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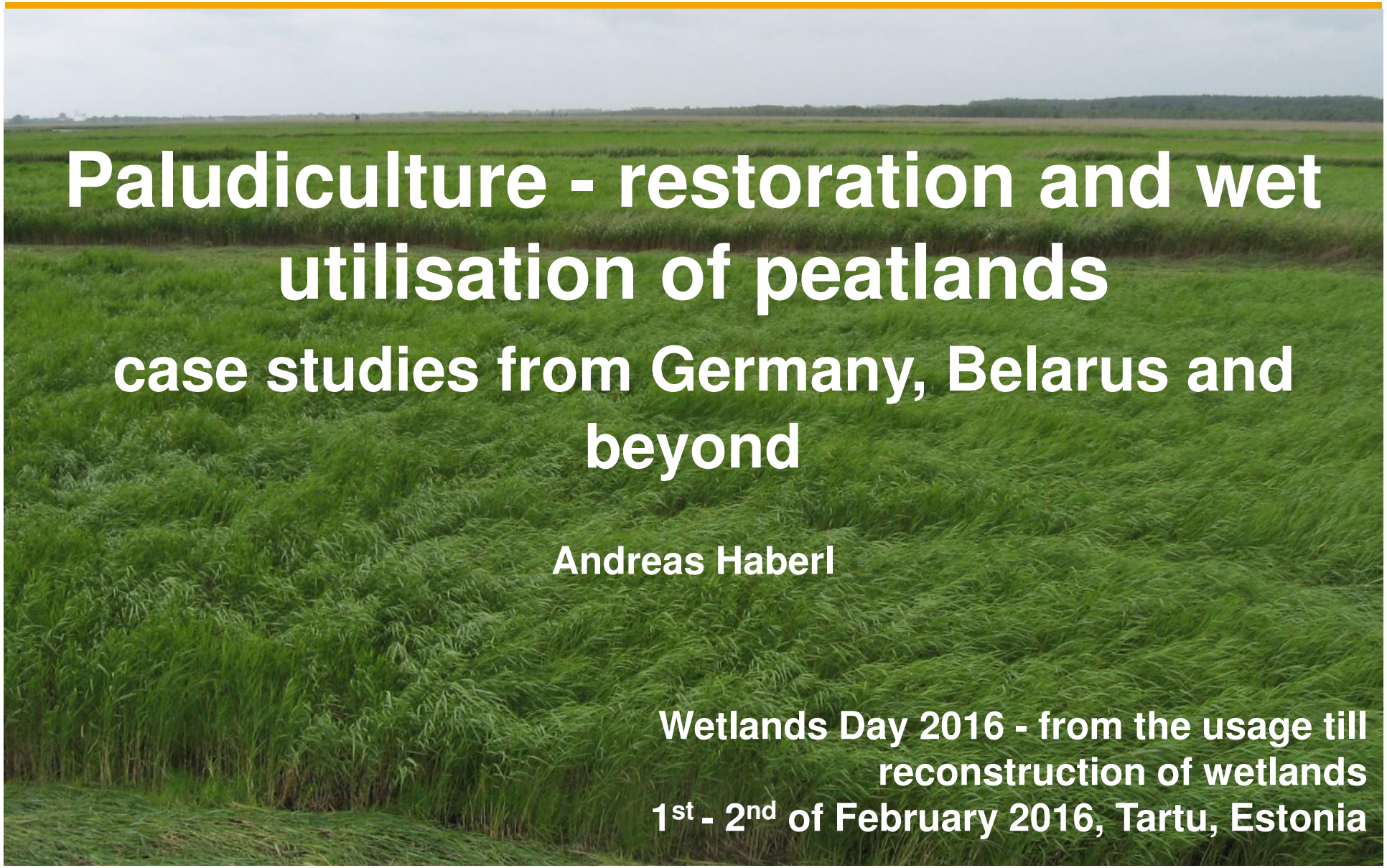

Paludiculture - restoration and wet utilisation of peatlands

case studies from Germany, Belarus and beyond

Andreas Haberl

Wetlands Day 2016 - from the usage till reconstruction of wetlands
1st - 2nd of February 2016, Tartu, Estonia

Greifswald in Mecklenburg-Western Pomerania
conjoint peatland competence in the GMC

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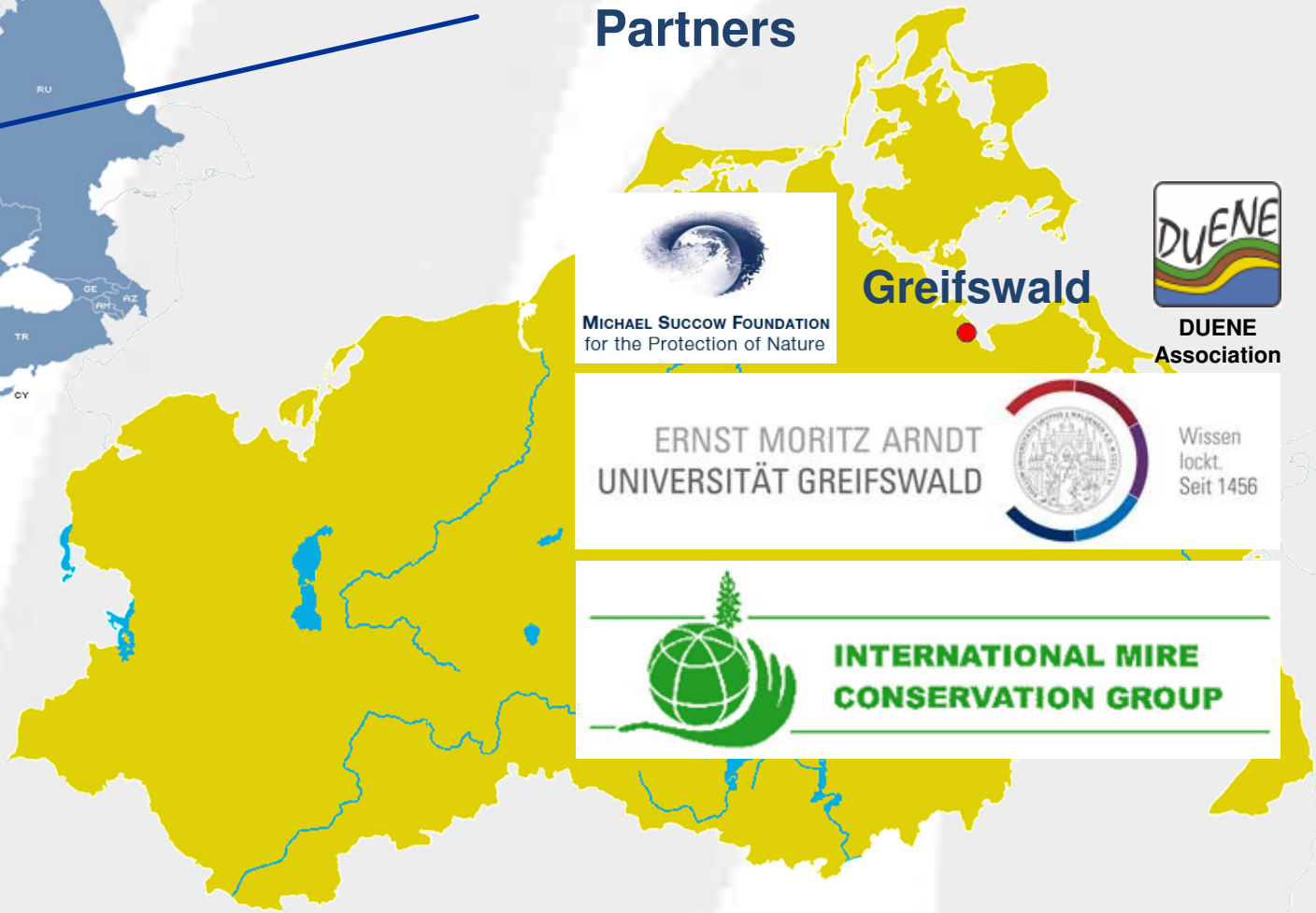
Partners



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DUENE
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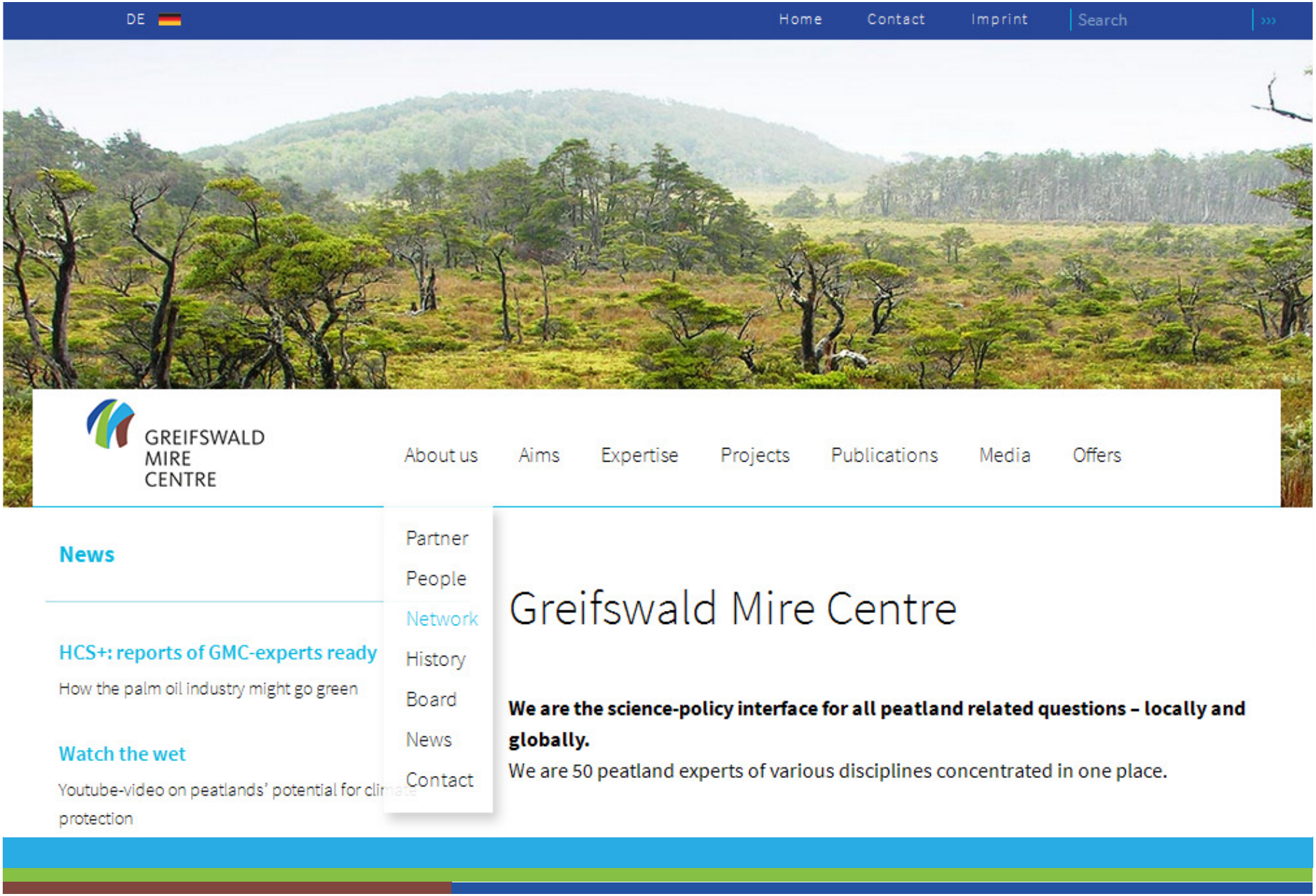
INTERNATIONAL MIRE CONSERVATION GROUP

www.greifswaldmoor.de



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Peatlands
in the EU Regulatory Environment
with Case Studies from Member States

- Poland: Fens, agriculture (1st part started 2015)
- Estonia: Bogs, peat extraction (2nd part started 2016)

- MSF Project administration: Jan Peters
- Kick off workshop 2nd part 25-26th February in Tallinn (Keskkonnaministeerium)

Funded by:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Umwelt Bundesamt

AAP Advisory Assistance Programme

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Partners of the project

Poland:

- Polish Society for the Protection of Birds (OTOP),
- WKB Wierciński Kwieciński Baehr spółka komandytowa

Estonia:

- Estonian Wetland Society
- Siim Vahtrus (Environmental law expert)

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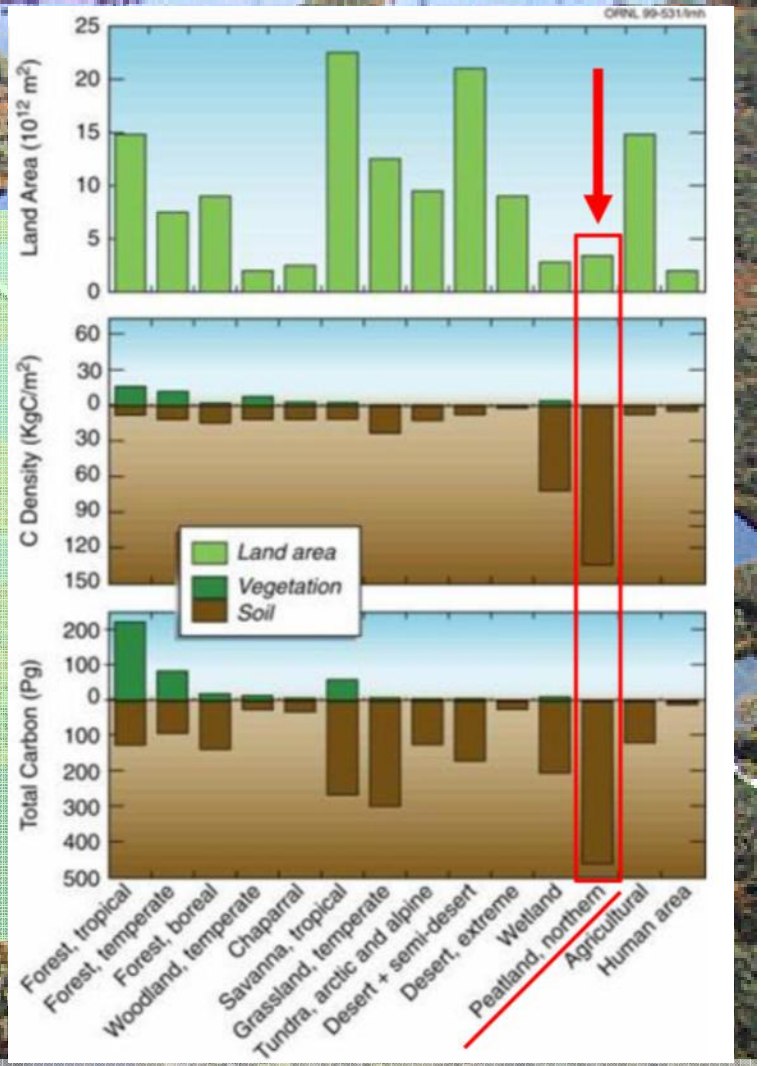
Objectives of the project

- Track **influence of EU regulatory** in exemplary regions:
  - Poland: Fens, protected, agriculture (1st part)
  - Estonia: Bogs, protected, peat extraction (2nd part)
  - Compare to other regions in EU
- Analyse **land use changes on peatlands** after joining EU in 2004
- Involve **relevant stakeholders** in selected case studies

Peatlands

- cover “only” 3 % of the land area
- but contain 30% of the world’s soil carbon
- an equiv. of 60% of all atmospheric carbon
- as much carbon as in all terrestrial biomass

➢ Peatlands are important for the global carbon cycle



Sequestration and long term storage of carbon require water logging

Patterned bog Endla - Estonia

Peat accumulates in wet mires…

…over **centuries** from died off **mire plants** and **water saturation** that inhibits their decomposition

⇒ In the boreal and temperate zone 0.5-1 mm/year

⇒ In natural mires also long periods with no accumulation or loss of peat occure (hydrology and climate dependent)

⇒ Peat is not renewable under an economic aspect

⇒ Peat is a fossil and finite resource

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Environmental consequences of peatland drainage

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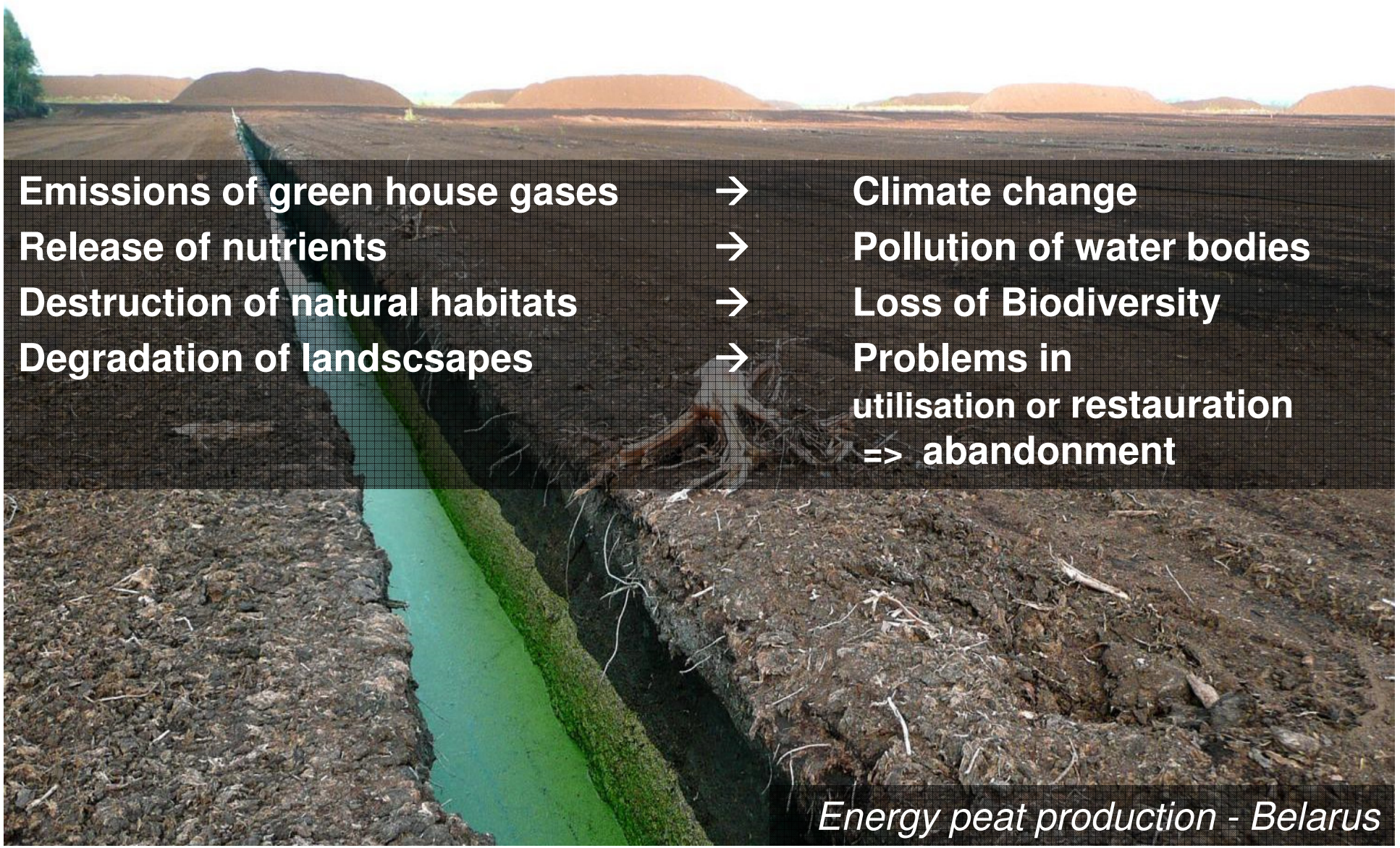

Emissions of green house gases	→	Climate change
Release of nutrients	→	Pollution of water bodies
Destruction of natural habitats	→	Loss of Biodiversity
Degradation of landscsapes	→	Problems in utilisation or restauration => abandonment

Energy peat production - Belarus

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Drained peatlands – global CO_2-emission hot spots

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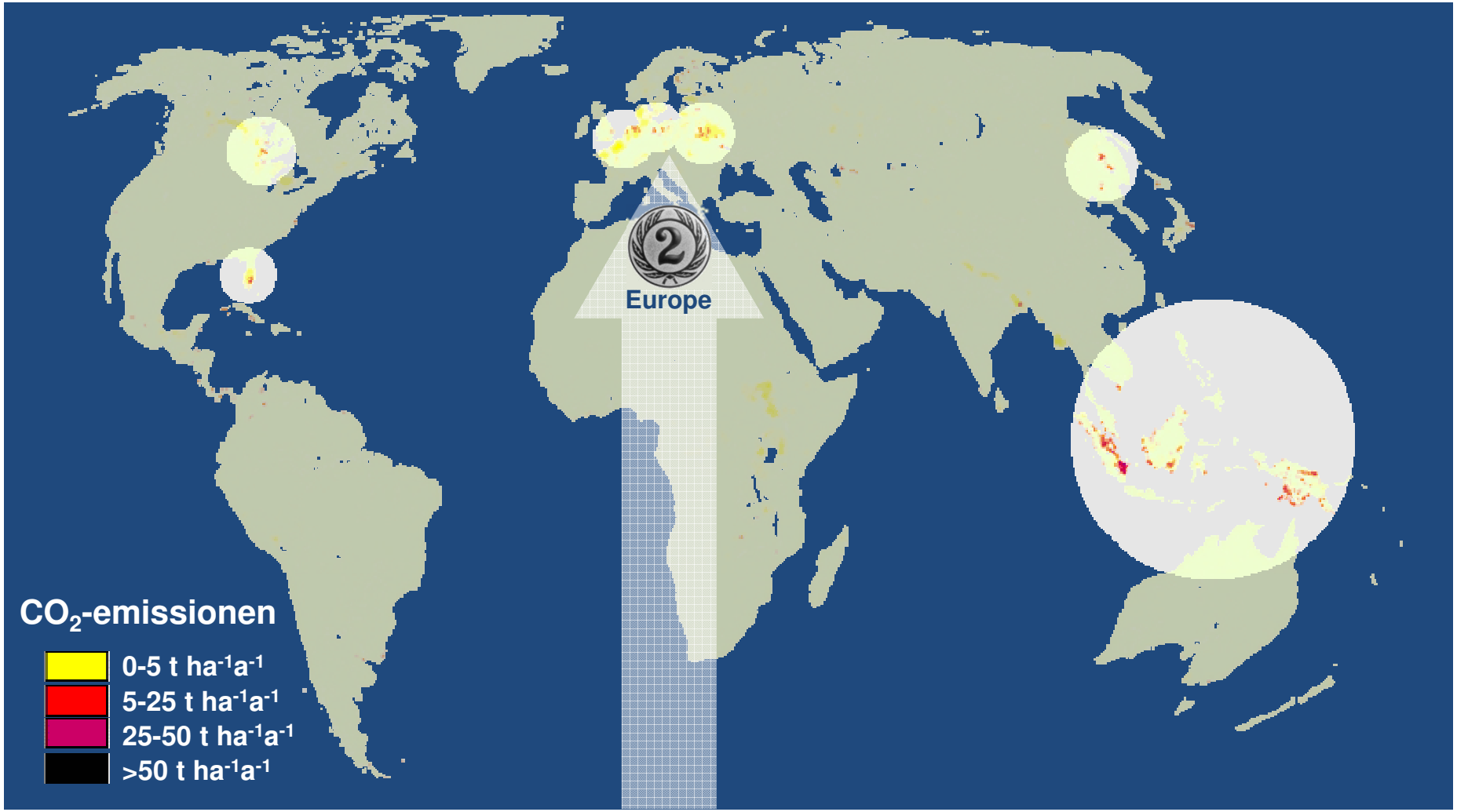

⇒Conventional drainage based land use of peatlands is not sustainable

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Drainage based use of peatlands and GHG emissions

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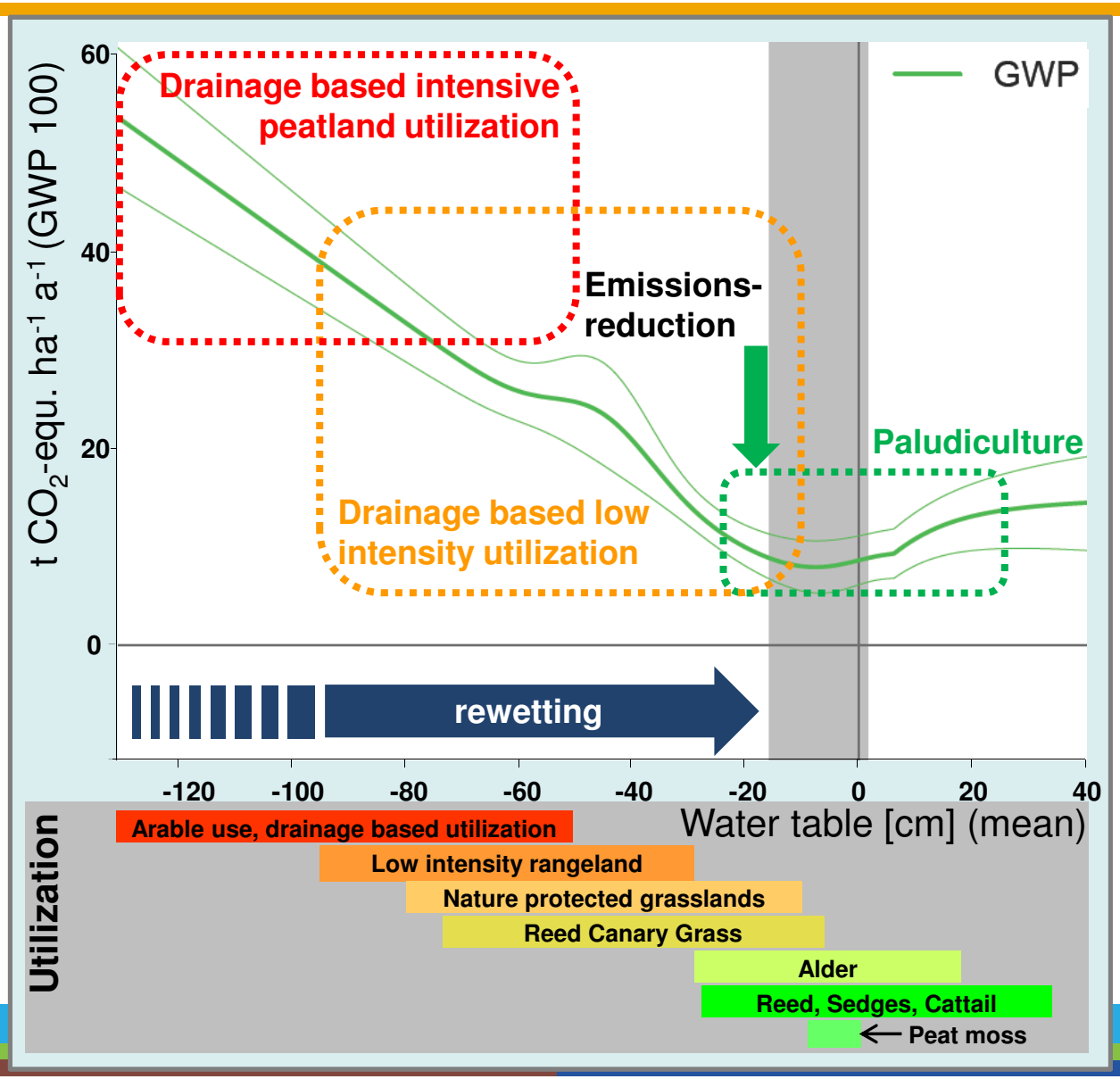

⇒Drainage based Peatland utilisation causes **high GHG emissions** and peatland degradation

⇒**Agro-Environmental schemes** improve the situation but...

⇒...only **Paludicultures** with mean annual water tables **in surface level** mitigate emissions significantly

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What is Paludiculture?

Partner in the
GREIFSWALD MIRE CENTRE

PALUDI KULTUR
GREIFSWALD

„palus“ – lat.: swamp

“Cultivation of biomass on wet and rewetted peatlands with plant species that contribute to the conservation of peat deposits and ideally to the formation of peat”

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What is Paludiculture?

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Paludiculture provides and safeguards **Ecosystem-Services** of Peatlands

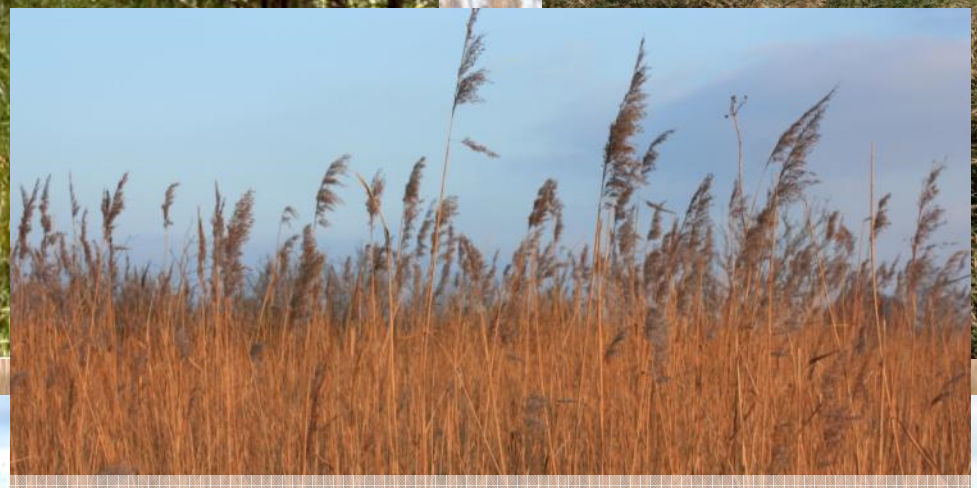
- **Production services**
  - Biomass for material use
  - Biomass for energetic use
  - Utilisation as fodder or food (comestibles)
- **Regulation services**
  - Biodiversity (nature near habitats)
  - Water quality protection (retention of nutrients)
  - Water quantity (harmonisation of discharge)
  - Climate protection (mitigation of GHG emissions)
  - Palaeo archives (landscape- and human history)

Paludiculture on fens

Black Alder (*Alnus glutinosa*)

productivity: 3 – 10 t DM/ha*a

emissions: ~ 0 t CO_2eq/ha*a



Common Reed (*Phragmites australis*)

productivity: 3 – >25 t DM/ha*a

emissions: ~ 10 t CO_2eq/ha*a

Reed canary grass (*Phalaris arundinacia*)

productivity: 3.5 – 15 t DM/ha*a

emissions: ~12 t CO_2eq/ha*a

Cattail (*Typha* spec.)

productivity : 5 - 22 t DM/ha*a

emissions: ~ 10 - 15 t CO_2eq/ha*a

Tall Sedges (Carex spp.)

productivity: 3 – 12 t TM/ha*a

emissions: 0 – 8 t CO2 -eq / ha*a

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Harvest - Individual solutions

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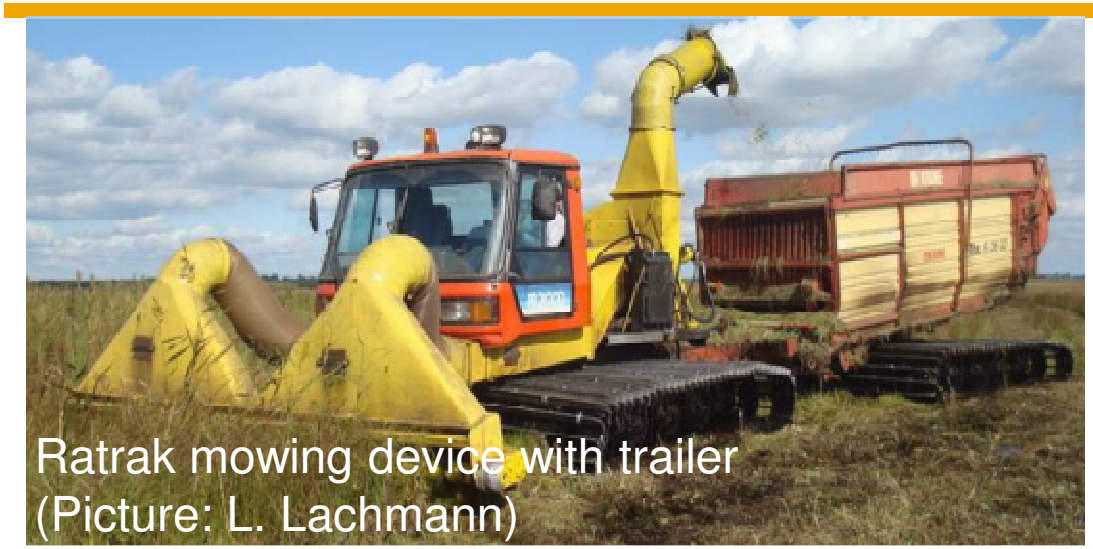

Ratrak mowing device with trailer (Picture: L. Lachmann)

Seiga based field chopper (Picture: W. Wichtmann)

Pisten-Bully with trailer (Picture: W. Wichtmann)

Caterpillar mounted mowing and baling device (Picture: S. Wichmann)

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Material utilisation of fen biomass

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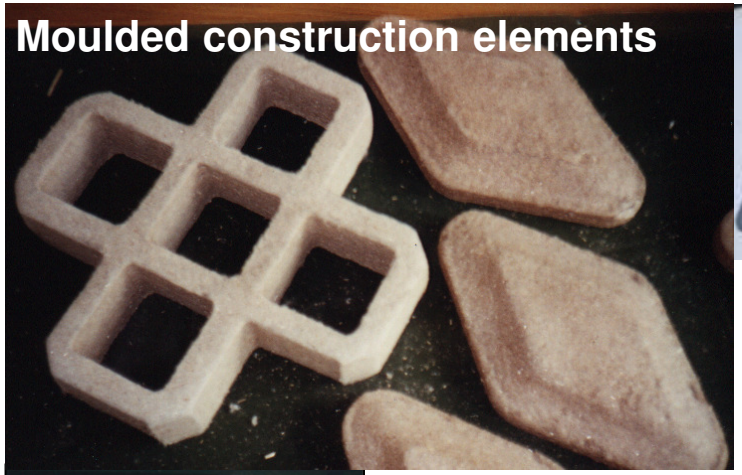

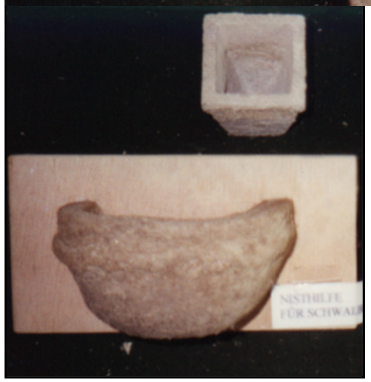

www.typhatechnik.com
www.naporo.com

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Traditional Paludiculture
reed for roof thatching

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50%

50%

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European roof thatching reed trade

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Orange:
Predominant import countries

Green:
Export countries

Brown:
Export/import neutral countries

⇒ Major reed supplier for the European import countries is China

Source: Köbbing & Wichmann (2015)

Contemporary Architecture
using reed as roof thatching material

example from Finland

Energetic Utilisation

Carburation of whole bales

Combustion of chops

Briquettes and pellets

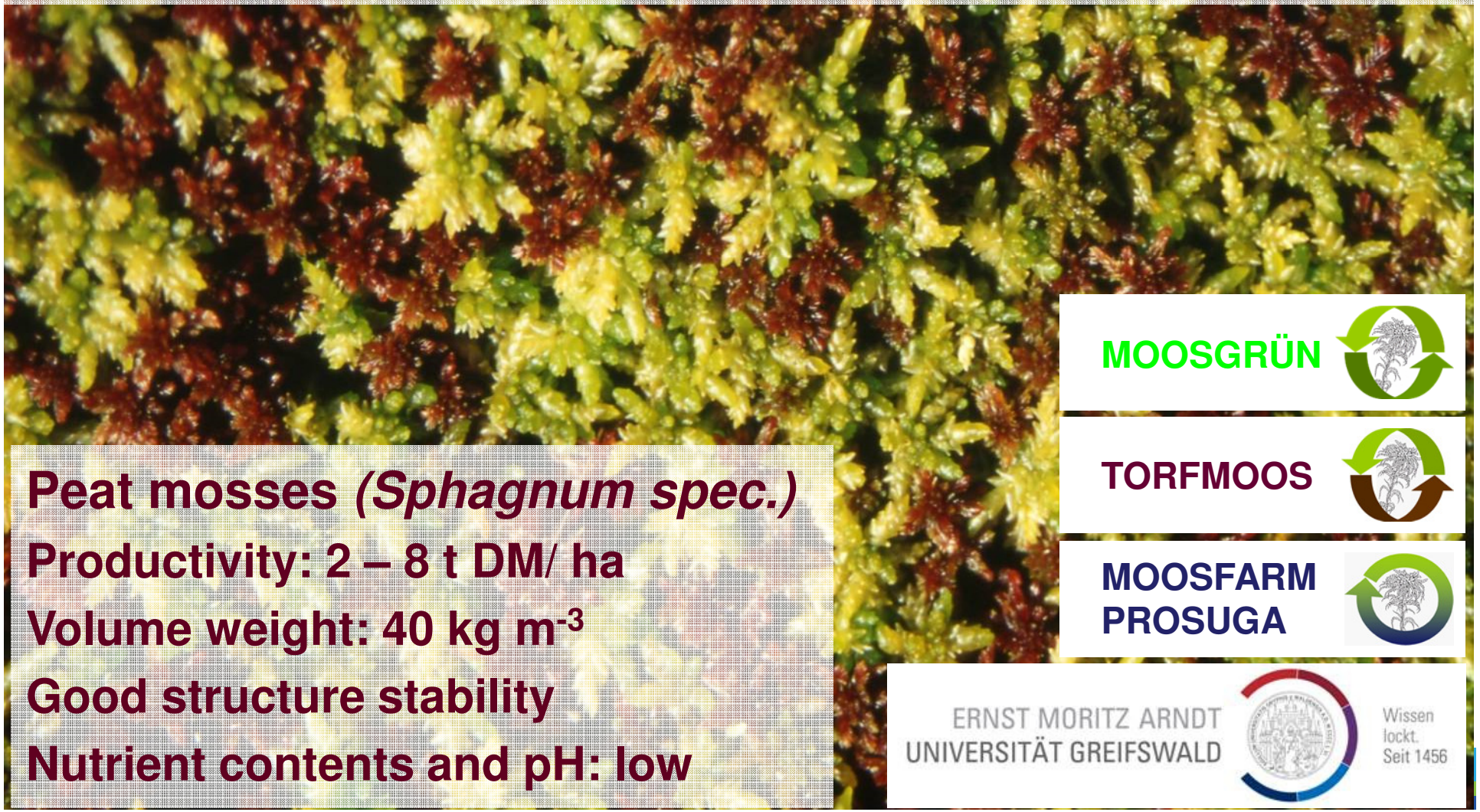
Bio-coal

- **HydroThermal Carbonisation (HTC)**

Bio-gas

Paludiculture on bogs

- Cultivation of peat mosses (*Sphagnum* farming)
- Substrate for horticulture (substitut for *Sphagnum* peat)



Peat mosses *(Sphagnum spec.)*
Productivity: 2 – 8 t DM/ ha
Volume weight: 40 kg m^{-3}
Good structure stability
Nutrient contents and pH: low

MOOSGRÜN

TORFMOOS

MOOSFARM
PROSUGA

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Wissen
lockt.
Seit 1456

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Why a horti-cultural peat substitute?

Partner in the
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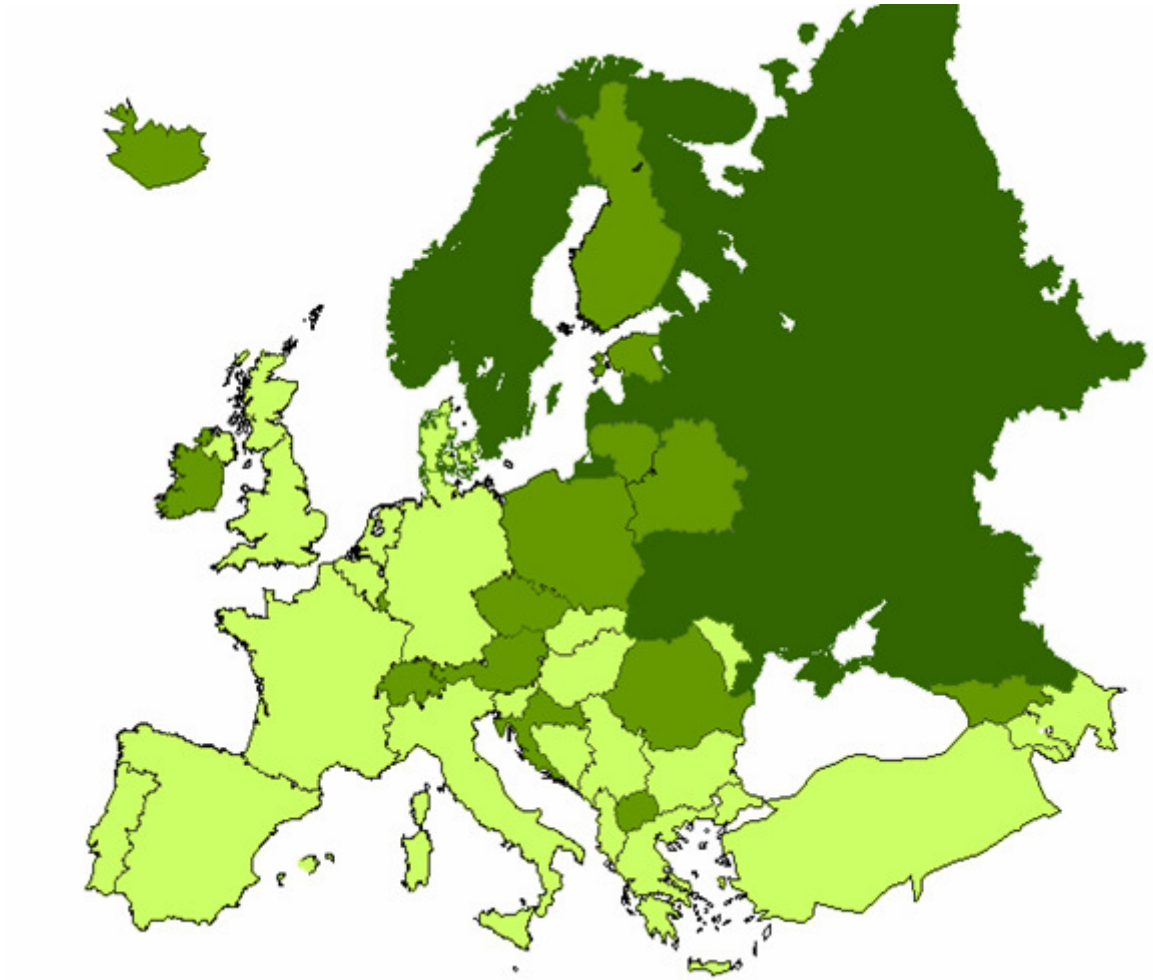
slightly humified peat moss peat is…

… a finite resource
(in Western and Central
Europe nearly depleted)



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Sphagnum peat is globally wanted!

Partner in the
GREIFSWALD MIRE CENTRE

slightly humified peat moss peat is...

... an irreplaceable resource in professional horticulture

... offers optimal quality as substrate

... most important material

... globally about 30 million m³ per year

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The alternative:
"*Sphagnum* farming"

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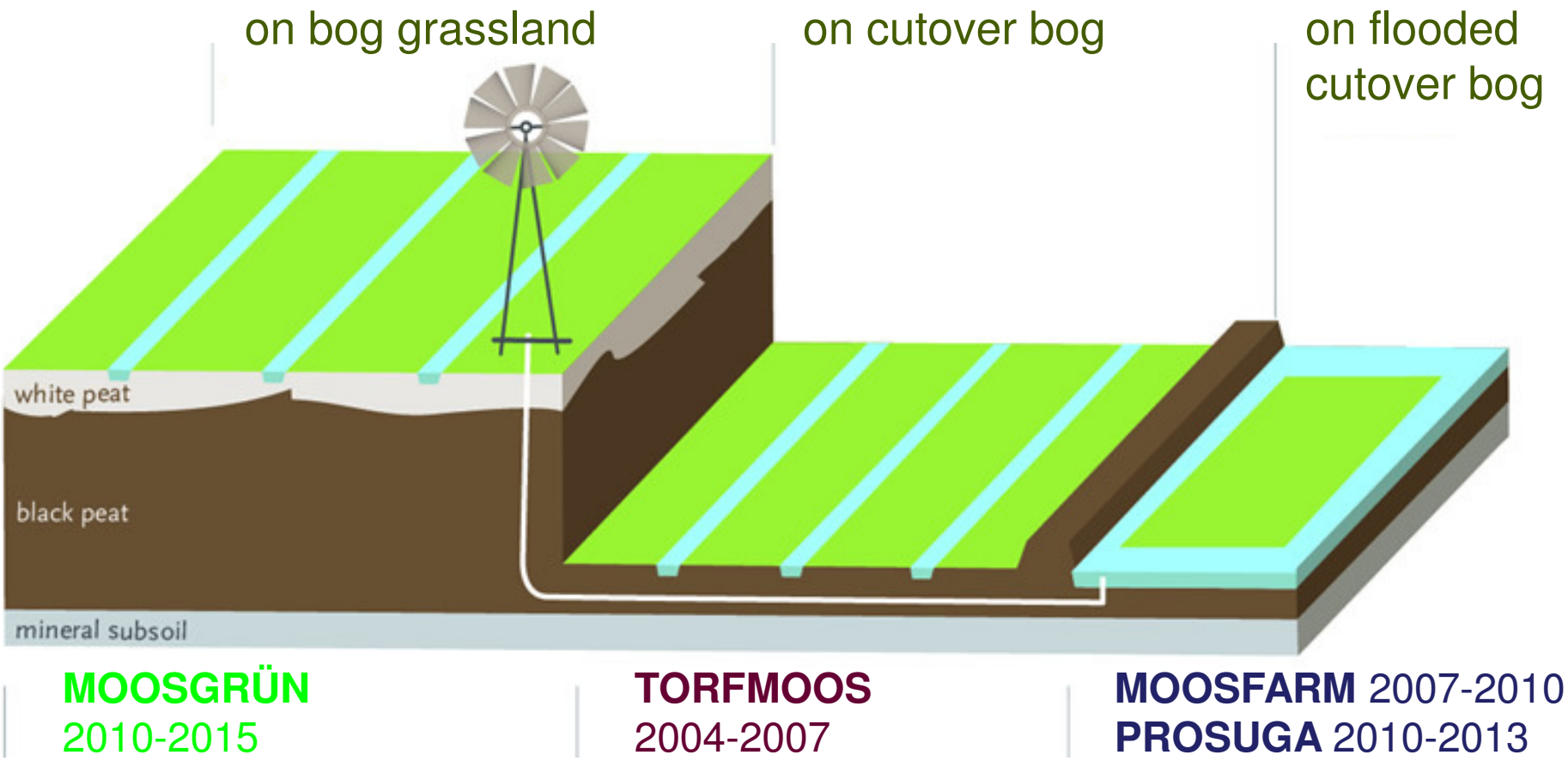
MOOSGRÜN 4 ha pilot site Foto: Tobias Dahms

Sphagnum farming on degraded bog areas



MOOSGRÜN 2010-2015

TORFMOOS 2004-2007

MOOSFARM 2007-2010
PROSUGA 2010-2013

Further upscaling: → 2016-2019 **MOOSWEIT** on 12 ha
→ ca. 40,000 ha necessary for production of *Sphagnum* biomass to substitute 3 Mio m³ white peat in Germany

www.sphagnumfarming.com, *contact: Greta Gaudig,* gaudig@uni-greifswald.de

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Paludiculture
read all about it!

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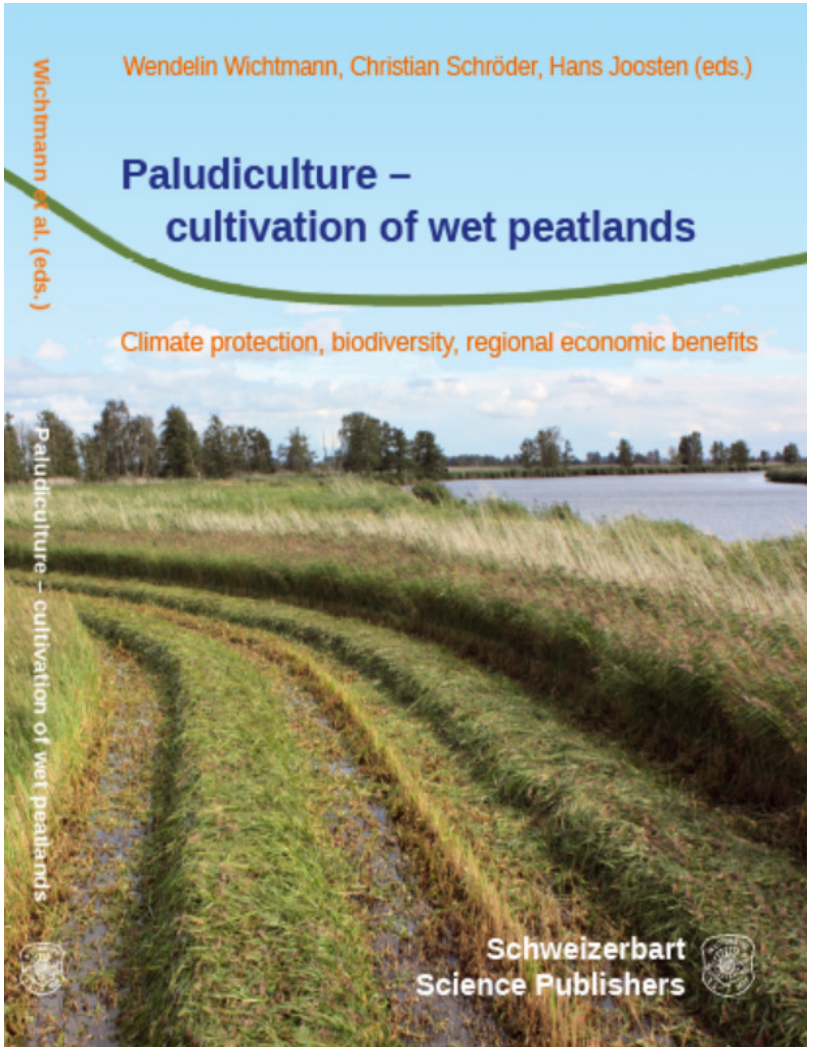
1 Paludiculture as an inclusive solution
2 The limits of drainage based peatland utilisation
3 Production and utilisation of paludiculture biomass
4 Harvest and logistics
5 Ecosystem services provided by paludiculture
6 Economics of paludiculture
7 Legal and political aspects of paludiculture
8 Social aspects of paludiculture implementation
9 Sustainability and implementation of paludiculture
10 Paludiculture in a global context
11 The way out of the desert – What needs to be done



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Paludiculture
case studies on fens in Germany

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Restoration of fens by establishment of alder forest stands

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ALNUS

DBU
Deutsche Bundesstiftung Umwelt

⇒ Scientific research on Carbon balances of wet alder carrs

⇒ Cost benefit analysis of economic forest cycle in wet alder forest

⇒ Guidelines

Duration 2002 - 2005

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ENIM
Energy biomass from fens

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ENIM

DBU
Deutsche Bundesstiftung Umwelt

⇒ **Cost benefit Analysis of Reed cultivation for Energy**

⇒ **Harvesting – adapted technology for wet sites**

Duration 2007 - 2010


Seedling production and establishment


Harvest of biomass for Energy

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ELAN + HYDBOS

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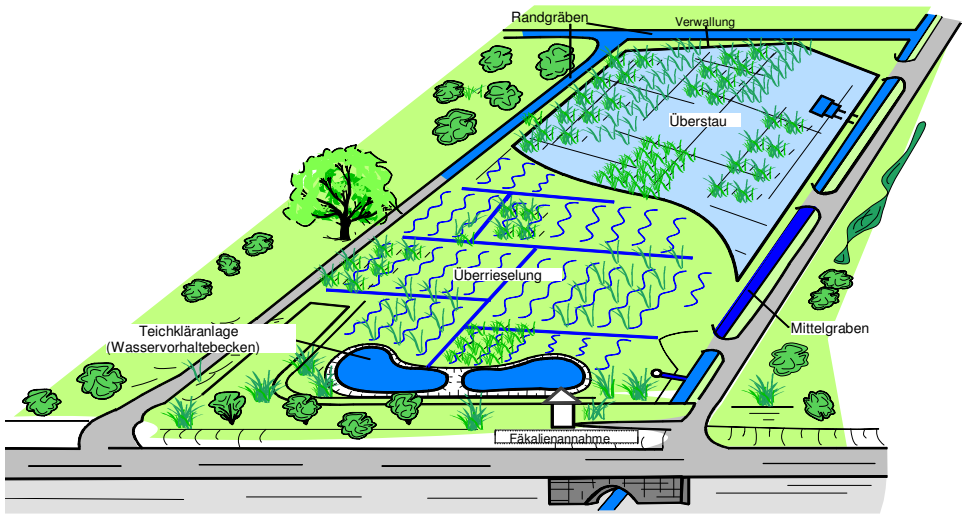
Aims:

- Utilisation of pre treated waters for re-wetting
- Retention of nutrients
- Production of biomass for energy



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Mecklenburg-Western Pomerania heating plant Malchin

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Aims:

- Landcare in rewetted peatlands
- Production of biomass for energy
- Produce heat for grid supply

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Mecklenburg-Western Pomerania heating plant Malchin

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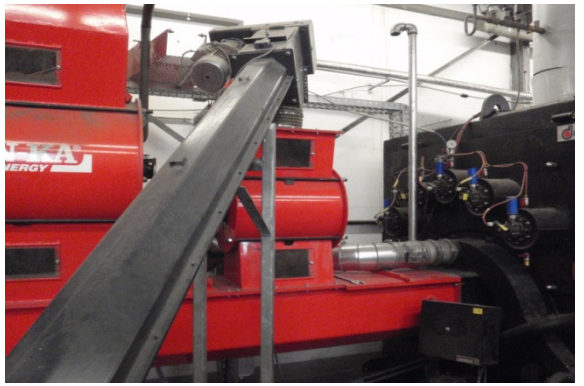
Heizwerk Agrotherm GmbH

Location	Heat supply grid Malchin
Performance:	800 KW (thermal)
Biomass need:	800-1.000t
Biomass origin:	Rewetted fen peatland sites in the Peene river valley
Harvest area (yield):	400 ha (~ 4 - 5 t/ha)
Substitution effect:	290.000-380.000 l Oil



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Paludiculture
case studies on fens in Belarus

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Belarus I

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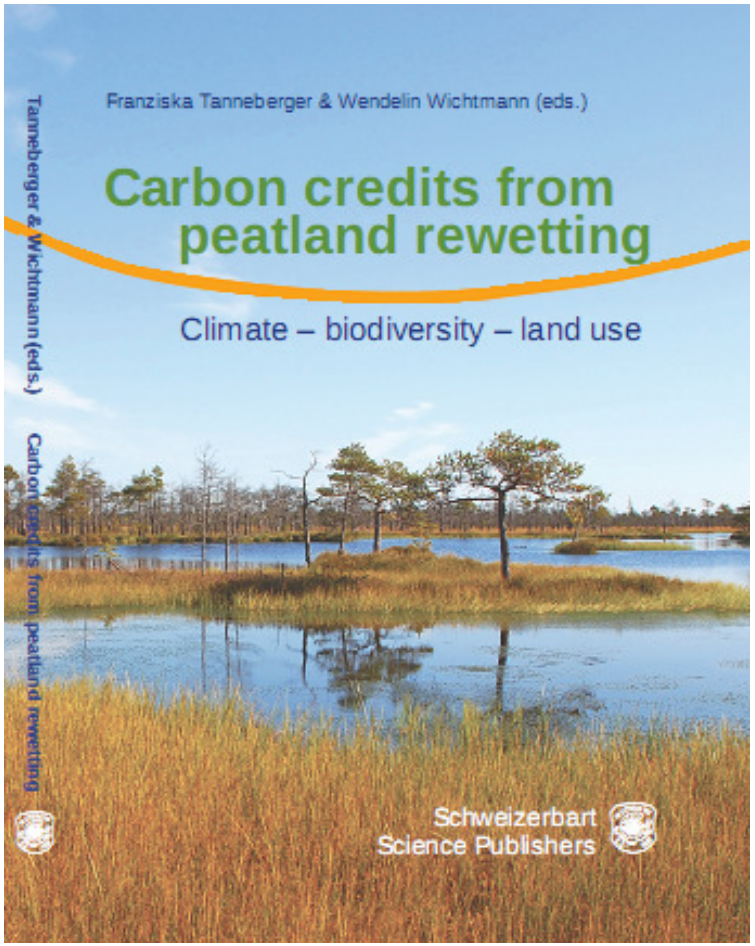
BMU ICI Project rewetting and sustainable use of peatlands

Aims:

- Rewetting of ~15.000 ha of peatlands
- „Production“ of CO_2 credits

- Keeping open abandoned sites (nature near fens)
  - ➢ management of biotopes (Aquatic warbler)
  - ➢Give economic perspectives
- Energetic use of biomass



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Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

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Belarus - Wetland Energy

Partner in the
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Implementation of new concepts for wet peatland management for the sustainable production of biomass-based energy

Aims

- Energetic use of biomass cultivated on excavated sites
  - ➢ replacement of peat
  - ➢ production of briquettes
  - ➢ keeping landscapes open (natural fens)
  - ➢ Habitat management
- Development of harvesting techniques

Энергия болот Wetland Energy

ИНСТИТУТ ПРИРОДОПОЛЬЗОВАНИЯ НАН БЕЛАРУСИ

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Государственное производственное объединение по топливу и газификации
ОАО «Торфобрикетный завод «Лидский»

EuropeAid

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From a fossil fuel…

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…to a renewable fuel

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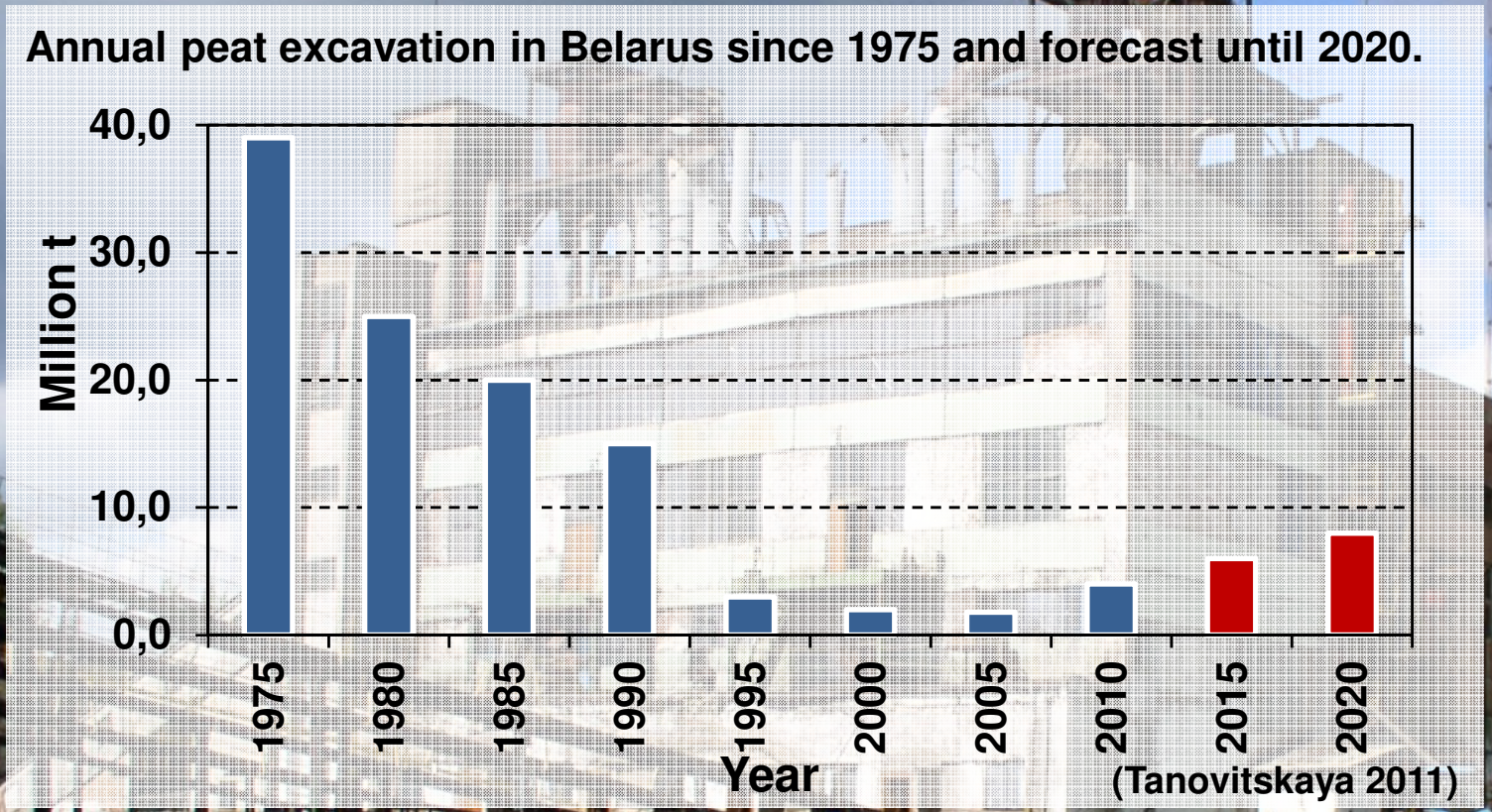
Peat extraction for energy fuel briquettes in Belarus has a long tradition



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From a fossil fuel…

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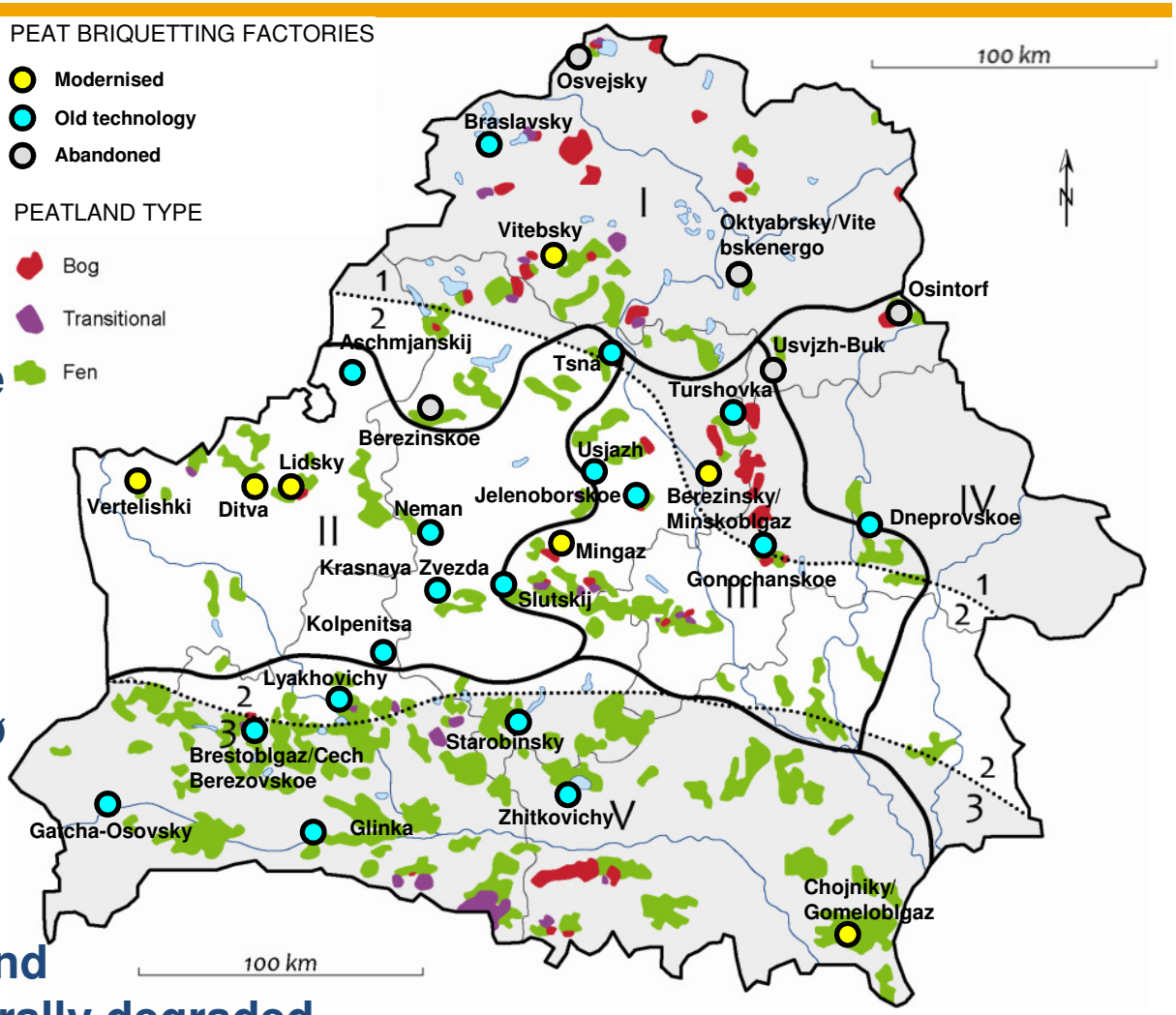
In the past 26 factories produced peat briquettes from 150 000 ha prepared for peat extraction

Today ~20 factories contribute an energy equivalent of 800 Mil. m^3 Gas ("Economy of Belarus" 2014)

Substitution with Biomass from Paludicultures would need 215 321 ha (assuming Ø yield of 8t DM/ha and a calorific value of 17.5 MJ kg^{-1})

=> 150 000 ha on the long run worked out abandoned peatland

=> 250 000 ha of agriculturally degraded peatland



(Busse 2011 after Bambalov & Rakovich 2005)

Showcase peat briquetting factory Lidsky

БЕЛТОПГАЗ
Государственное производственное объединение по топливу и газификации

ОАО «Торфобрикетный завод «Лидский»

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The Successful cooperation shows that reorientation to renewables biomass fuels can be feasible in Belarus

European Commission
EuropeAid Development and Cooperation

Provision and prepa-ration of harvest sites

ОАО «Торфобрикетный завод «Лидский»

European Commission
EuropeAid Development and Cooperation

Investment in new production lines

БЕЛТОПГАЗ
Государственное производственное объединение по топливу и газификации

ОАО «Торфобрикетный завод «Лидский»

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Mini peat briquetting line at LPF is installed for processing biomass peat-biomass briquettes

Pellet line for the production of biomass pellets

European Commission
EuropeAid Development and Cooperation

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Paludiculture
case studies worldwide

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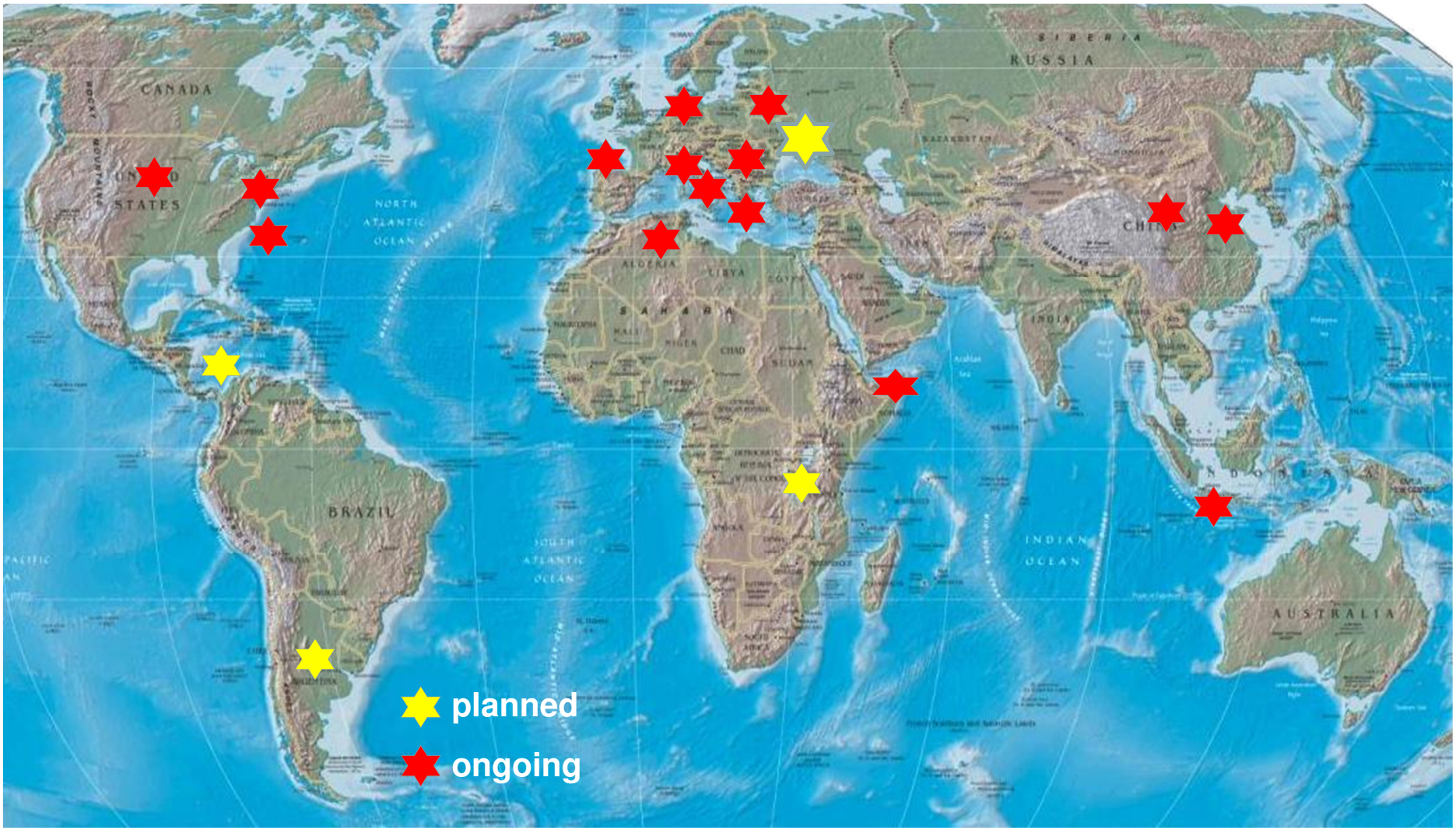

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Come to the 2nd RRR in autumn 2017 in Greifswald

Partner in the
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http://www.paludiculture.uni-greifswald.de/en/projekte/rrr2013/index.php

Conclusions

The production of biomass and utilisation in Paludicultures on (re)wetted peatlands:

- **Needs further optimisation and national and international cooperation to learn from successful pilots for further upscaling**
- **Has synergies with peatland conservation**
- **Can contribute to GHG emissions reduction from drained peatlands**
- **Sustainability of the economic aspects needs further policy support**


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Tänan
teid tähelepanu eest!
http://www.paludikultur.de/
http://www.succow-stiftung.de
http://duene.botanik.uni-greifswald.de
http://greifswaldmoor.de
http://paludiculture.de