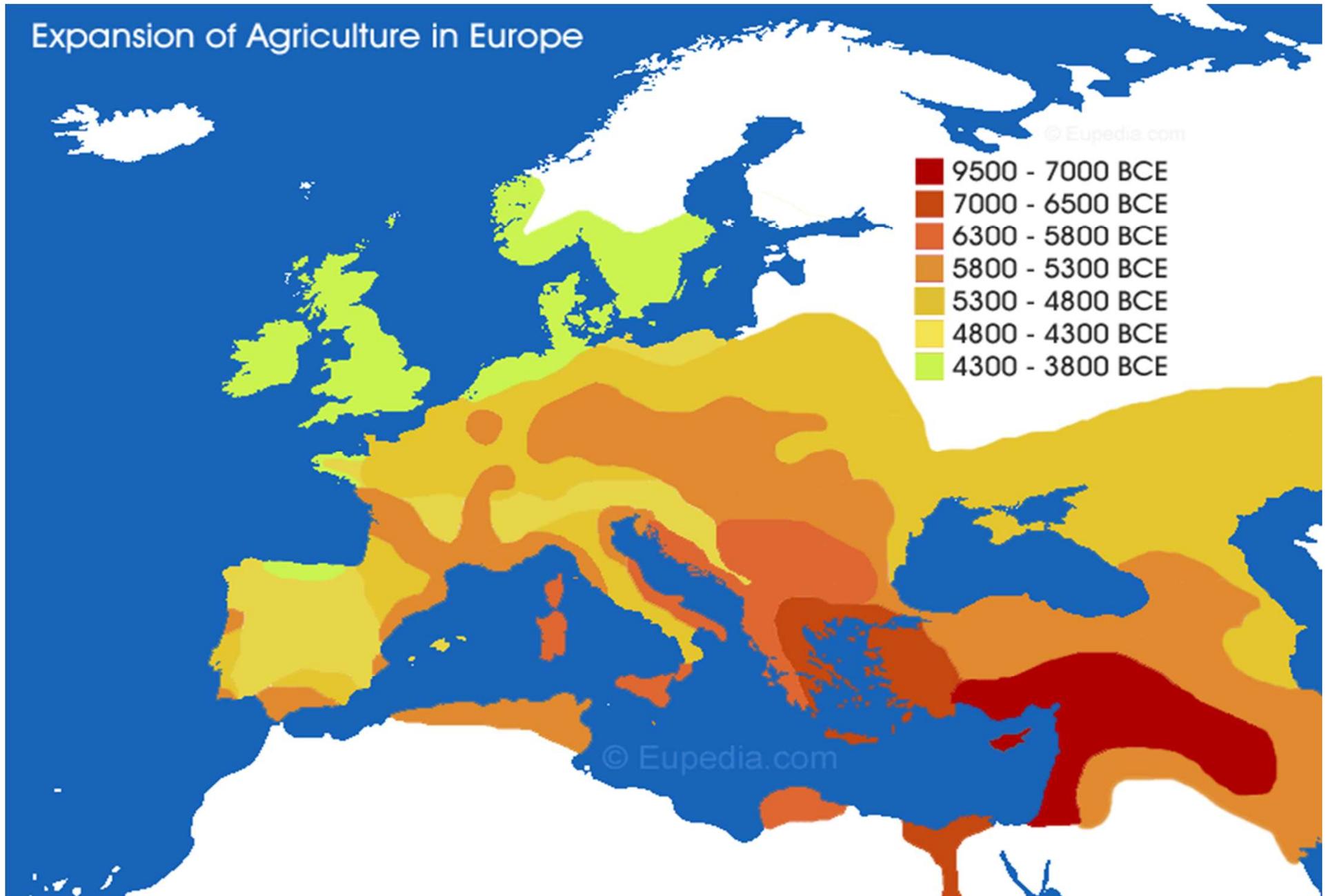
Aljosja Hooijer

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



Kalimantan

Root problem: Our agriculture had a semi desert as a cradle...



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



Qatar

...and soils continuously moved...



Qatar

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



Germany

Greta Gaudig

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



Kalimantan

Bostang Radjagukguk

... or semi-arid Maize on drained peat in Europe...



Germany

Rewetting solves most of the problems and provides additional ecosystem services



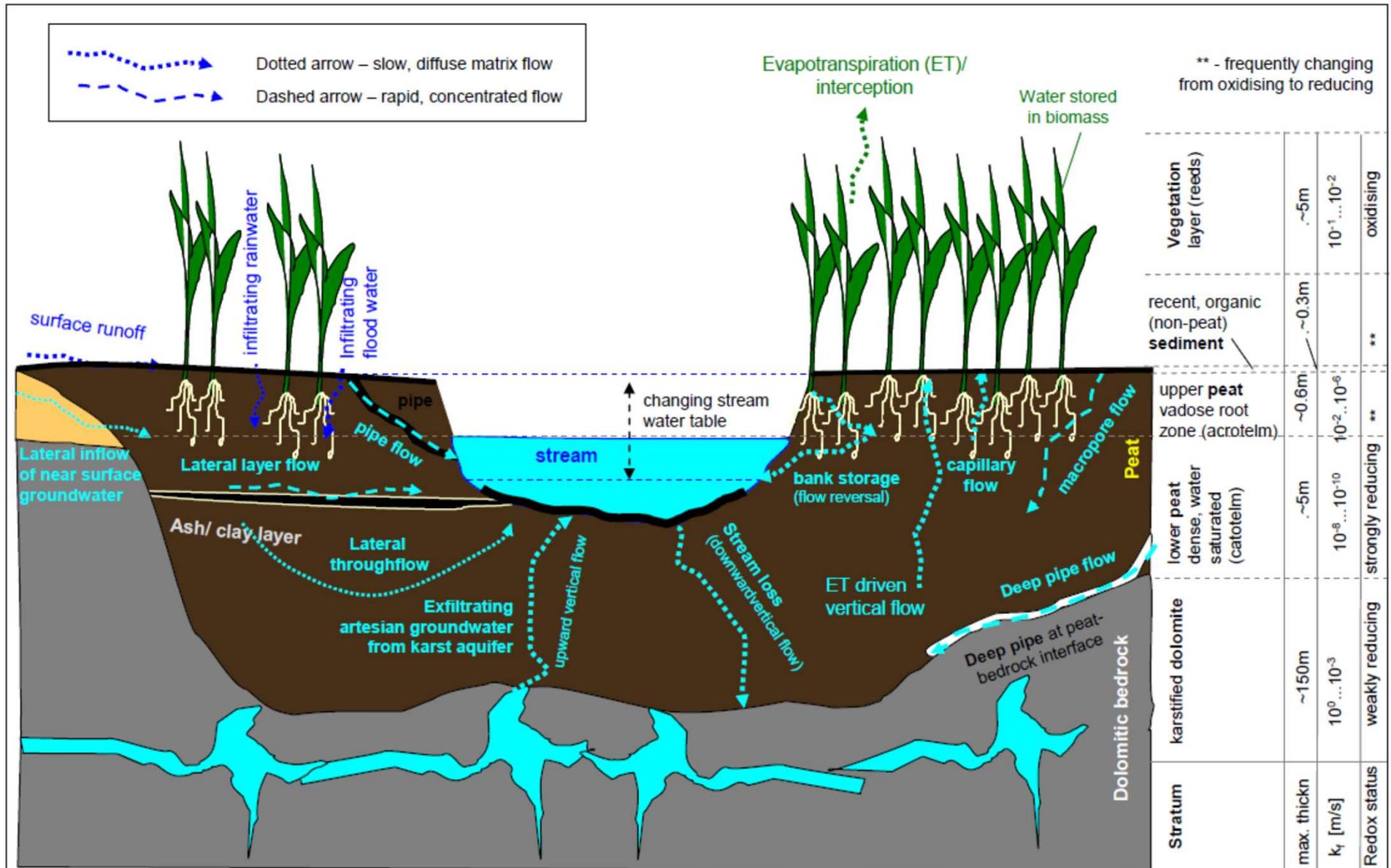
Wet peatlands are 'cool': they cool the landscape:
More energy for evaporation → less for heat

Adaptation!



Netherlands

Wet peatlands remove nitrogen and purify and protect waters



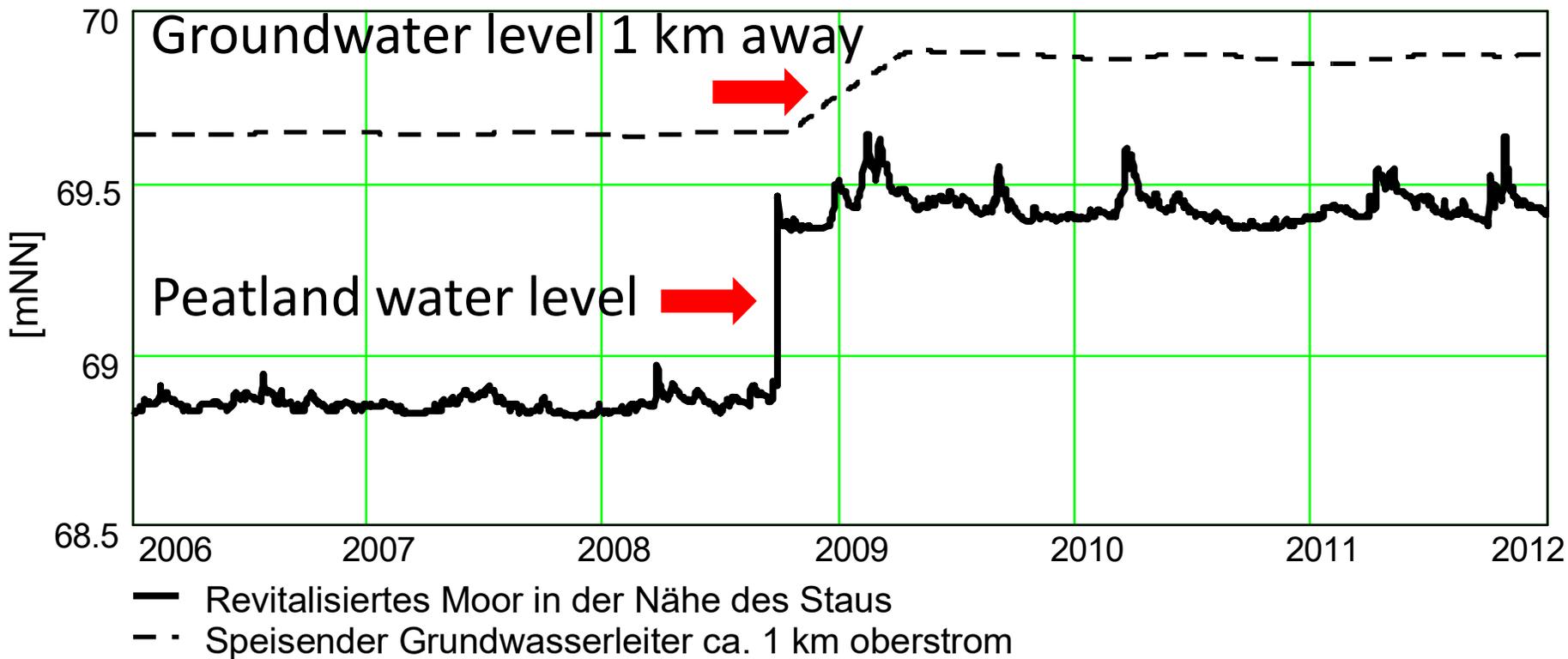
Peatlands absorb high water events and reduce peak flow

Adaptation!



Rewetting increases regional groundwater availability

Adaptation!



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

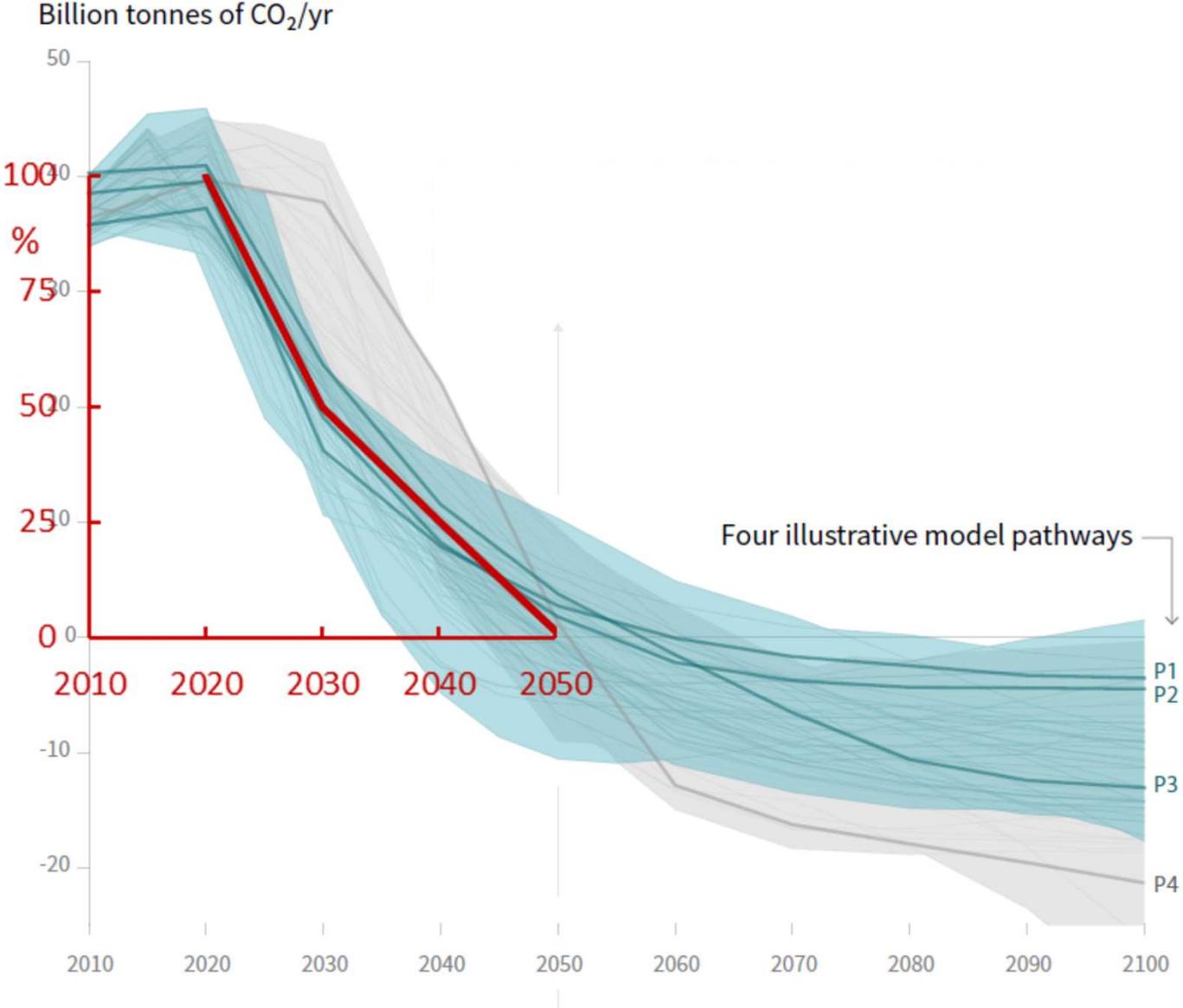


Adaptation!

Karrendorf

Reinhard Lampe

Paris implies for EU: We must rewet 150,000 km² of drained peatland until 2050 = 5,000 km² per yr!



Rewetting in Europe has hitherto focused on the easy stuff:
abandoned and low productive land with few emissions



Scotland

... but we have to go to the core problem:
intensive agriculture and forestry on drained peat...



Germany

However: we cannot flood all drained peatlands worldwide or in the EU and take them out of production



Sumatra

We can only solve the drainage problems while maintaining production...



Germany

Tobias Dahms, lensescape.org

i.e. with *paludiculture*: wet agriculture/forestry



Germany

Miscellaneous biomass: for heating and energie generation...



Malchin Mecklenburg

Reed cultivation: biomass and peat accumulation



Poland

Philipp Schroeder, lensescape.org

Reed: high-quality construction materials



Schleswig-Holstein

Cattail (Typha) for very many products...



Bavaria

...for construction, insulation, fodder, growing media, plastics alternative, packaging and pest control



Last month: establishment of new cattail field



Mecklenburg

Alder cultivation: biomass and peat accumulation



Alder wood: for furniture and furnear



Peatmoss cultivation to replace fossil peat in horticulture



Water buffalos: for meat and mozerella...



Vorpommern

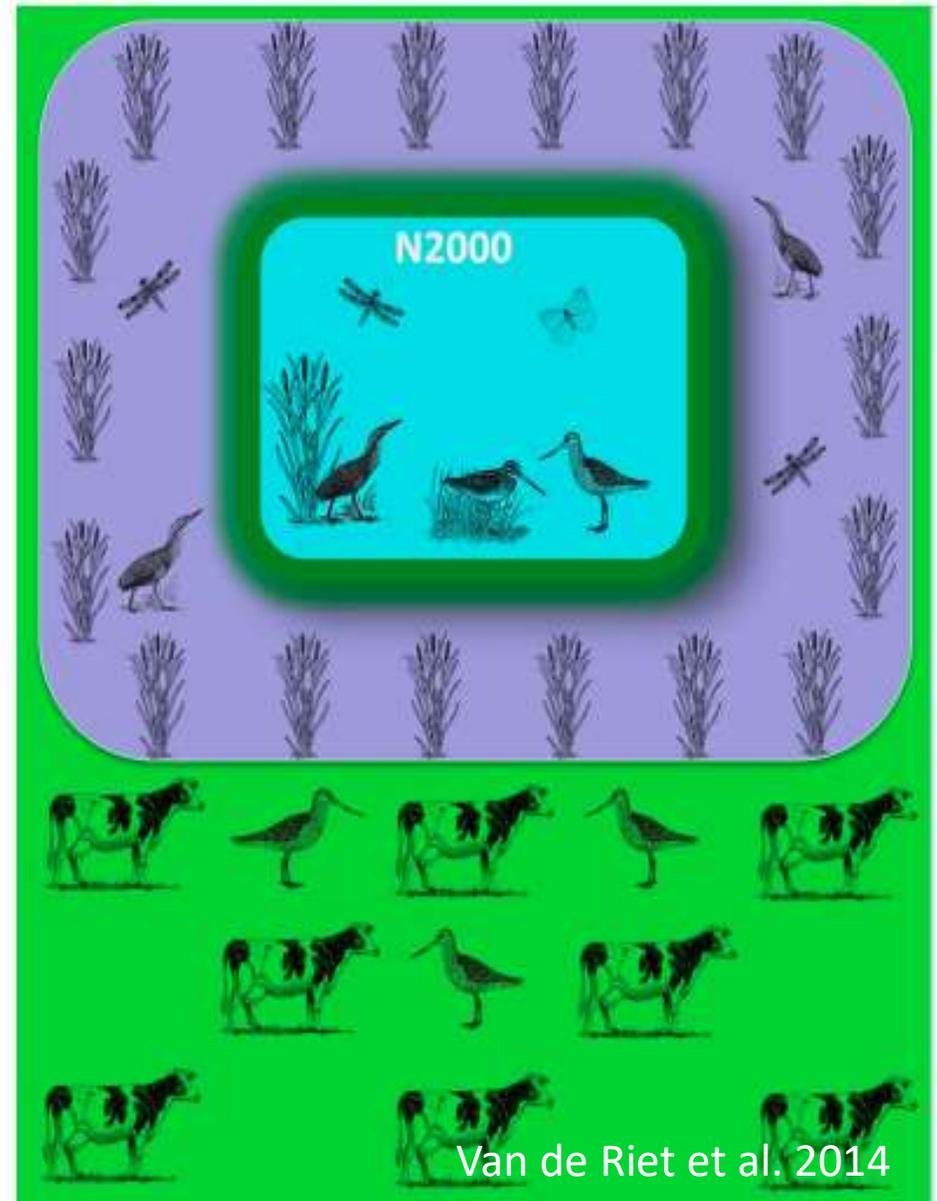
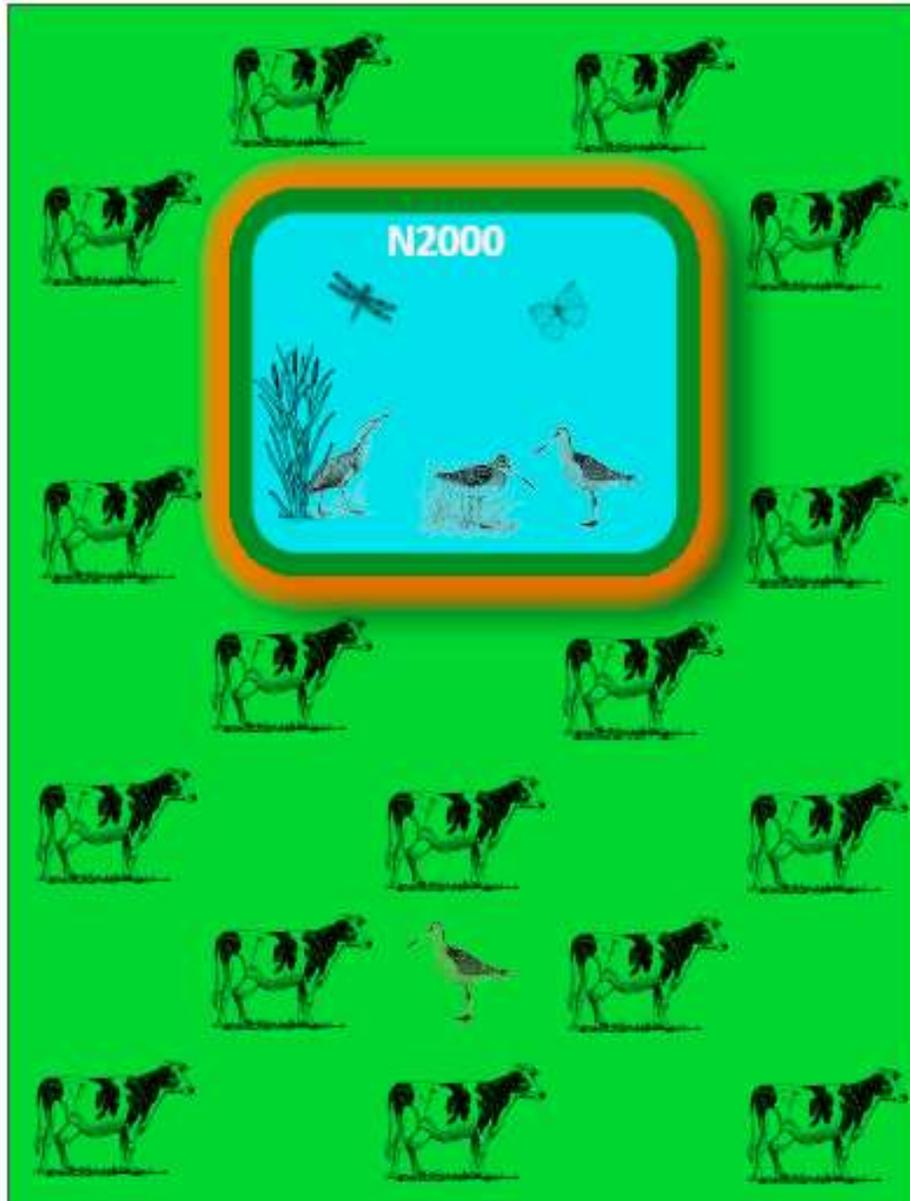
Let it be clear: Paludiculture is no nature conservation s.s.
Paludiculture is agriculture with clear production goals



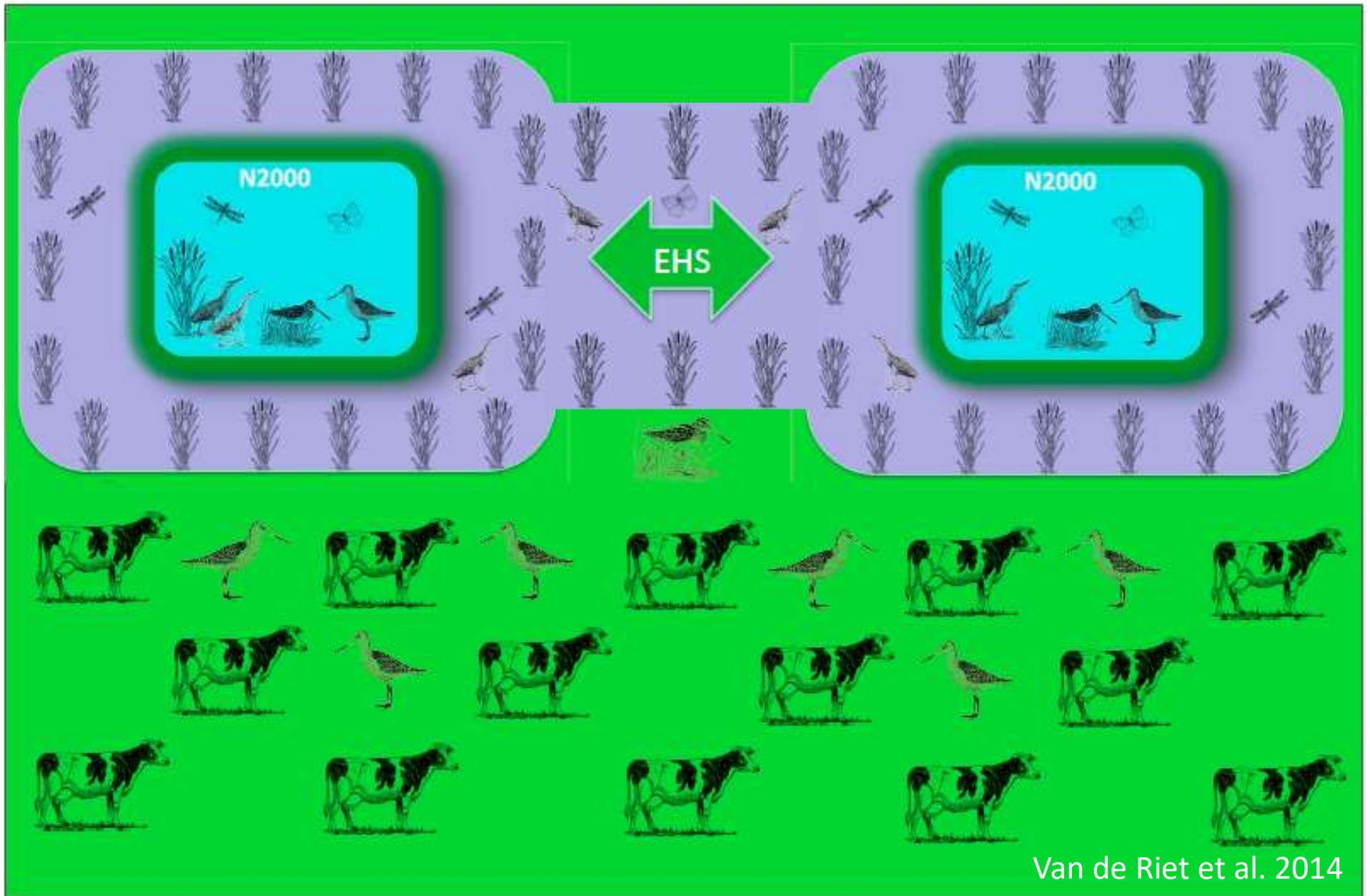
But its machines, value chains and infrastructure can support necessary management in protected areas



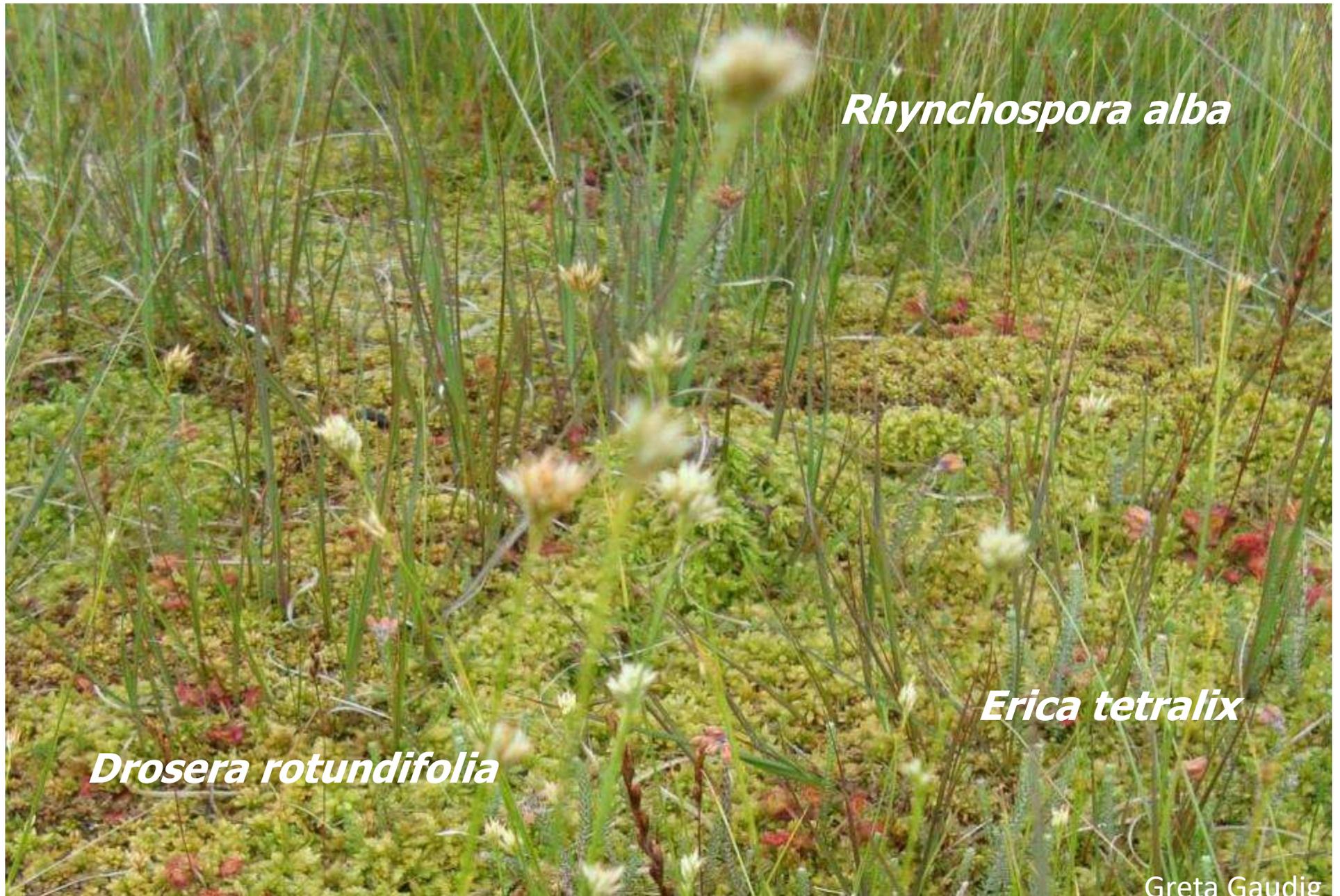
Paludiculture strengthens nature conservation by establishing *wet* agricultural buffer zones around protected areas



...and by creating *wet* connecting corridors



...and as additional wetland habitats for Red List „weeds“



... and other 'pests and bugs' ...



Pardosa sphagnicola



Bathyphantes setiger

Biodivers Conserv
DOI 10.1007/s10531-015-0922-8

ORIGINAL PAPER

Sphagnum farming: the promised land for peat bog species?

Christoph Muster¹ · Greta Gaudig² · Matthias Krebs² ·
Hans Joosten²

Hankhausen 2017: 19 dragonfly species , incl. tyrphobiotic *Aeshna subarctica* + 3 tyrphophilous species (25% of indiv.)



EU: until 2050 rewet 5,000 km² per year...
Illusorious, naive...?



Finland drained in the 1970s 3,000 km² every year!



Finland

Indonesia 2015: 20,000 km² peat fires : 100,000 people killed,
0.5 million in hospital, US\$ 16-40 billion domestic damage



Indonesia has in 2017-2018 rewetted 6,700 km² of peatland, i.e. 3x as much as *entire* Europe in its *entire* history!



Sumatra

We live at the best time in history on the best place on Earth:
if we cannot manage, who can???



Paris-conform peatland transition until 2030

- Stop arable use of peat soils, stop subventions in 2021
- Raise water level in all grassland
- Rewet 50% of the drained forest
- Stop peat extraction
- Include paludiculture in EU agricultural subsidies
- Stop drainage in all state-owned peatlands
- Establish paludiculture demonstration sites
- Build capacity for rewetting 50.000 ha per year

We have to turn back the „meliorations“ of the past
with similar large efforts...



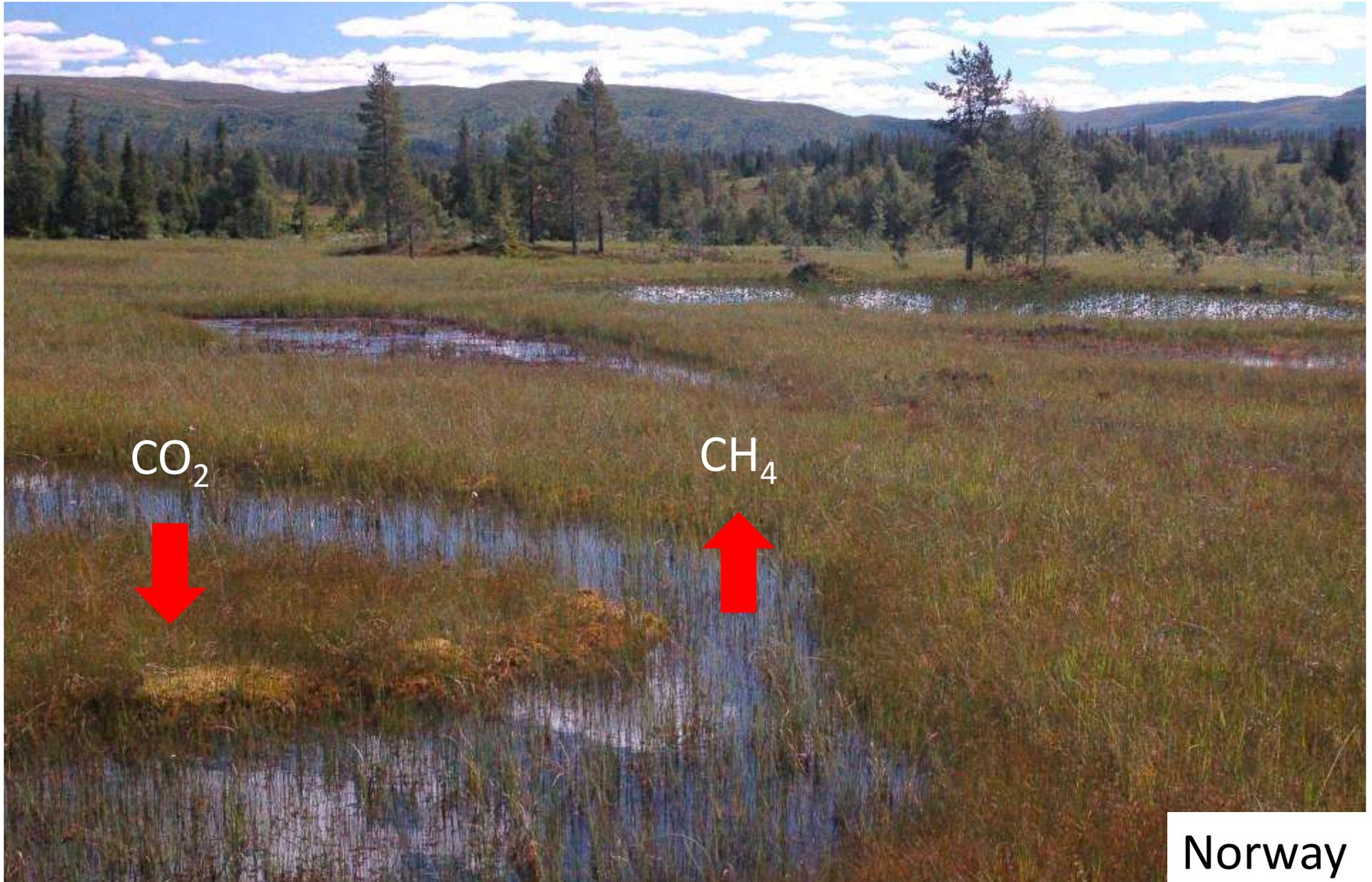
Emsland

But what about methane (CH_4) after rewetting?



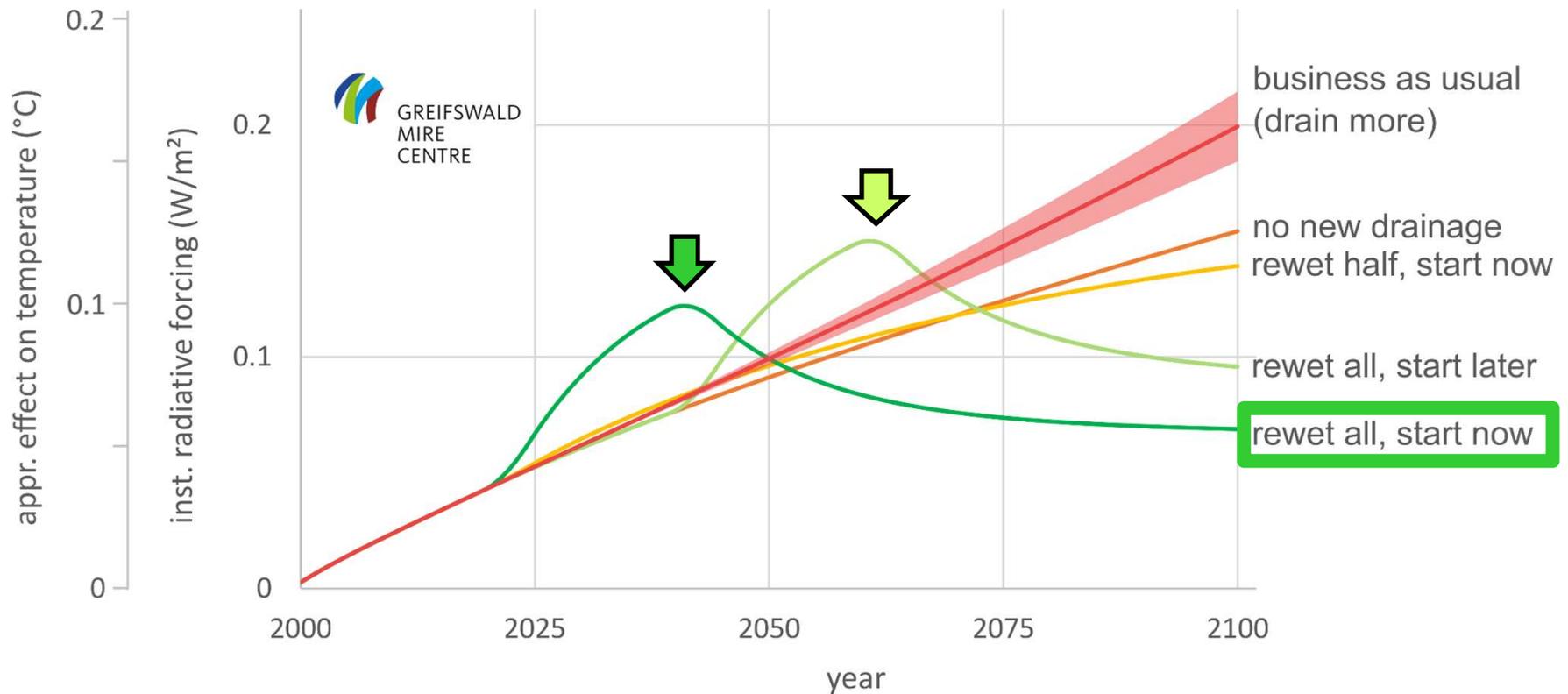
Germany

Go for CH₄! CH₄ is strong but short-lasting (12 yr), CO₂ weak but accumulative. On the long term, CO₂ is much worse



To stop adding to heating, full rewetting is the best scenario.

Rewet all, start now avoids adding to peak temperature





GREIFSWALD
MIRE
CENTRE



MOOR
MUSS
NASS!*

*und zwar sofort!

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



No Paris without peatlands!
Paludiculture for Future!

Tobias Dahms, lensescape.org