Alternative management options for degraded fens – use of biomass from rewetted peatlands

Wendelin Wichtmann

Institute for sustainable use of landscapes Greifswald

Institut für dauerhaft umweltgerechte Nutzung von Naturräumen der Erde e.V. (DUENE)
c/o Botanisches Institut, Grimmer Strasse 88, 17487 Greifswald

Content

- actual situation and possible development
- some functional aspects
- assessment of alternatives
- examples for biomass use
- potentials for energetical use in N-Germany
- conclusions

The actual situation

Main interests on fen peatlands:

- **Nature conservation**
- **Agriculture on peatlands**
  - **is connected with burdening of environment and costs**
  - **is only efficient because of subsidies**

➢ **Subsidies promote not adapted land use**

➢ **Users do not have incentives to look for site adapted land use alternatives for peatlands**

Possible development of degraded fen peatlands

- **Cultural landscapes**
  - **intensive:** peat excavation, arable land, grassland

    problem: very high environmental impact
  - **low intensive:** ecological farming, maintainance of landscapes, nature protection

    problem: still environmental burdens, biomass use (still) not efficient
  - **alternative:** environmentally adapted production under semi-aquatic conditions

    problem: efficiency and political acceptance

- **Natural landscape without any use**
  - **free succession** without rebuilding of amelioration or
  - **restoration** inclusive removing of amelioration installations

    problem: land use options must be bought from the farmers

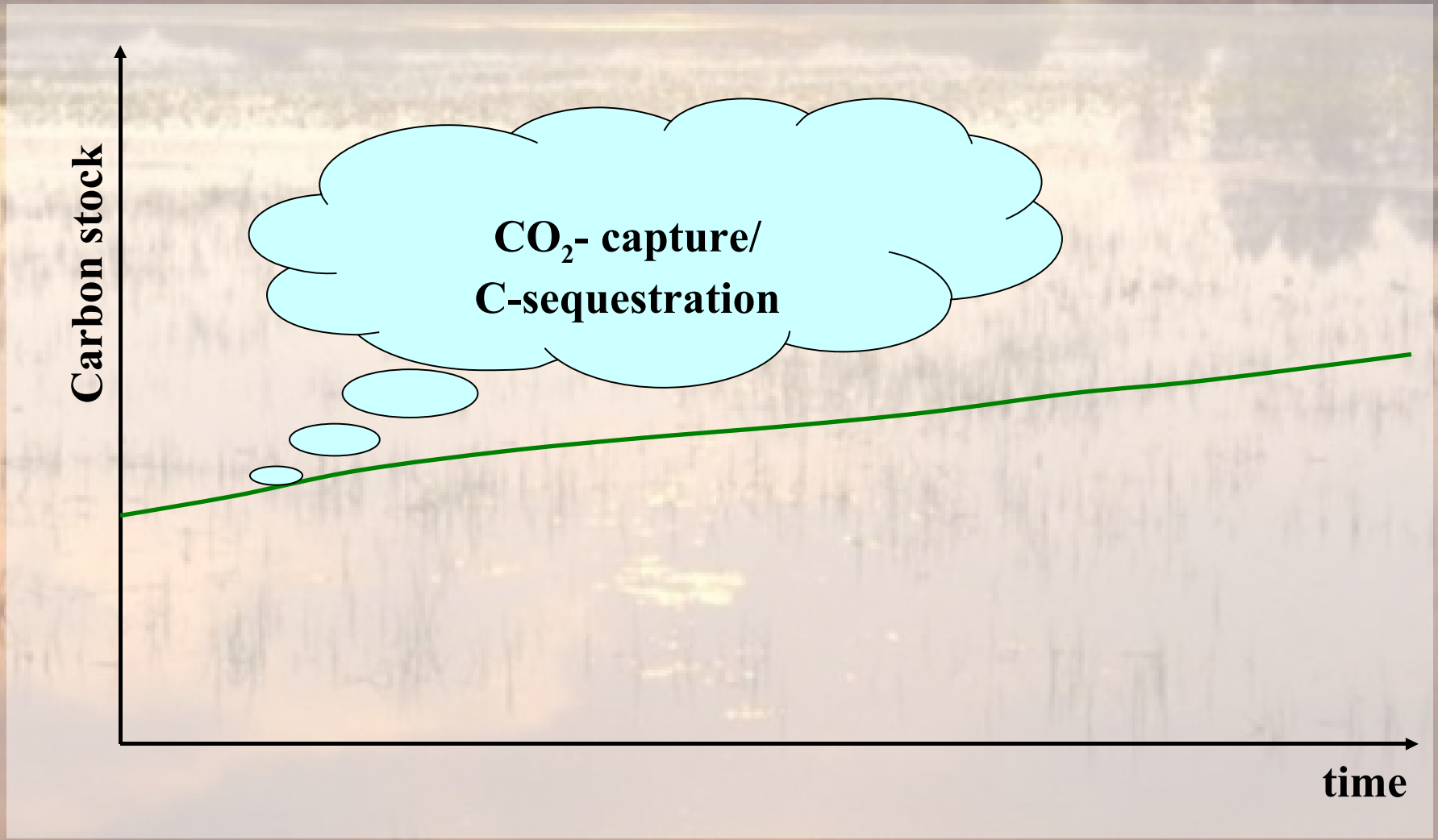
    financing in times of low budgets is not sure

    what will EC-future bring….?

Reasons for keeping peatlands in cultivation

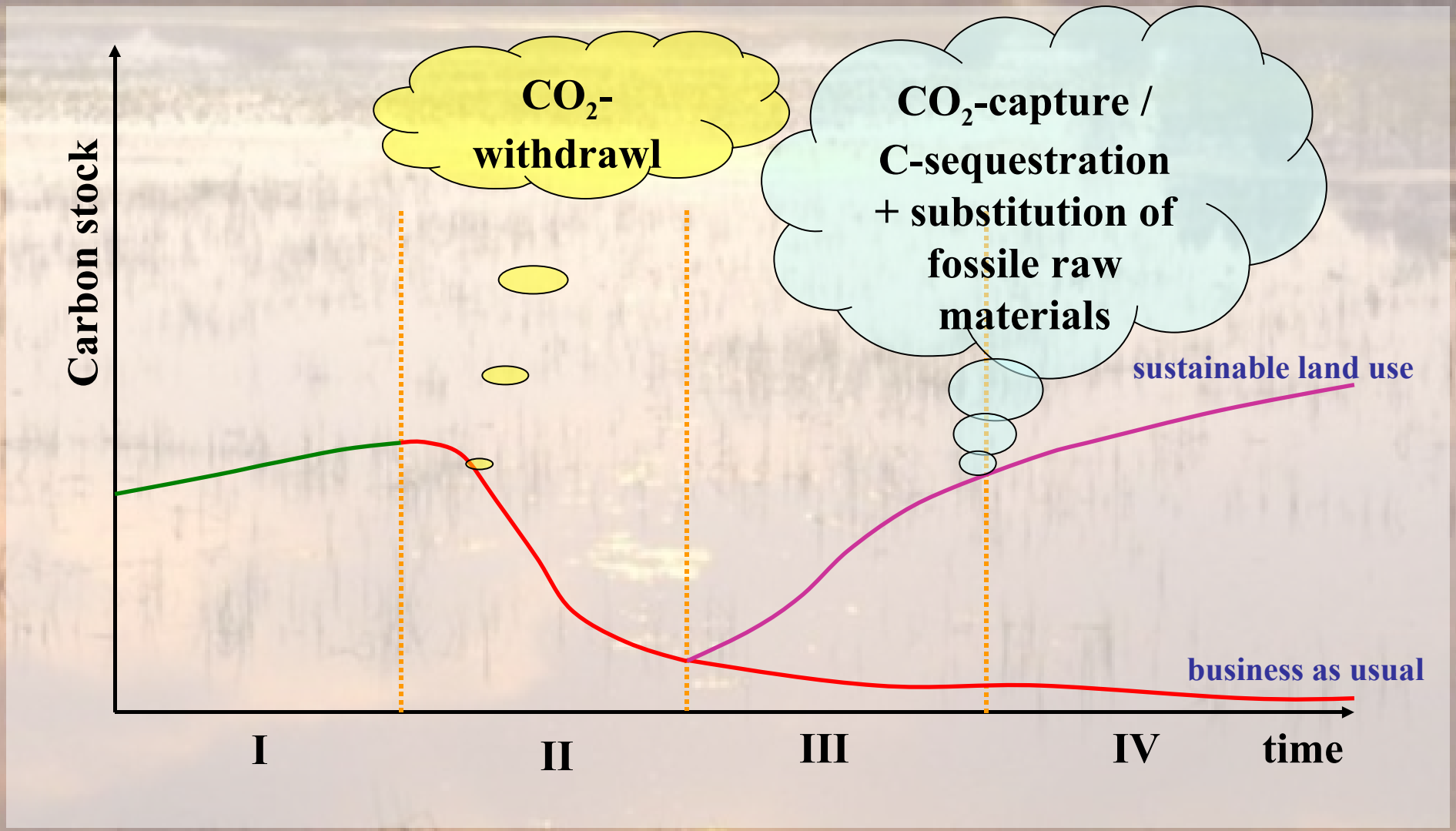
function	
sink disposal	Deposition and recycling of nutrients, carbon sequestration
regulation	keeping cultural landscapes open, site and culture specific biodiversity ground water retention
conservation/ preservation	regional responsibility for plant communities key species
production	fodder, comestible goods, biomass, raw materials
transformation and option	later intensification possible
information	landscape beauty, recreation, esthetics and cognition, research

Natural mires as C-sink



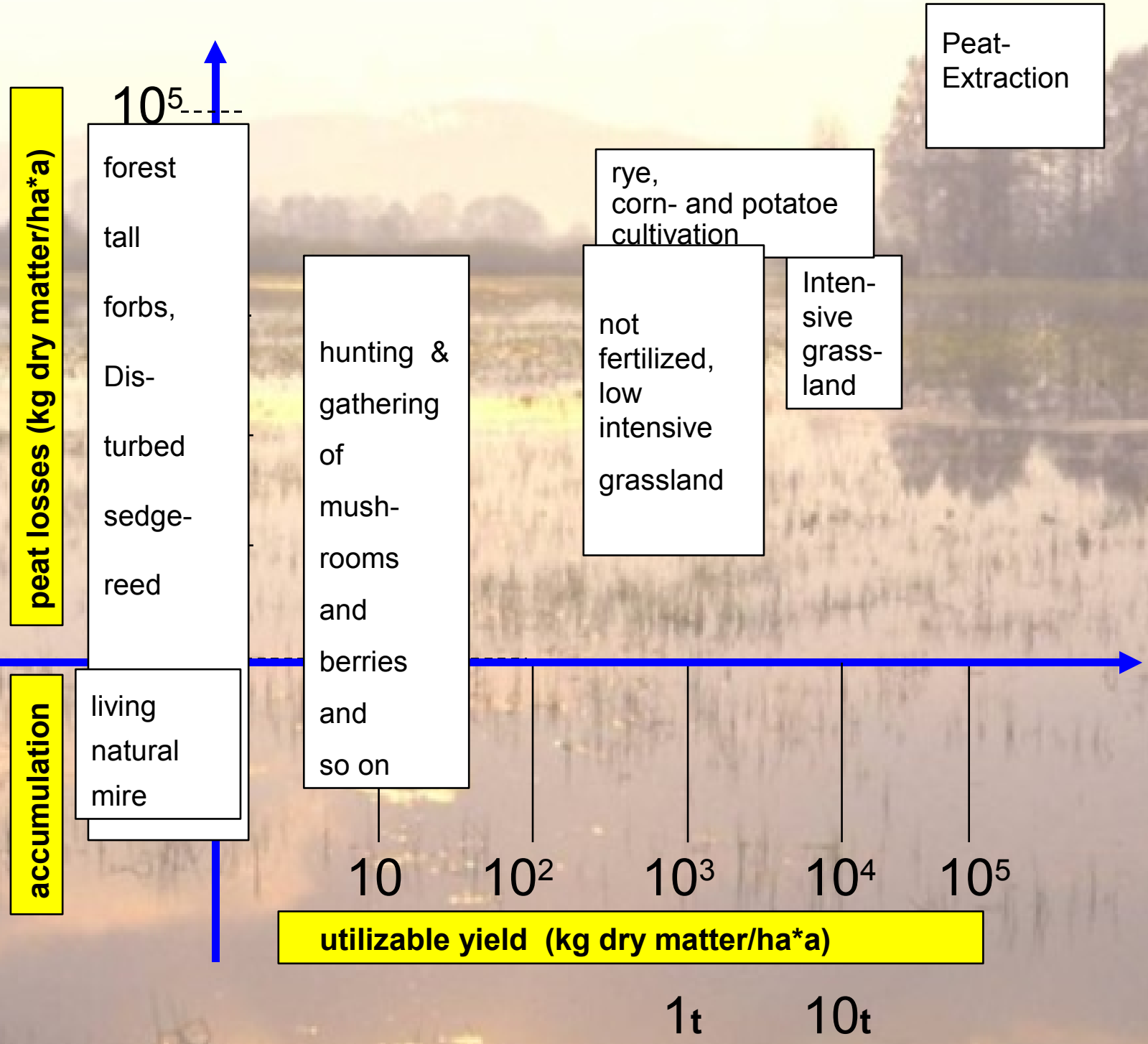
after Schäfer 2005

Carbon ecology in peatland use

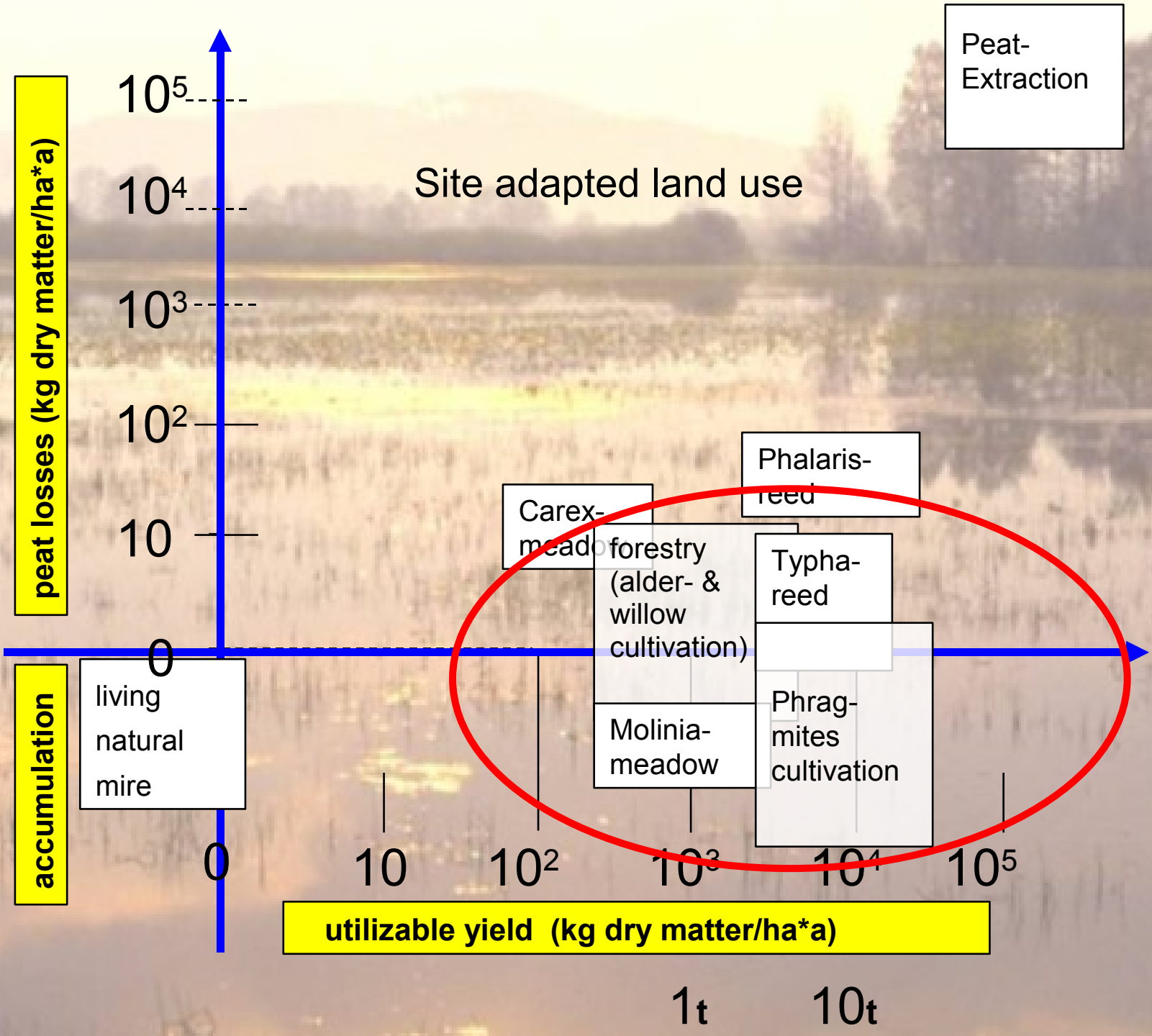


after Schäfer 2005

Land use alter-natives as sink or source for carbon



Land use alter-natives as sink or source for carbon



goals

1. Assessment of alternatives for site adapted land use
2. Restoration of the sink function of peatlands, e.g. for carbon and nitrate
3. Give space for mire key species

1. Development of new land use concepts with minimal harms to environment

Assessment of alternatives for peatlands

Half-open pasture landscapes

fallow/sucsession

afforestation (pine)

Effects on	halfopen pastures	fallow/sucsession	afforestation (pine)
productivity	+-	-	+-
waterretention	+-	+-	-
conservation aspects	+	-	-
environmental aspects	+	+-	--

Assessment of alternatives for peatlands

Low intensity:

Pasture under wet conditions
Trebel valley

Conservation cultivation in the Peene valley

intensive:

Pasture of intensive grassland, Welse valley

alternative:

planted cattail, 2nd year

natural elder stand

Planted reed stand, 2nd year

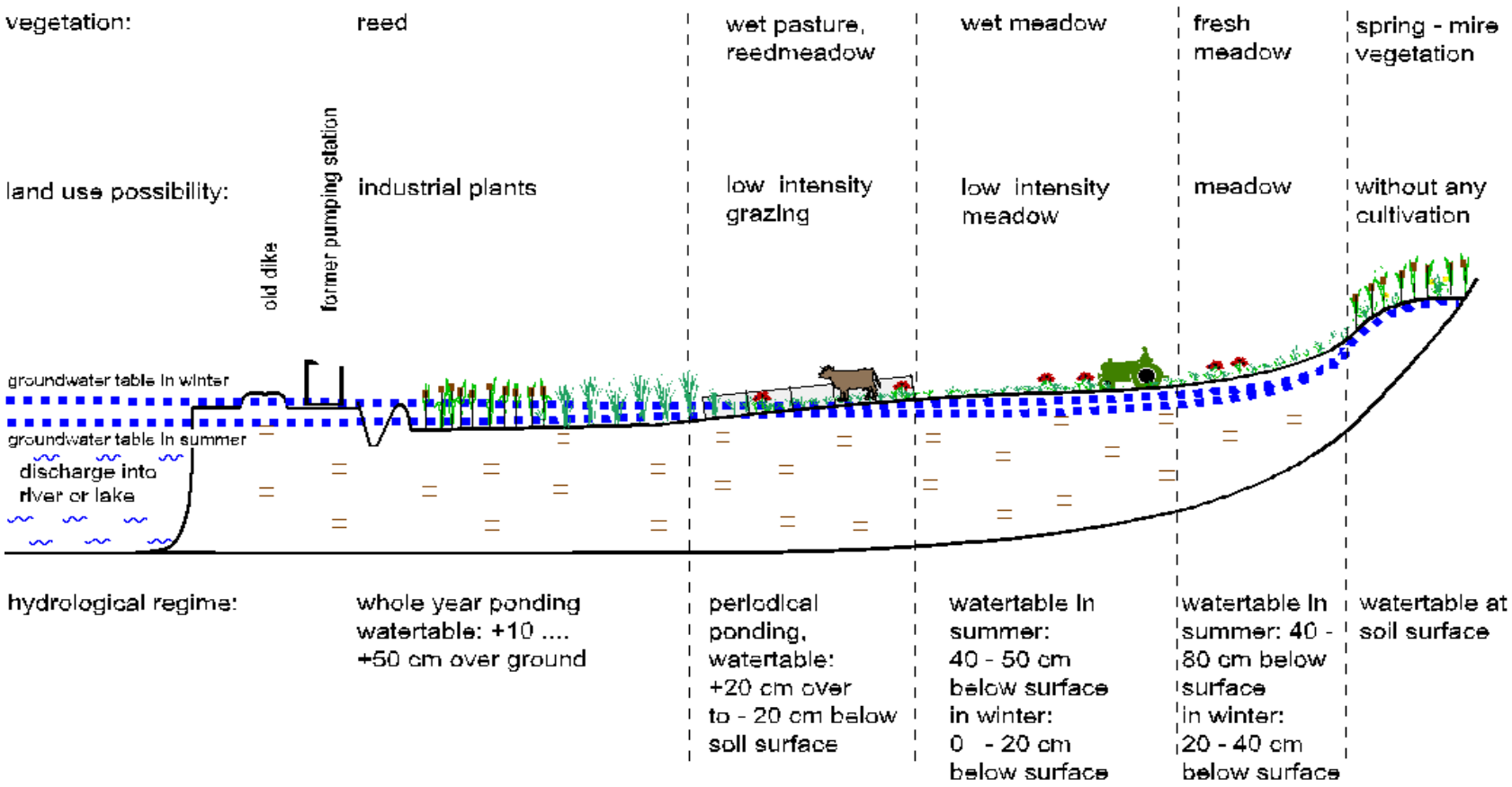
Effects on	Intensive land use	Low intensity	Alternative land use
productivity	++	+-	++
waterretention	+-	+-	++
conservation aspects	--	+	+-
environm. aspects	--	+-	++

natural Phragmites reed stands in the Peene-river valley

Stability of new ecosystems?

The restored Trebel-river lowland

How may a sustainable used fen peatland look like?



Alternative land use on fen peatlands

Examples for utilization of biomass from wet fen-peatlands

demand for quality: + = high, 0 = medium, - = low

Utilization		vegetation	harvest	quality
agricultural	mowing, fodder	wet meadows, reeds	early summer	+
	grazing	wet meadows, reeds	whole year	+
	litter	(Carex)- meadows, reeds	summer	-
	compost	wet meadows, reeds	late summer	-
	pellets	wet meadows, reeds	early summer	+

environmental aspects + nature conservation

harvest

Saiga harvestor

wetlandtrucks

Alternative use of peatlands in Poland, nearby Wolin (Foto: M. Succow, August 2005)

Reed store in Poland (Foto: M. Succow, August 2005)

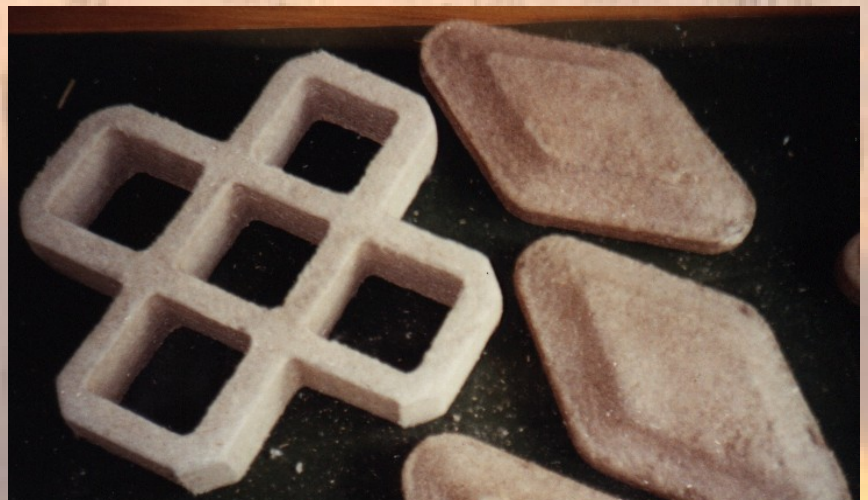
Examples for the industrial use of biomass

formbody
made of cattail

Sandwich plates from cattail

Furniture from elder

formbodies (II): Grids for
prevention from erosion
and „Gesteckträger“



Insulation material

formbodies (III): plant-pot
and nest for swallows

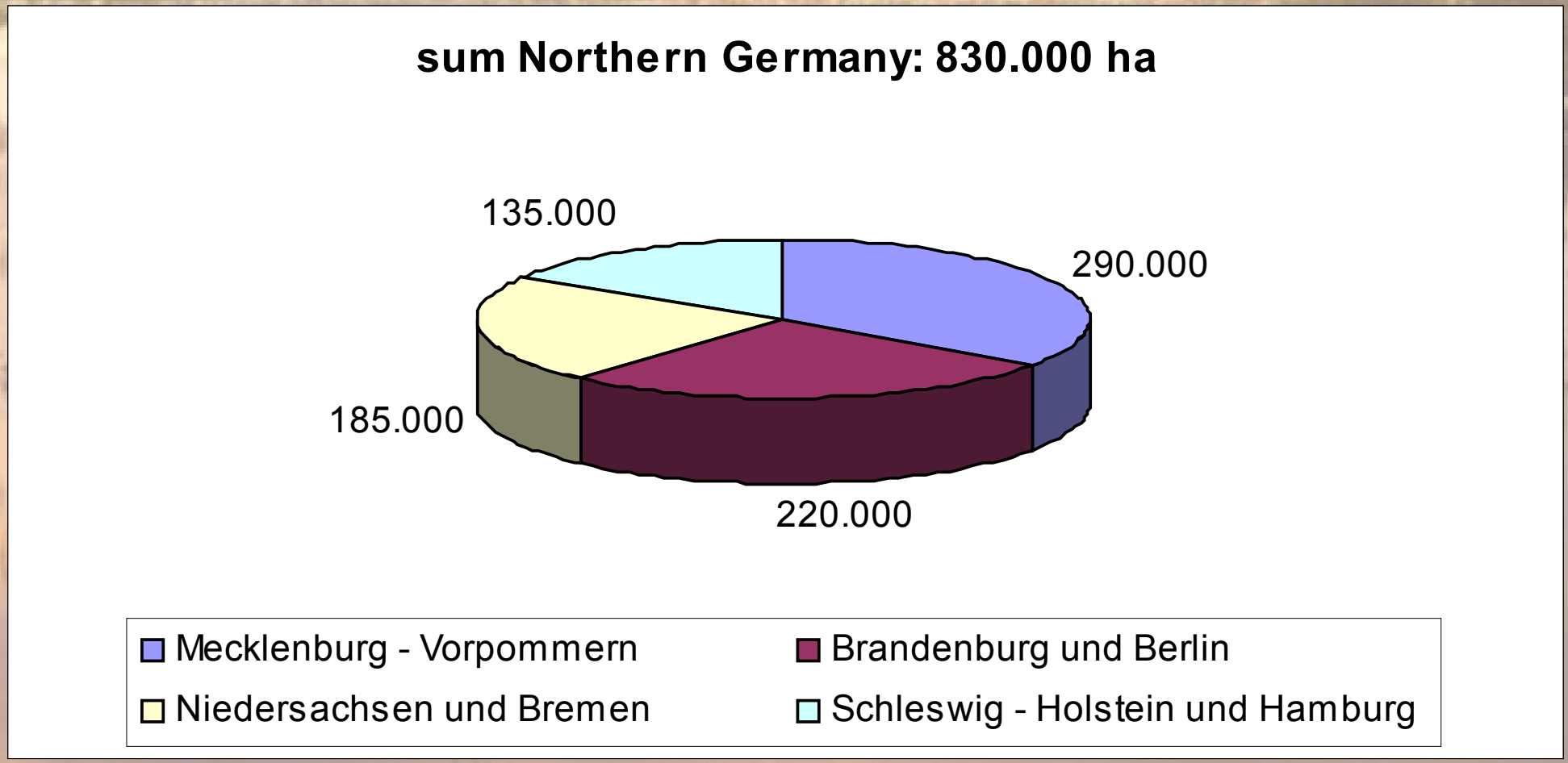
Examples for the energetical use of biomass from peatlands – direct combustion

Biomass fired cogeneration facility in Demmin, M.-V.

oven for direct burning of round bales in Sweden (for heating)

Potential area for Northern Germany

- More than 10 % of the agricultural area are fen peatlands



Scenario for fen peatlands in Northern Germany (830.000 ha) ?

One half (415.000 ha) business as usual (grassland)
(not rewettable sites)

One half (415.000 ha) will be rewetted

50 % of these
~200.000 ha nature conservation
in parts with inundation the whole year
in parts in low intensity with small biomass amounts

The other 50 % of the rewetted peatlands

~200.000 ha → high effective biomass production on
hypertrophic peatlands under wet conditions

Energetic use

Assumption:

harvestable biomass (reed, cattail or reed canary grass: winter harvesting)

average 10 t DM/ha x a

necessary for capacity of 1 MW: 5.000 t DM/a

→ demand for 20 MW power plant 100.000 t/a

→ 10.000 to 30.000 hectar for one power facility

Northern Germany: 7 to 20 power facilities with 20 MW-capacity

basic data a after Thrän und Kaltschmitt 2001

How many money is needed

- evaluation of costs
  - direct calculation of economic conditions
    - gross-margin, full cost analysis
  - asking farmers how many they need

efficiency of biomassproduction for energy use

Assumptions, data changed after Reinhold 2001, Schäfer 1999, Kraut et al. 1996 and Lenk 2002

		canary grass, sedges, glyceria maxima, wet meadows	reed, canary grass	quality-reed (cattail)
Harvest time Kind of biomass		summer green mass	winter dry biomass	winter dry bomass
yield	t (DM)	5	8	20
Big bales	**à 250 kg**	**20**	**32**	**80**
costs				
Fix and variable costs (harvesting)	Euro/ha	210	250	450
transport/storage (3,2 €/t)	Euro/ha	16	25	63
handling/delivery (12,5 €/t)	Euro/ha	63	100	250
grassland subsidies	Euro/ha	204	----	---
sum of costs	***Euro/ha***	***85 (289)***	***375***	***763***
costs per ton	Euro/t	17 (58)	47	38
minimum yield (+ 30%)	Euro/bale	6 (19)	13	12

Actual price for biomass for energetical use: 40€/t

Costs of management of peatlands in comparison with other land use concepts in nature conservation

method	deficiency €/ha	author
sheep	530	Tampe & Hampicke 1995
	160 …. 370	Schlauderer & Prochnow 2003
meadow	200 …. 550	Roth & Berger 1999, Hampicke & Roth, 2000
afforestation pine…beech	210 …. 450	Hampicke 2001
removal of scrubs (2-20J)	140 …. 400	
burning (2-10J)	4 …. 71	Schlauderer & Prochnow 2003
wild animals in half open landscapes	129	
Heck-cattle	150 …. 255	Rühs 2004
altern. use energy	0 ….. 250	
of peatlands : raw mat.	- 41 .... - 415	Wichtmann & Schäfer 2005
elder-production	- 28 ….. 153	

Where may the needed money come from?

- financing
  - payment for biomass **and** for ecol./environm. services
    - CO_2-sequestration
      - Use of biomass from wet peatlands is one of the cheapest options for CO_2-reduction
      - CO_2-permission certificates 20 €/t (emission permissions):
        - » elder production→600 €/ha
      - connect eco-taxes with payments for carbon sequestration
    - regular EC-payments also for wetlands
    - EC-agro-environmental programmes (modulation)

      →wetlands must be included in the agricultural used area

Conclusions I

Importance of use potentials of fen peatlands

- Raw materials for agriculture: litter, humus, fodder

  → **will decrease**
- Nature conservation

  → **will increase**
- Raw materials for energetical and industrial use

  → **will increase**

Sustainable land use on rewetted fen peatlands is

- **possible**, if enough water is available
  - an immediatly valid method for climate protection
  - **positive** for the protection of biodiversity, landscape and waters (not with the beginning)
  - **economic** for the farmer
  - a **cheap** option for climate protection for the society

Conclusions II

- There are enough concepts for sustainable land use on wet peatlands
- There is enough demand for
  - nutient reduction
  - flood control
  - bidiversity maintainance
  - CO_2-reduction

- challange: bring concepts and demands togeteher!

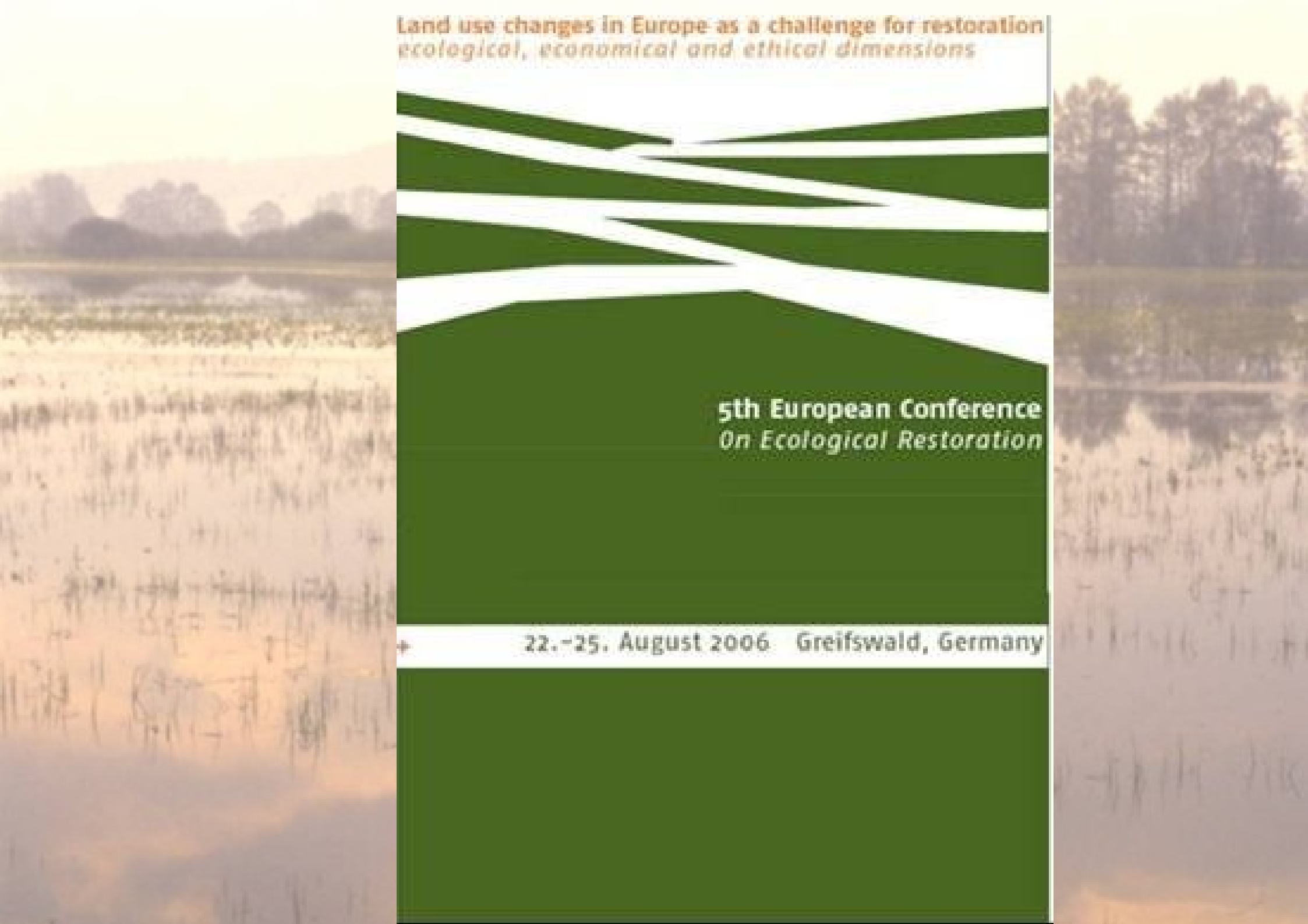
Conclusions III:
How to get nature with a high degree of diversity

- Removal of amelioration-installations linked with free succession (high starting investment)
- Nature conservation by preservation for the maintainance of species rich ecosystems (high permanent investments necessary)

  → the only option for creation and maintainance of sites with scarce plant and animal species
- Rewetting with growing of industrial or energy plants in semi-aquatic ecosystems (neutral to investment)

  → large scaled realisation will lead to a mosaic with high degree of biodiversity

Thank you for listening



Land use changes in Europe as a challenge for restoration
ecological, economical and ethical dimensions

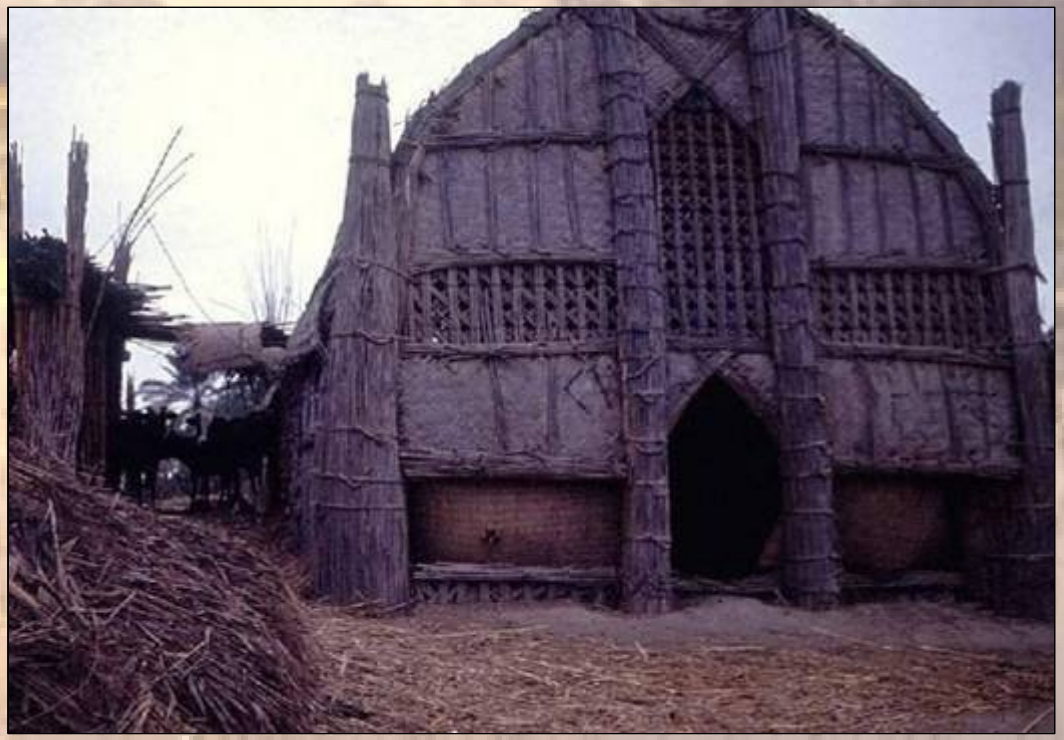
5th European Conference
On Ecological Restoration

22.–25. August 2006 Greifswald, Germany

What you can make else from biomass

The „Ra“ of Thor Heyerdahl

Andreas Tschernoch: „The year of the butterfly„ (reed/steel)



- Cultural land
  - arable farming, intensive (artificial) cut swards, settlements, peat cutting
  - extensive grassland, ecological farming
  - nature conservation
  - industrial plants in semiaquatic ecosystems
- Natural landscapes
  - free succession without rebuilding of amelioration
  - renaturation inclusive removing of amelioration installations
  - restoration of the whole catchment area

Conclusions

-If a fen valley peatland shall be treated more sustainable, one cannot decide for one option of landuse.

-Nutrient and water conditions vary and corresponding to that land use has to conform to these properties.

Costs have to be avoided and highest possible degree of diversity has to be aimed at. Because fodder quality generally decreases with the heighth of the water table and other applications in agriculture are not financable only industrial and energetical utilization of biomass out of fens seem to be suggestive.

Entwicklung des Viehbesatzes und der Milchproduktion in Mecklenburg Vorpommern

Tierart	Unit	Animals per 100 ha agr.			changes 2001 in %	
		1991	2000[3)]	2001[3)]	ict 2000	ict 1991
cattle	head	56	44	44	0	-21
cows	head	19	14	14	0	-26
pigs	head	89	47	47	0	-47

1) 1992; 2) einschl. Pferde und Geflügel 1992; 3) Zählung 03. Mai; 4) 1999; 5) einschl. Pferde und Geflügel 1999; 6) einschl. Geflügel;

Quelle: Statistisches Landesamt.

Kennzahl	1991	2000	2001	Veränd. 2001 in %	
				zu 2000	zu 1991
Milchleistung je Kuh u. Jahr (kg)	4.275	7.002	7.143	+2	+67
Milcherzeugung (kt)	1.258	1.350	1.338	-1	+6

Quelle: Statistisches Landesamt.

expected advantages of reed cultivation:

- keeping full working capacity in rural areas during winter time
- avoidance of nitrous oxides and carbon dioxide emissions as products of mineralization of the drained peat body
- accumulation of carbon dioxide in the harvested biomass and in the developing peat
- filter effect for dissolved solutes in surface waters by the peat and the biomass
- purification effect by the use of reed sites as third purification step for sewage treatment
- utilization of nutrients available in the sewage saving of unnecessary mineral fertilizers and plant protecting agents,
- creation of water retention areas with high evaporation potential creation of stable wetlands as habitat for specialized, endangered species

Target species (mire plants)

Drosera rotundifolia

Ledum palustre

Eriophorum angustifolium

Oxicoccus palustris

Sphagnum spec.

Target species (animals)

Botaurus stellaris

Lutra lutra

Aquila pomarina