LITHUANIAN FUND FOR NATURE

Restoration of damaged peatlands – benefits for nature and climate

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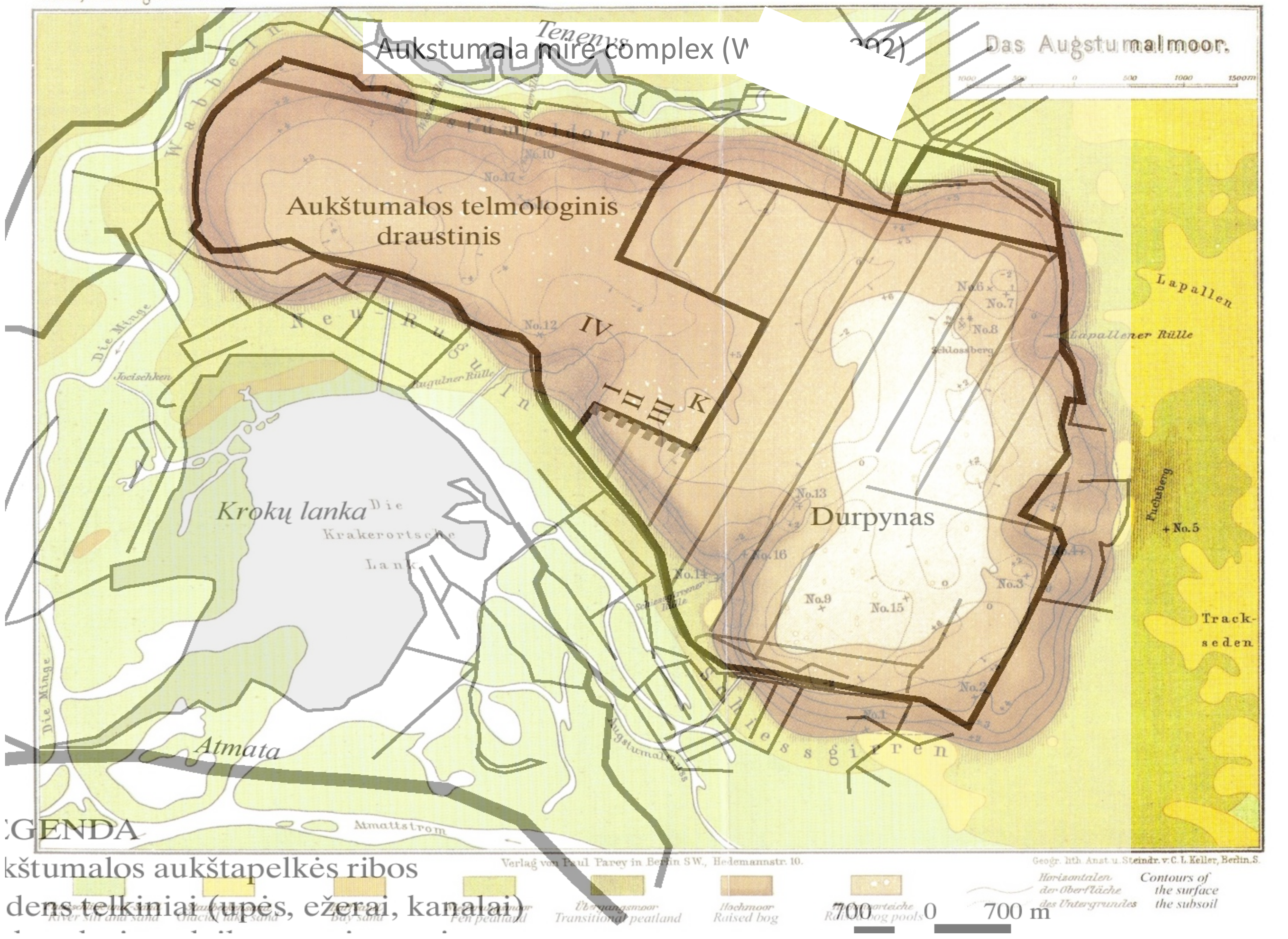
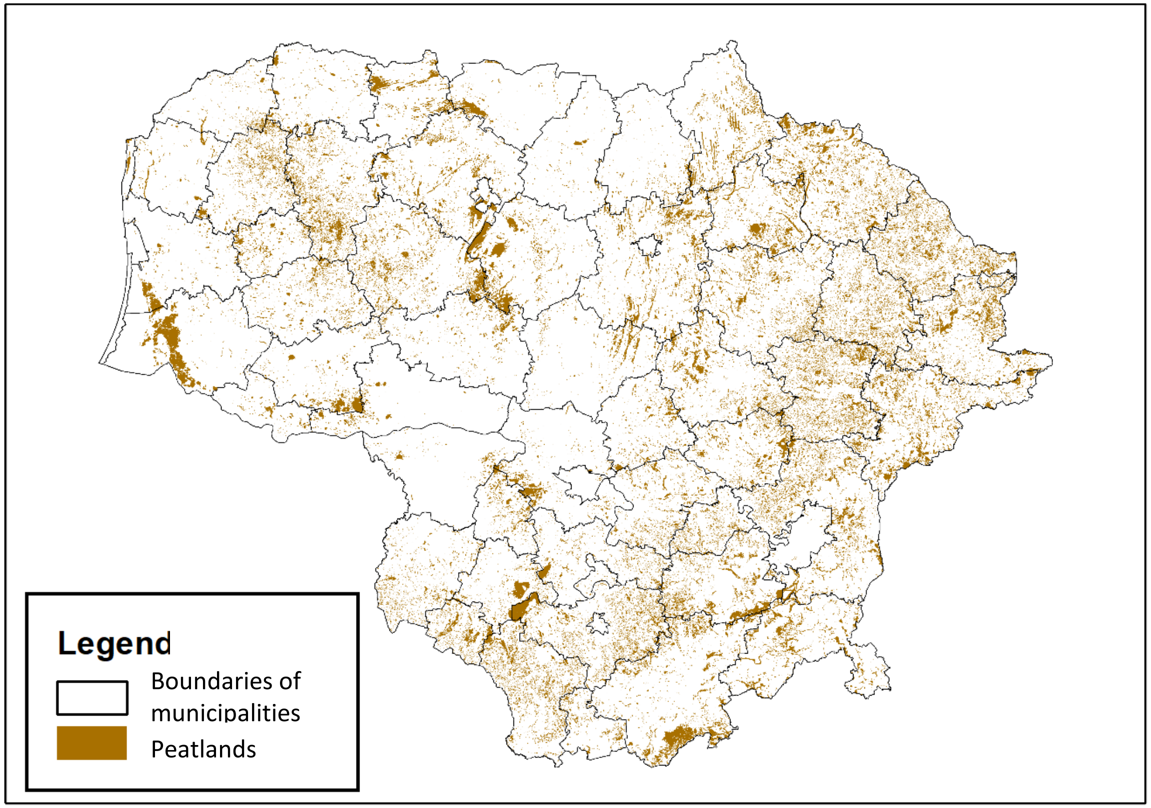
Weber, Das Augstumalmoor. Tafel 1.



The first known restoration of peatland in Lithuania

First “official” damming activity in the Strict Nature Reserve of Kamanos in early 1980th

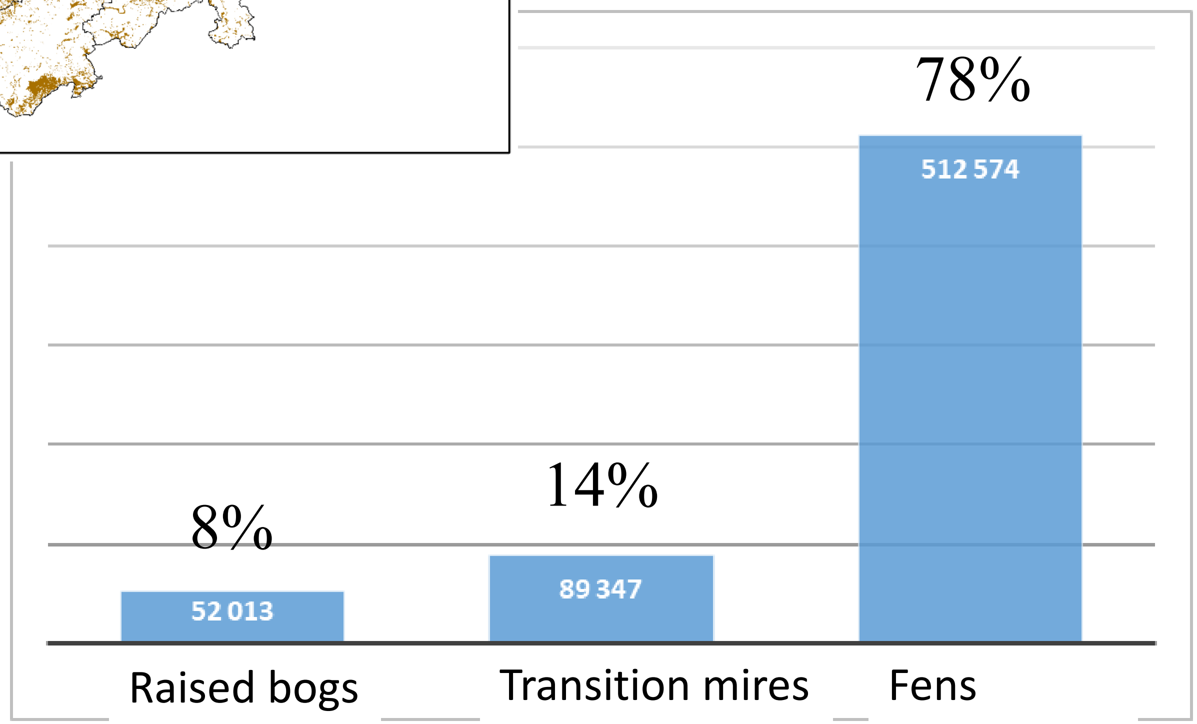


Area of Lithuanian peatlands 654 00 ha = 10% of country territory

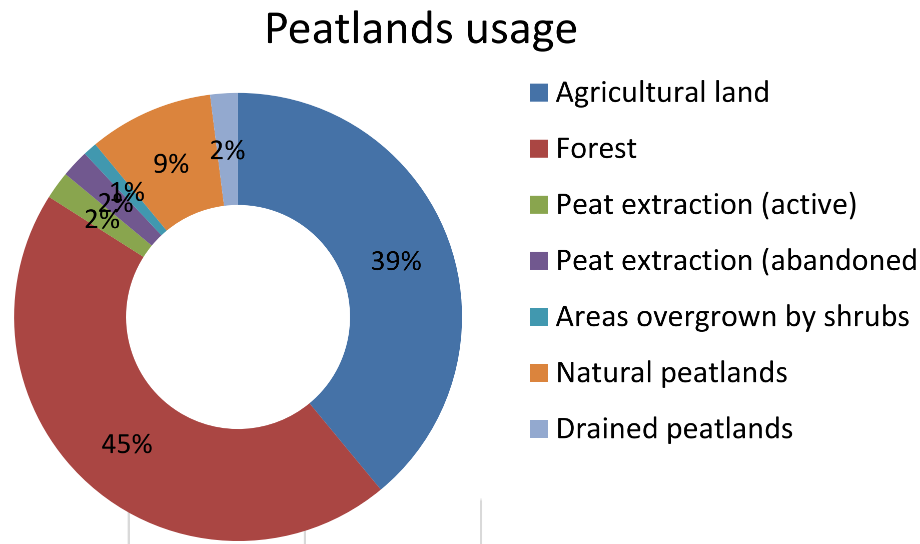
78% – fens

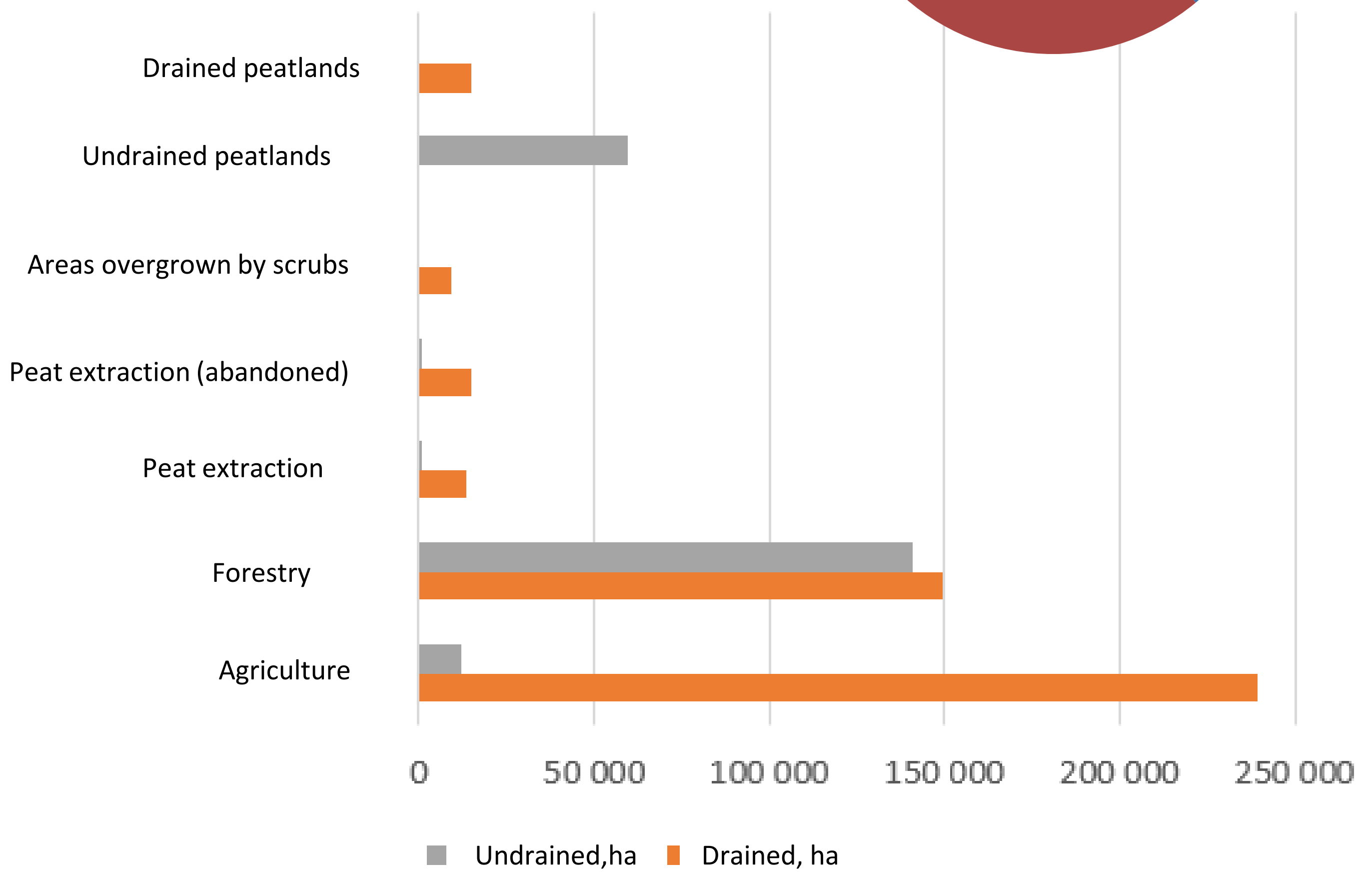
14% – transition mires

8% – raised bogs

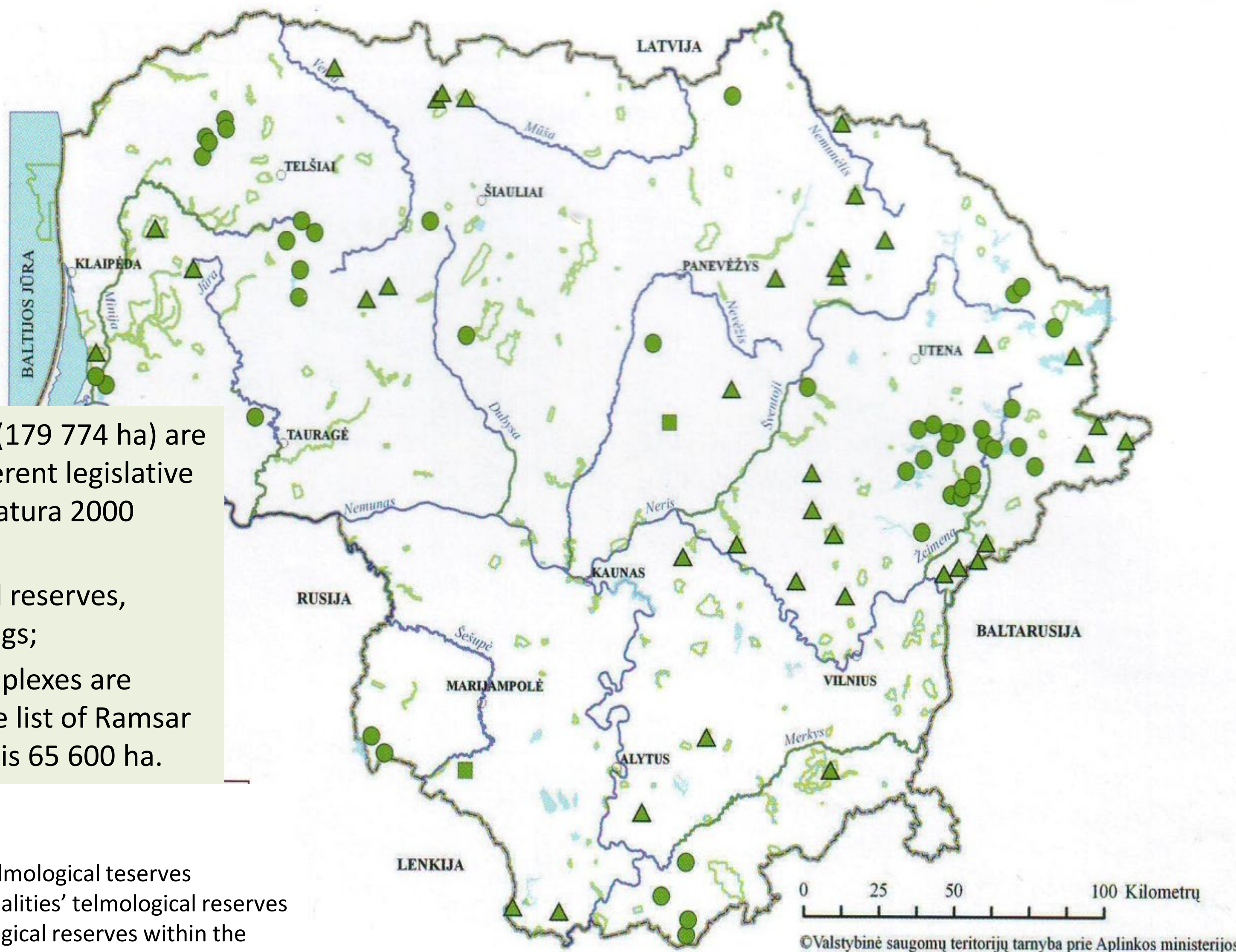


Area of drained peatlands ~70%





Protected peatlands in Lithuania



- 27% of all peatlands (179 774 ha) are protected under different legislative status, e.g. sites of Natura 2000 network.
  - 107 telmological reserves, mainly raised bogs;
  - 7 peatlands complexes are inlcuded into the list of Ramsar sites. Their area is 65 600 ha.

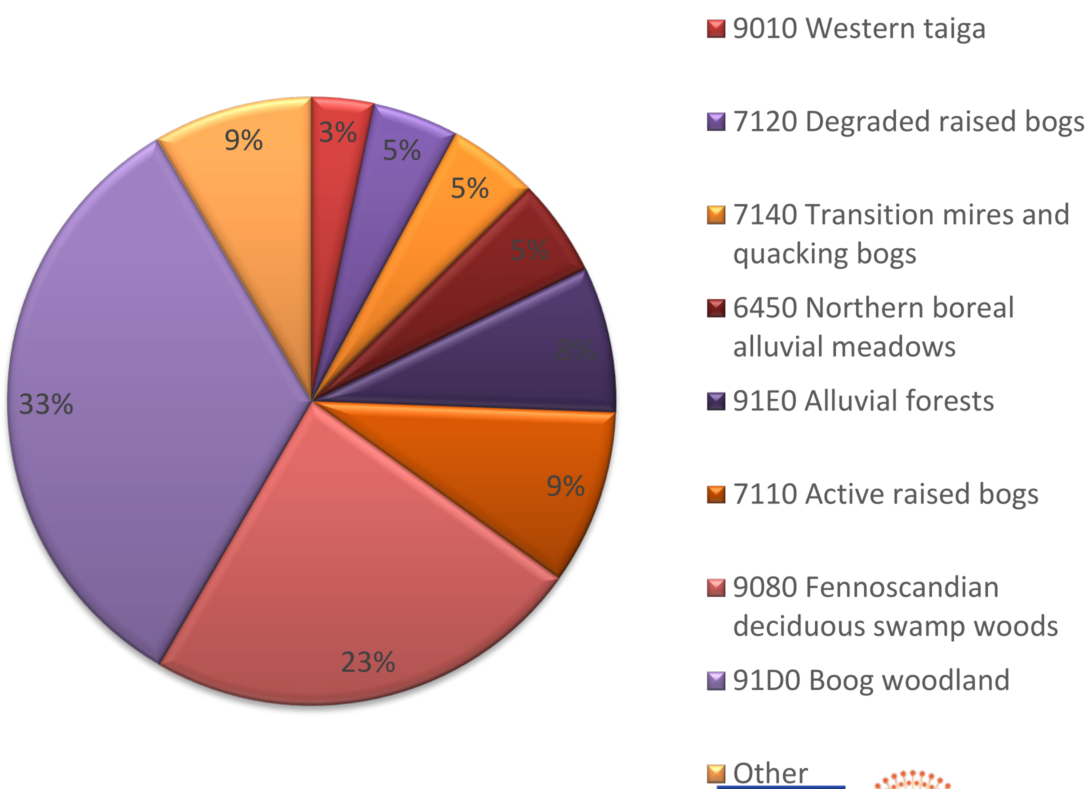
Legend

- State telmological teserves
- Municipalities' telmological reserves
- Telmological reserves within the protected sites

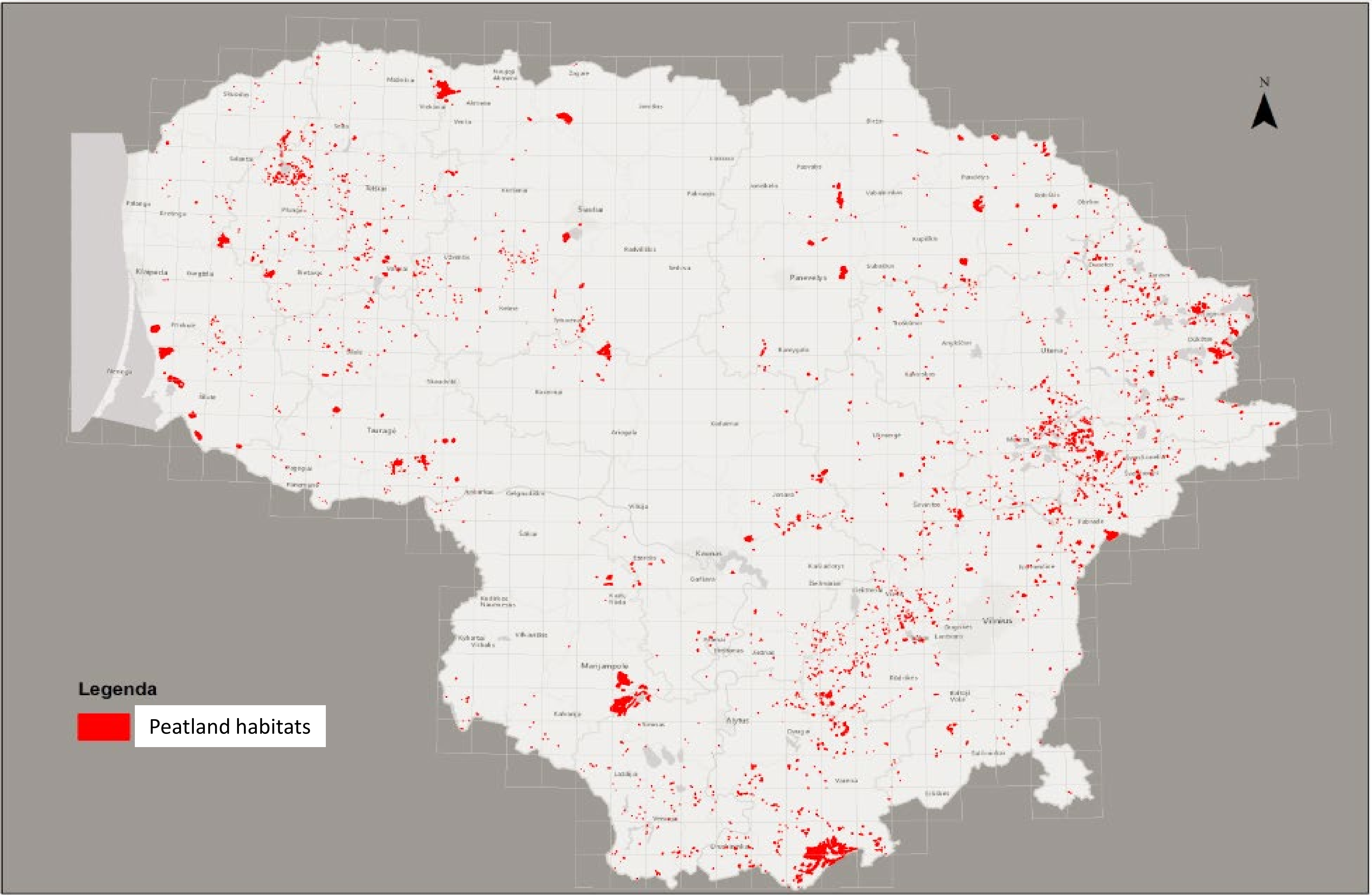
Habitats on peatlands

- 12 mires-related habitats (circa 130 220 ha) of European importance occur in Lithuania.
- More than half of protected peatlands are drained.
- Real protection is ensured only in strict nature reserves and nature reserves.

Distribution of EU habitats found on peatlands



Distribution of all peatland habitats (2015)



Restoration of protected sites

- In 2004-2018, 29 protected peatlands have been managed by restoring hydrological regime, impacting approx. 17 404 ha of protected peatlands. It is 11 % of all protected sites Or 2.7% of all peatlands.
- Financial sources: LIFE, EU Structural funds and other funds, contribution by peat companies. Previously UNDP grants were used to restore RAMSAR and other sites.

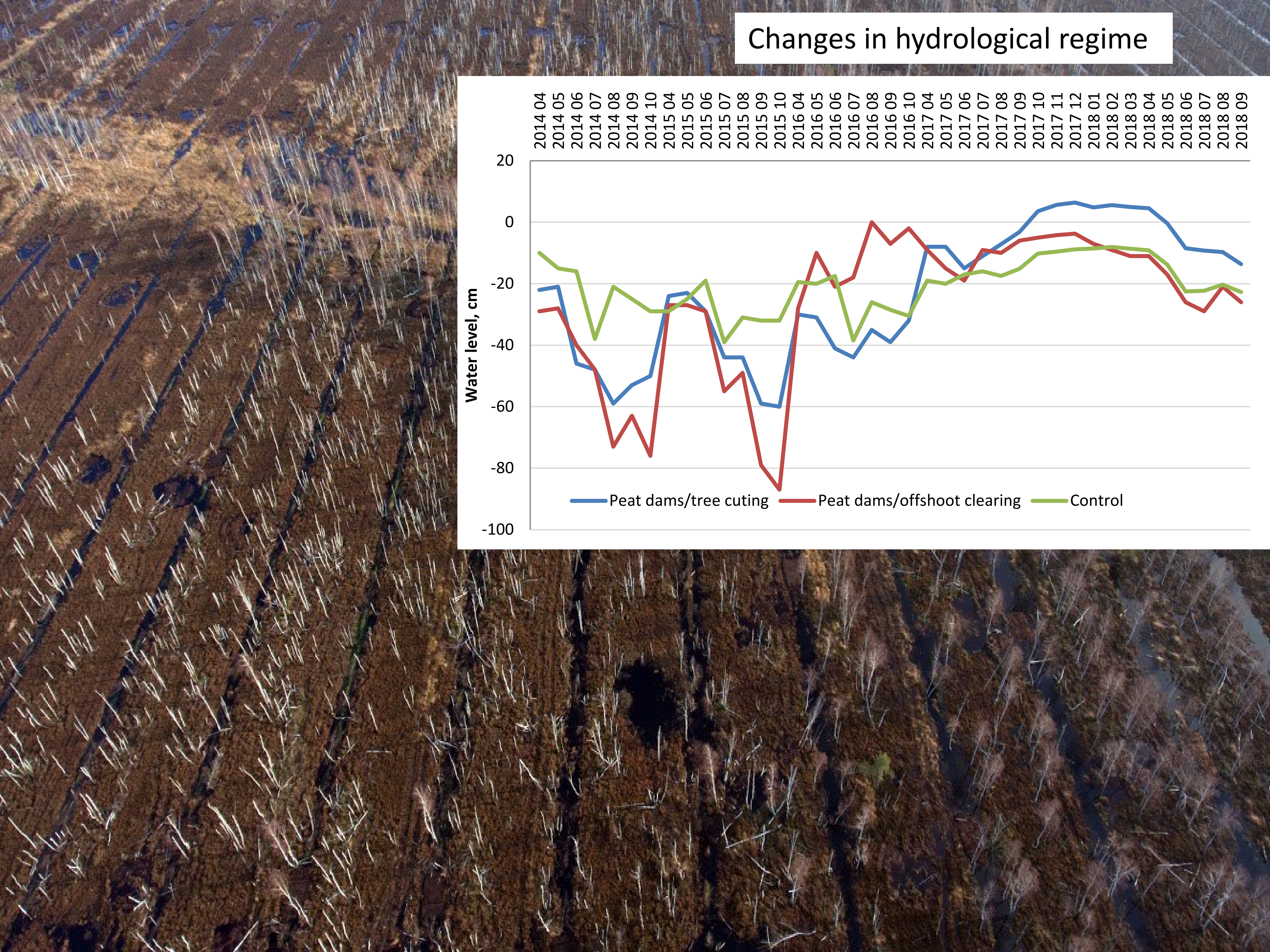
Usually Best practice is applied in restoration of damaged bogs.





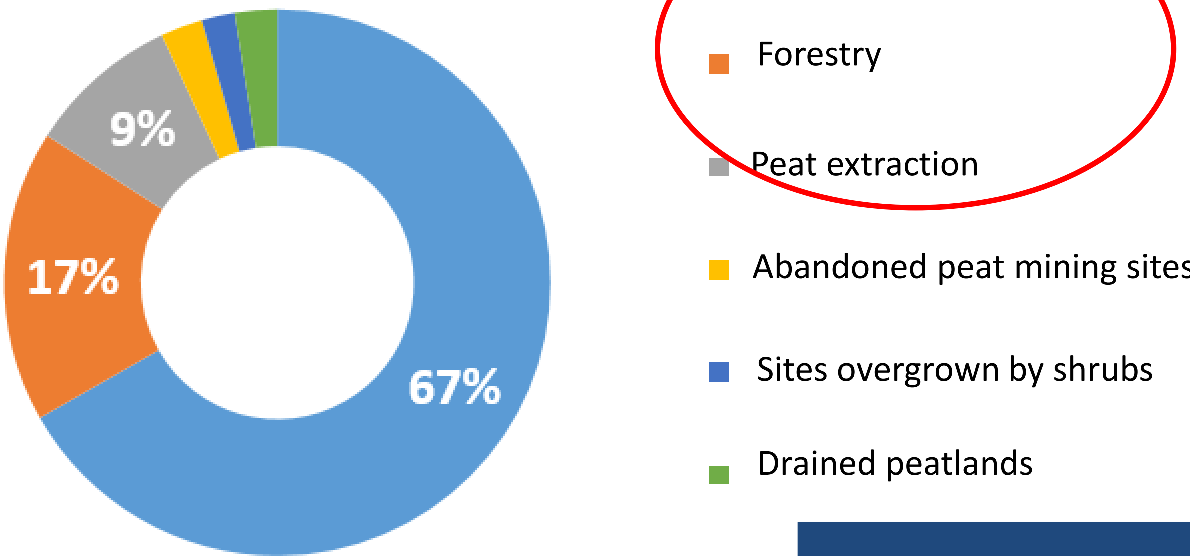
From complicated infrastructure…
To sometime simple handwork…


LIFEAUKSTUMALA
LIFE12NAT/LT/000965
Before
After


Changes in hydrological regime
2014 04
2014 05
2014 06
2014 07
2014 08
2014 09
2014 10
2015 04
2015 05
2015 06
2015 07
2015 08
2015 09
2015 10
2016 04
2016 05
2016 06
2016 07
2016 08
2016 09
2016 10
2017 04
2017 05
2017 06
2017 07
2017 08
2017 09
2017 10
2017 11
2017 12
2018 01
2018 02
2018 03
2018 04
2018 05
2018 06
2018 07
2018 08
2018 09
20
0
-20
-40
-60
-80
-100
Water level, cm
Peat dams/tree cuting
Peat dams/offshoot clearing
Control

But is there any or significant benefit to the mitigation of climate change?

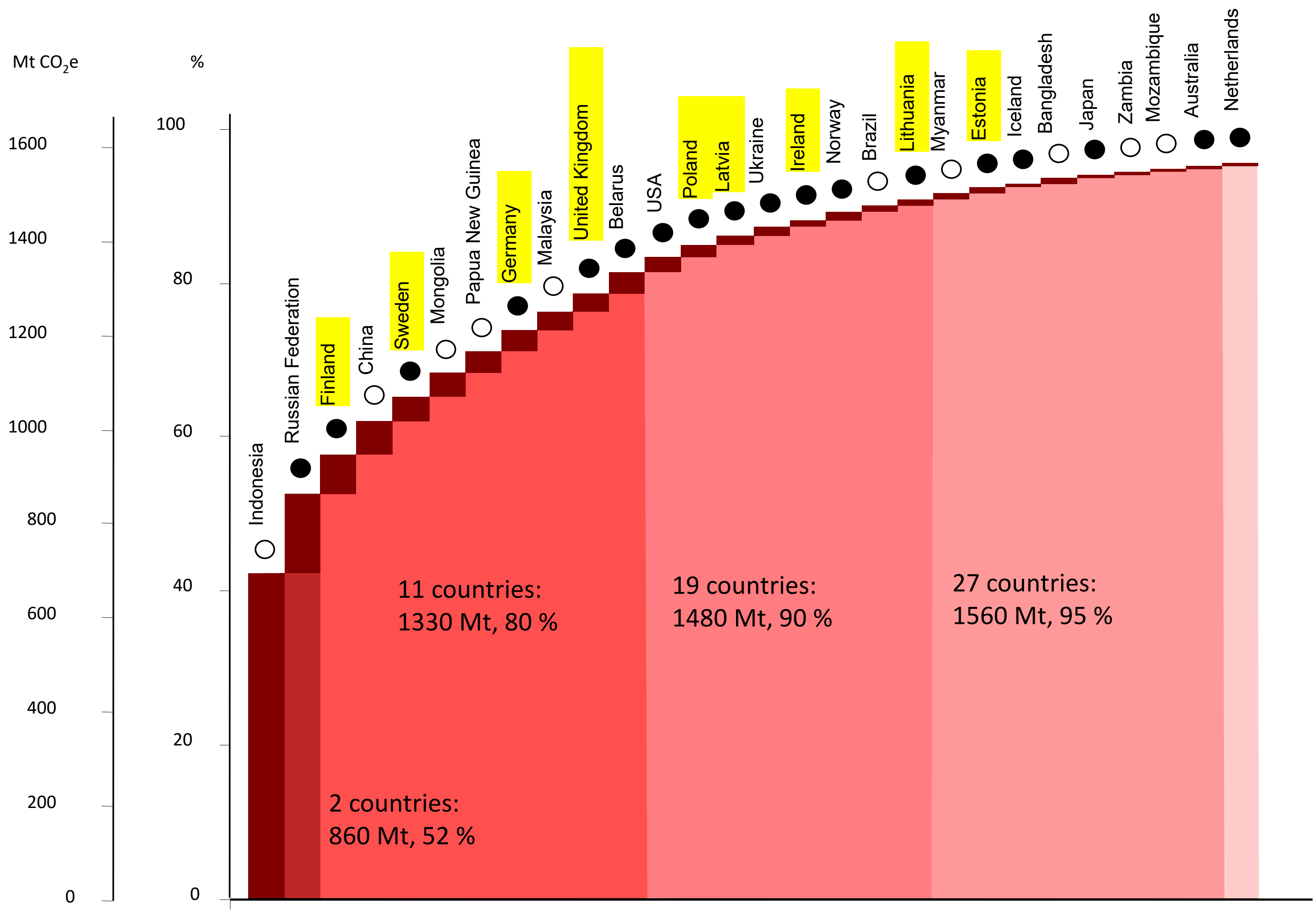
GHG emissions

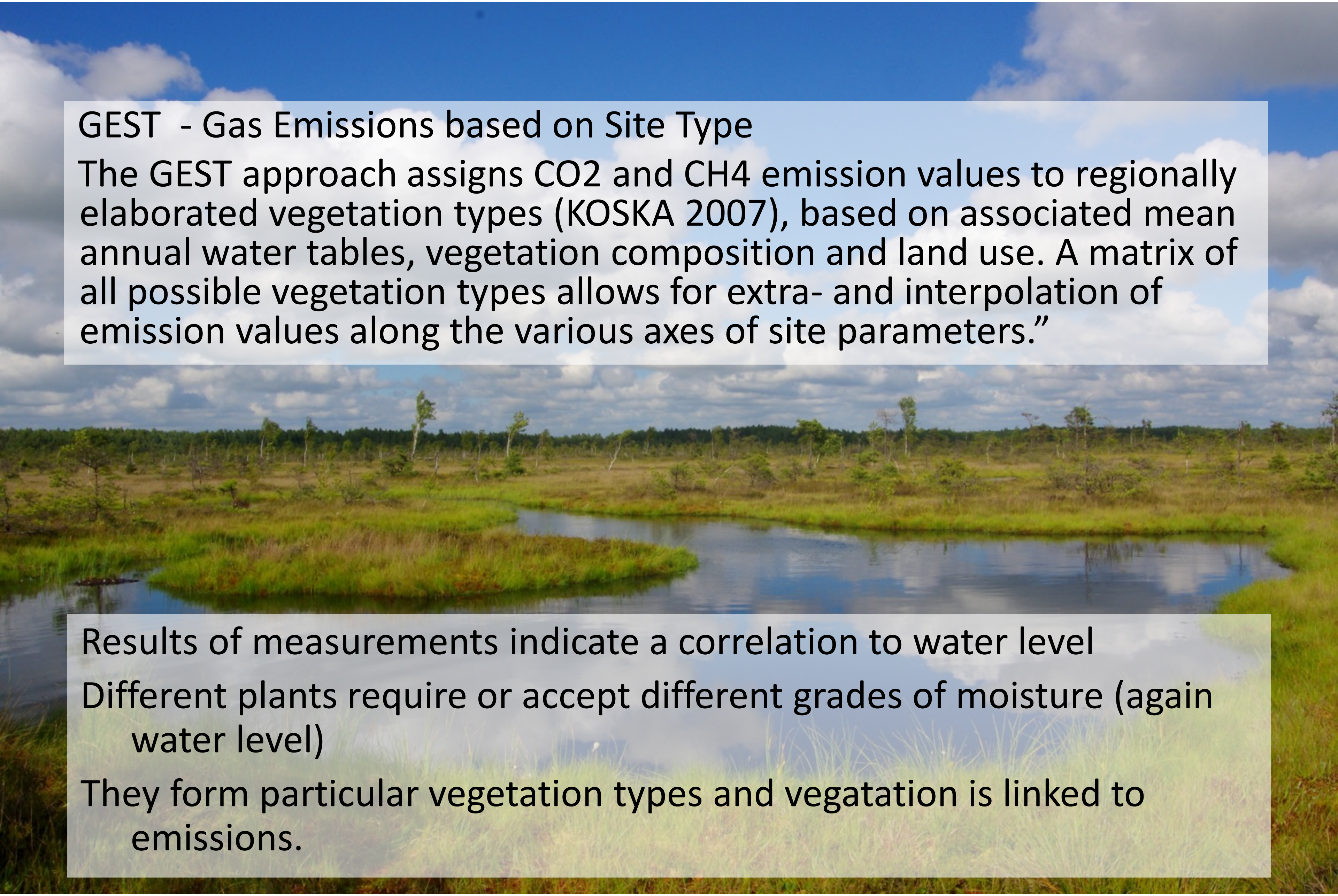


Lithuania's National Inventory of GHG – 1 900 GHG emissions kt of CO_2 eq. from peatlands in 2016. total country's emissions – 21 000 kt. kt of CO_2 eq.

Usage	GHG emissions kt of CO_2eq./year (from-to)
Agriculture	4 578-7 216
Forestry	1 868 - 2 117
Peat extraction	869 - 973
Peat extraction (abandoned)	268
Overgrown sites by scrubs	212
Drained peatlands	269
Total	**8 313 - 10 806**

Calculation based on new coefficients:
2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands


Mt CO_2e
%
1600
1400
1200
1000
800
600
400
200
0
100
80
60
40
20
0
Indonesia
Russian Federation
Finland
China
Sweden
Mongolia
Papua New Guinea
Germany
Malaysia
United Kingdom
Belarus
USA
Poland
Latvia
Ukraine
Ireland
Norway
Brazil
Lithuania
Myanmar
Estonia
Iceland
Bangladesh
Japan
Zambia
Mozambique
Australia
Netherlands
11 countries:
1330 Mt, 80 %
19 countries:
1480 Mt, 90 %
27 countries:
1560 Mt, 95 %
2 countries:
860 Mt, 52 %



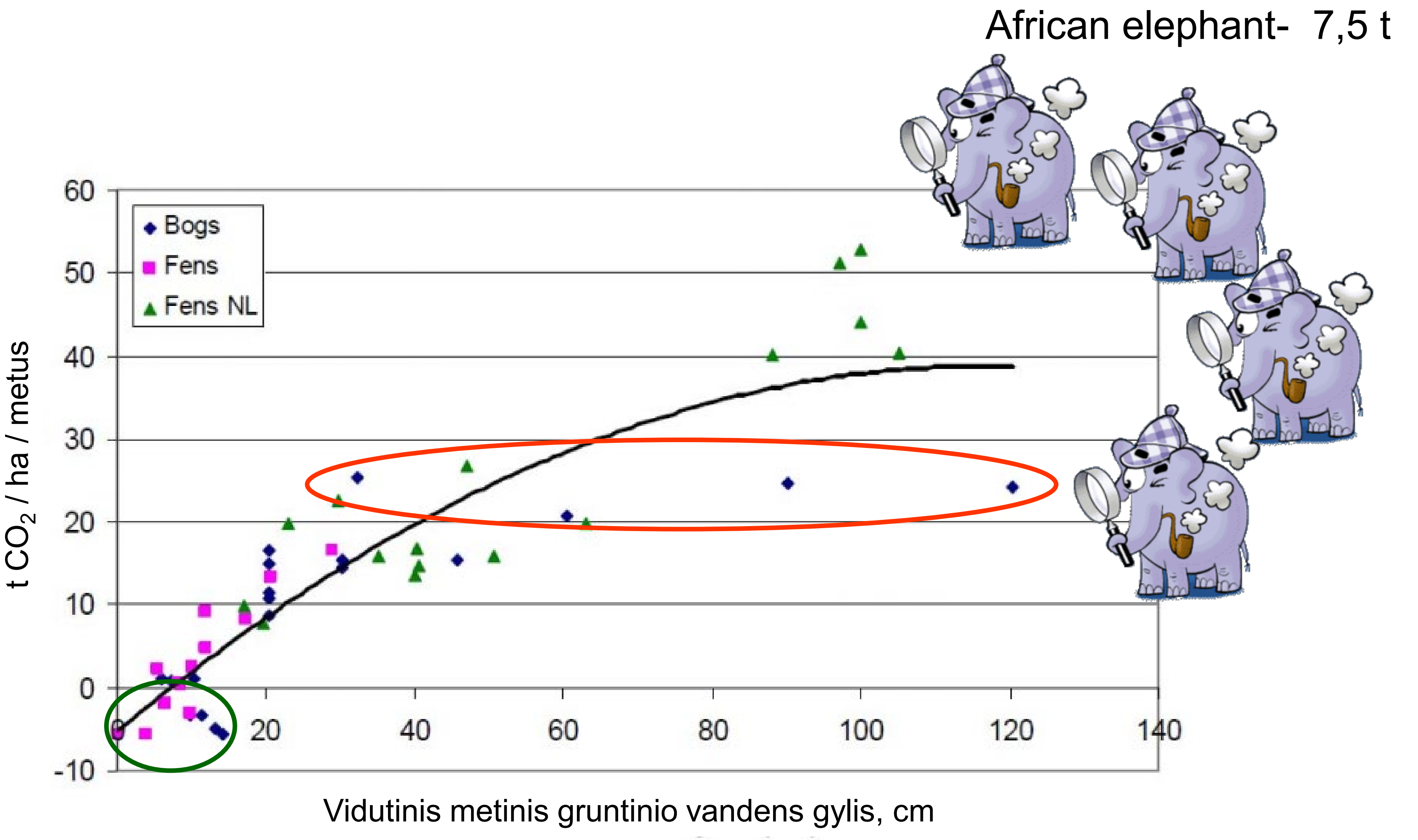
GEST - Gas Emissions based on Site Type

The GEST approach assigns CO_2 and CH_4 emission values to regionally elaborated vegetation types (KOSKA 2007), based on associated mean annual water tables, vegetation composition and land use. A matrix of all possible vegetation types allows for extra- and interpolation of emission values along the various axes of site parameters.”

Results of measurements indicate a correlation to water level

Different plants require or accept different grades of moisture (again water level)

They form particular vegetation types and vegatation is linked to emissions.



Correlation between the emissions of CO_2 and ground water level. According to the examples of Western Europe (Verhagen et al. 2009).

GEST / Vegetation type	Published/Typical Plant species	Water level	CO_2 emissions (t CO_2-eq. /ha/year)	CH_4 emissions (t CO_2-eq. /ha/year)	GWP estimate (t CO2 eq. /ha/year)
extremely flooded Reeds (>20 cm above surface)		6+	-32,7	26,2	-6,5
Wet cultivated grassland	Phalaris arundinacea	5+/4+	-3,9	0,0	-4,0
Very moist peat moss lawn		(5+/4+), 4+	-4,3	1,5	-3,0
+ additional with "shunt"-species	+ Juncus effusus, Phalaris arundinacea, Phra	5+, 5+/4+	-3,9	2,9	-1,0
Flooded Phragmites & Phalaris reeds		6+, (6+/5+)	-12,4	12,4	0,0
Bare Peat (wet-dry)	No or sparse vegetation	5+/4+	1,3	0,2	1,5
Wet peat moss lawn		5+, (5+/4+)	-3,0	5,3	2,0
Wet small sedges reeds mostly with moss layer		5+ (4+)	-2,0	4,7	2,5
Ditches along to extensive used areas	-	6+	0,0	3,2	3,0
Moist reeds and (forb) meadows		3+	2,8	0,0	3,0
Moist Forests and shrubberies		3+			3,0
Wet Meadows and forbs		5+	-3,9	7,4	3,5
Very moist bog heath	Calluna vulgaris, Erica tetralix, Eriophorum ...	(5+/4+), 4+	4,7	0,9	5,5
Simulated Harvest - Paludiculture	Phragmites australis, Typha latifolia	(5+), 5+/4+	11,5	3,1	14,5
Very moist Meadow		4+/3+	13,0	4,8	18,0
Wet bog heath	+ Andromeda polifolia, Sphagnum spec., Vac	6+/5+, 5+, (5+/4+)	0,0	17,8	18,0
Moist cultivated grassland	Agrostis stolonifera, Elymus repens, Festuca	3+, 3+/2+	19,4	0,0	19,5
Moderately moist (forb) meadows		2+	20,0	0,0	20,0
Moderately moist Forest and shrubberies		2+			20,0
Mesotrophic and eutrophic peatlands		2+			20,0
Moist Croplands	Avena sativa, Hordeum vulgare, Secale cerea	3+, 3+/2+	23,4	0,2	23,5
Cultivated grassland flooded in summer	not specified	(5+), 5+/4+, (4+)	-0,1	26,0	26,0
Moderately moist cultivated grassland	Alopecurus pratensis, Anthoxanthum odorat	2+, 2-	31,4	0,0	31,5
Croplands flooded in summer	Zea mays	3+	22,6	10,3	33,0
Croplands on degraded peat soils	Avena sativa, Zea mays	2+, 2-	35,1	0,1	35,0
Peat moss lawn on former peat-cut off areas	Eriophorum vaginatum, Molinia caerulea, Sp	5+, 5+/4+	2,8	37,3	40,0
Moderately moist Croplands	Hordeum vulgare, Secale cereale, Solanum t	2+, 2-	41,7	0,1	42,0
Flooded Reeds with lateral matter transport from surrounded areas		6+, 6+/5+,(5+)	2,4	40,9	43,5
Cultivated Grassland on degraded peat soils	Alopecurus pratensis, Dactylis glomerata, Fe	2-, 2+/2-, 2+	46,1	-0,1	46,0

Plinkšių Peatland

Sachara peatland

Puščios telmological reserve

peat restore

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LIETUVIŠKOS DURPĖS
DURPIŲ ĮMONIŲ ASOCIACIJA

LIFE PEAT restore LIFE15 CCM/DE/000138

"Reduction of CO_2 Emissions by Restoring Degraded Peatlands in Northern European Lowland"

Aukštumala peatland: exploited part

All together Lithuanian sites cover about 400 ha;

Amalvas peatland in the Biospehre Reserve of Zuvintasdurpynas

Sites	Area , ha	Emissions, tones of CO_2 eq./year	Emissions in 50 years
Aukstumala	10,0	46,944	2347,2
Amalvas	206,0	-61,08	-3054
Sachara	89,0	177,934	8896,7
Puscia	76,0	440,152	22007,6
Total	**381,0**	**604,0**	**30197,5**
scenario on emissions after rewetting		**Reduction of emissions of CO_2 eq./year**	
after rewetting	350,0	332	
bare peat (moist, dry) -> very moist peat lawn	33,4	-100,2	
Moderately moist Forest and shrubberies -> moist forests and shruberies	138	414	
Wet peat moss lawn with pine trees-very moist peat lawn	40,1	-120,3	
ditches		0	
other	138,5	138,5	

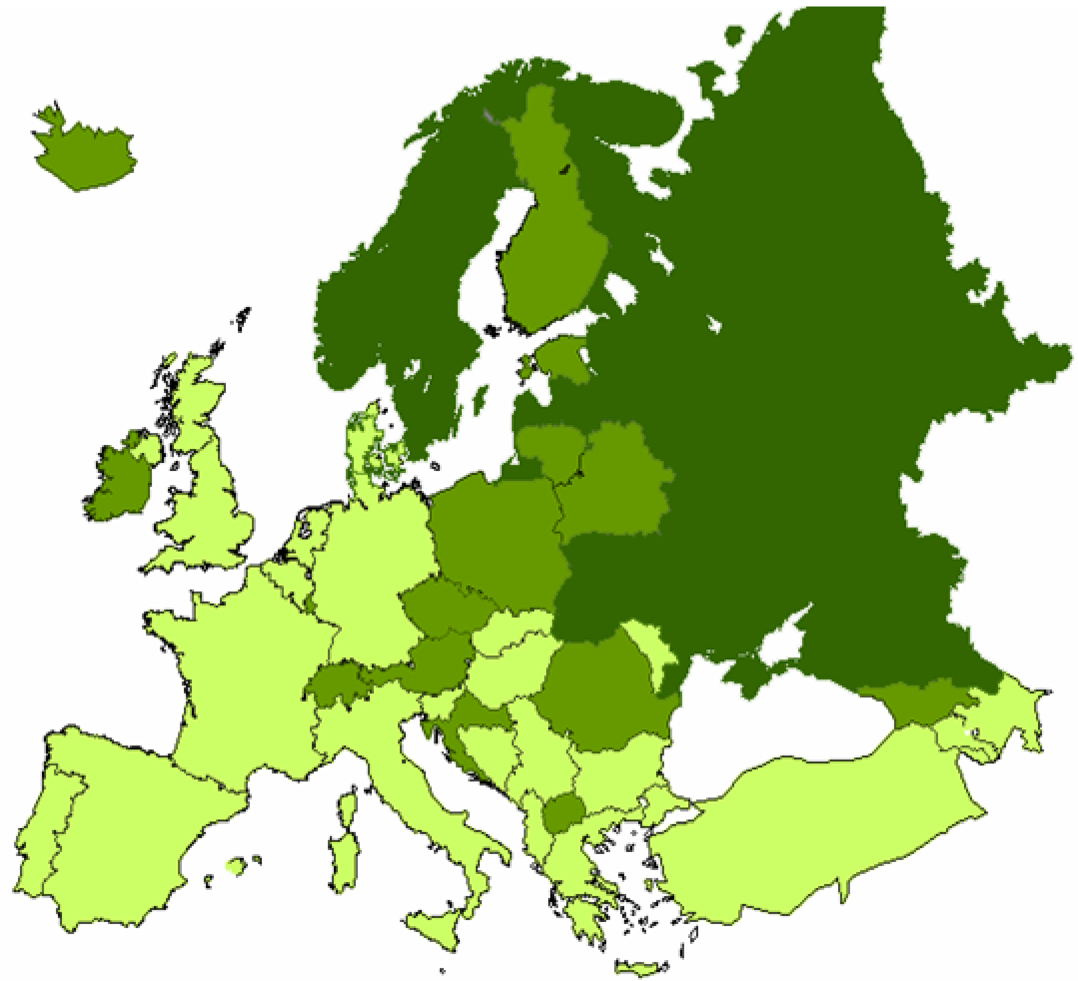
Using GEST approach we roughly estimated that restoration of peatlands in protected sites (~17 000 ha) resulted in reduction of approx. 100 – 200 kt of CO_2 eq. since GEST types with relatively low emission factors dominate in such areas.

Why a horti-cultural peat substitute?

ERNST MORITZ ARNDT UNIVERSITÄT GREIFSWALD

slightly humified peat moss peat is…

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



mires in Europe

- < 50% destroyed
- > 50% destroyed
- > 90% destroyed

Paludiculture – solution for both nature and climate?

- Paludiculture - a climate-friendly economic exploitation of natural and restored mires involving the production of indigenous mire plants, the maintenance and / or restoration of the hydrological regime typical for mire habitats, the promotion of peat formation, the conservation of wetlands biodiversity to ensure the ecological stability of mires”
- Old way of peatland usage, e.g. reed harvesting.

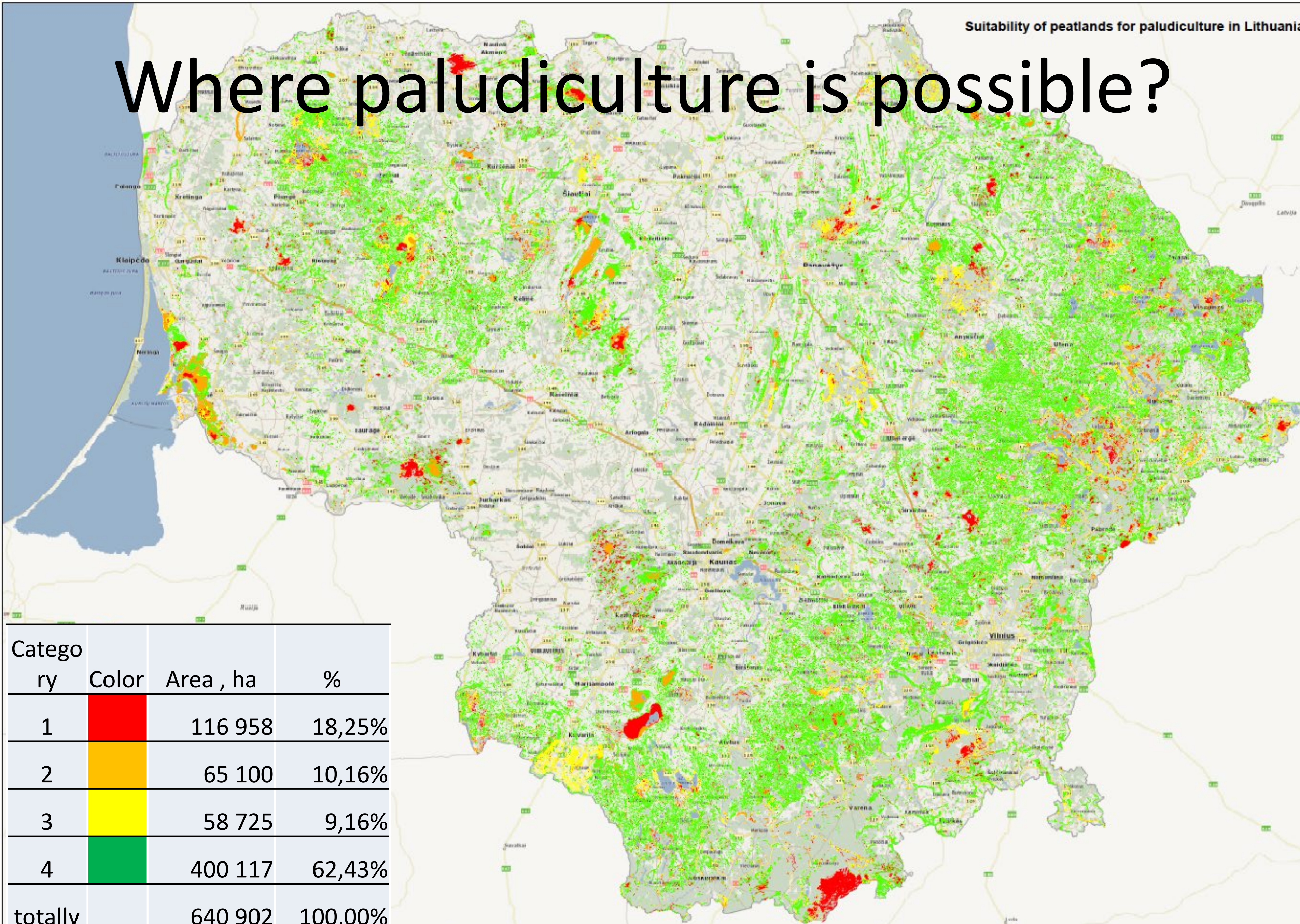
Reed harvesting


Wetland
Products

Sphagnum farming in Hankhausen implemented by Greifswald University

Sphagnum farming in Geeste
implemented by Klasmann-Deilmann

Where paludiculture is possible?

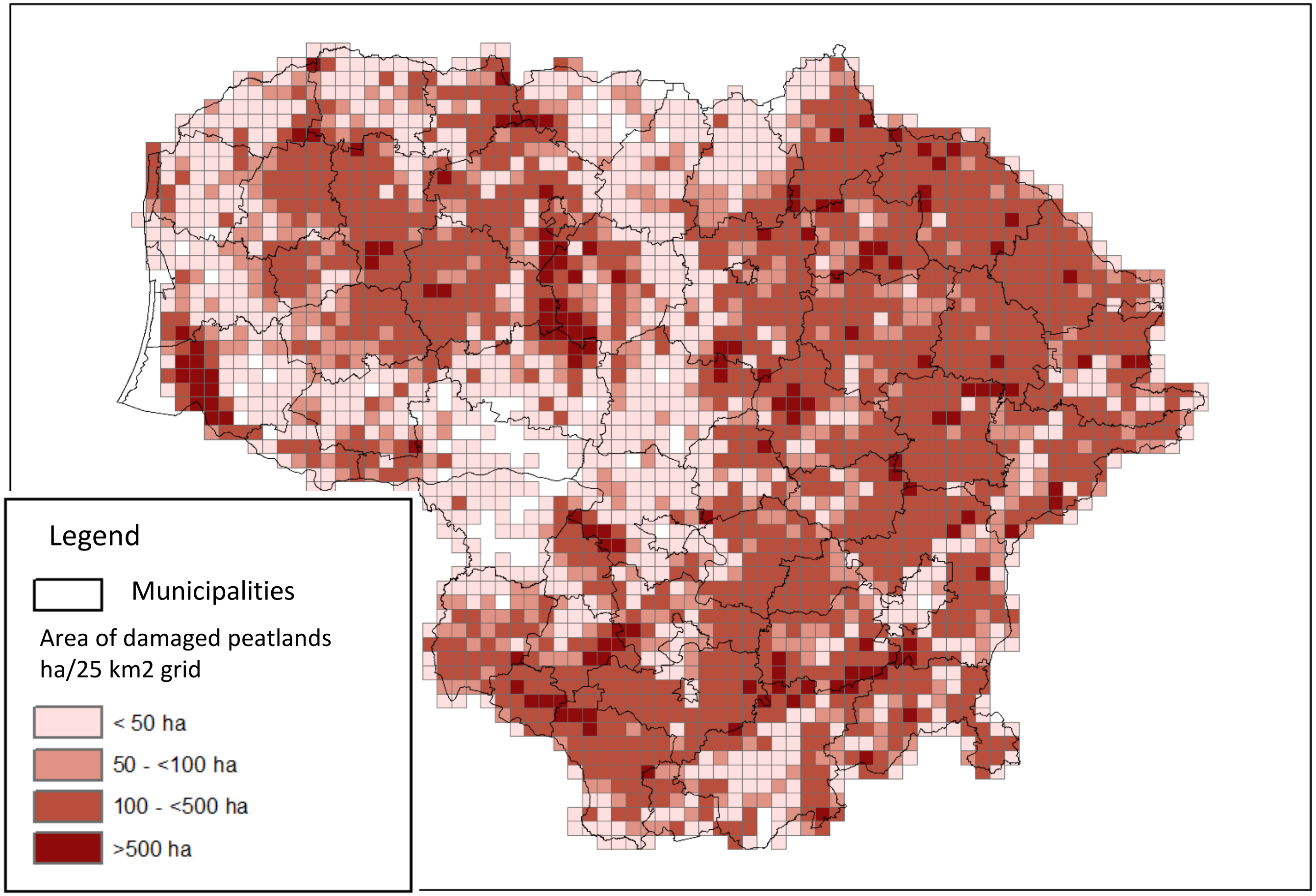


Category	Color	Area , ha	%
1	red	116 958	18,25%
2	orange	65 100	10,16%
3	yellow	58 725	9,16%
4	green	400 117	62,43%
totally		640 902	100,00%

Paludiculture categories

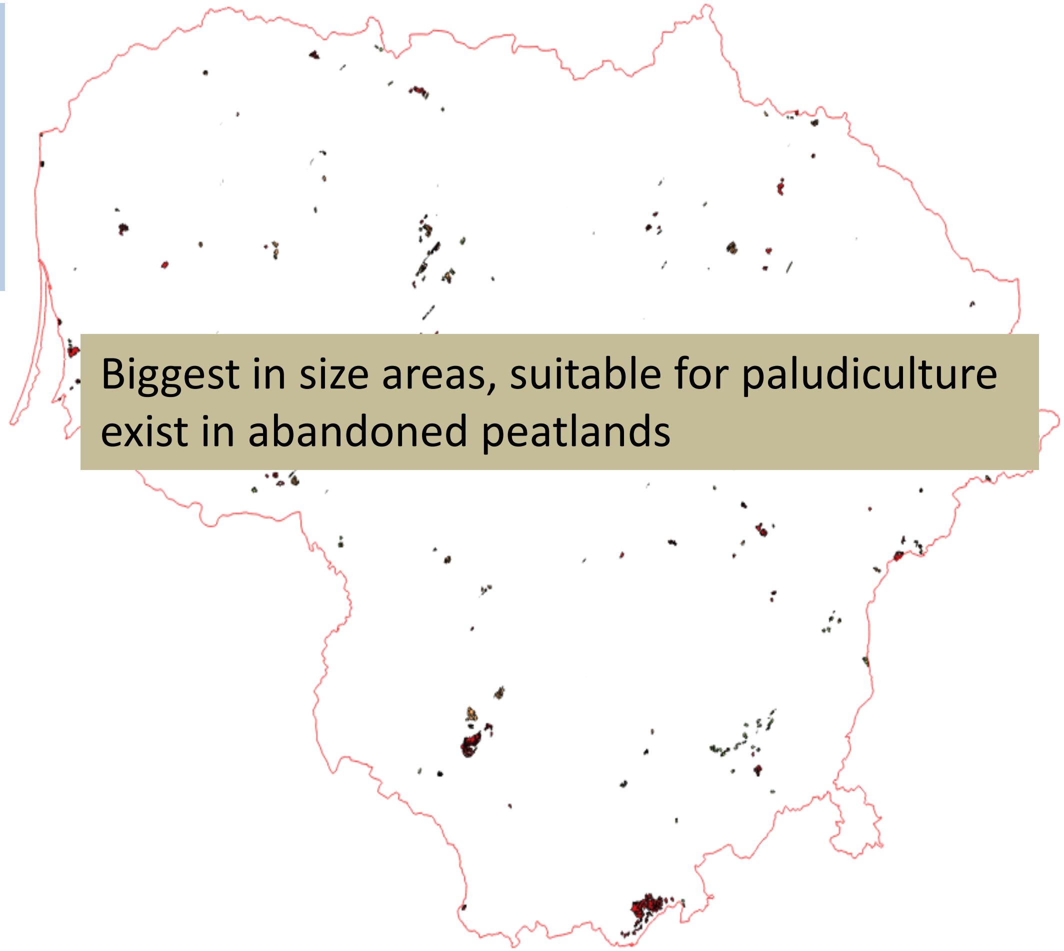
- I. Red – not possible. Mainly reserves, reserve forests
- II. Orange – paludiculture possible only after considerations, but major restrictions might appear, e.g. valid peat mining permits
- III. Yellow – paludiculture possible after considerations, but it is likely more possible, e.g. abandoned peatlands.
- IV. Paludiculture is possible, e.g. agricultural sites.

Drained peatlands

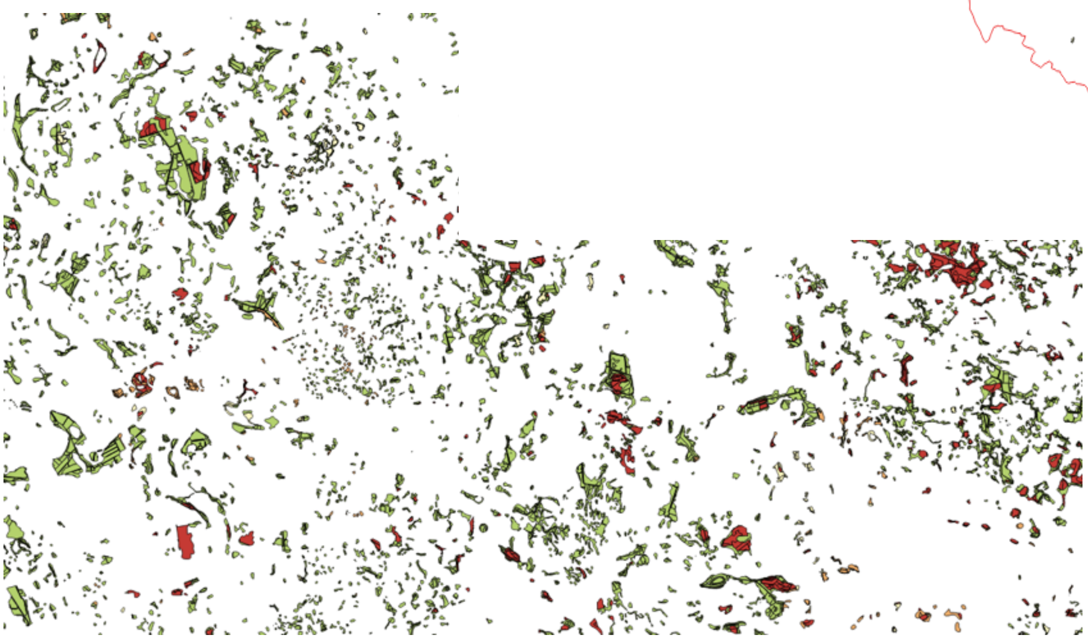


- Green house gas emissions
- Water pollution
- Degradation of biodiversity
- Increased fire risks
- Loss of regulatory functions: hydrological regime, local climate

>10 ha - 10000 units
>50 ha – 660 units
>100 ha - 65 units

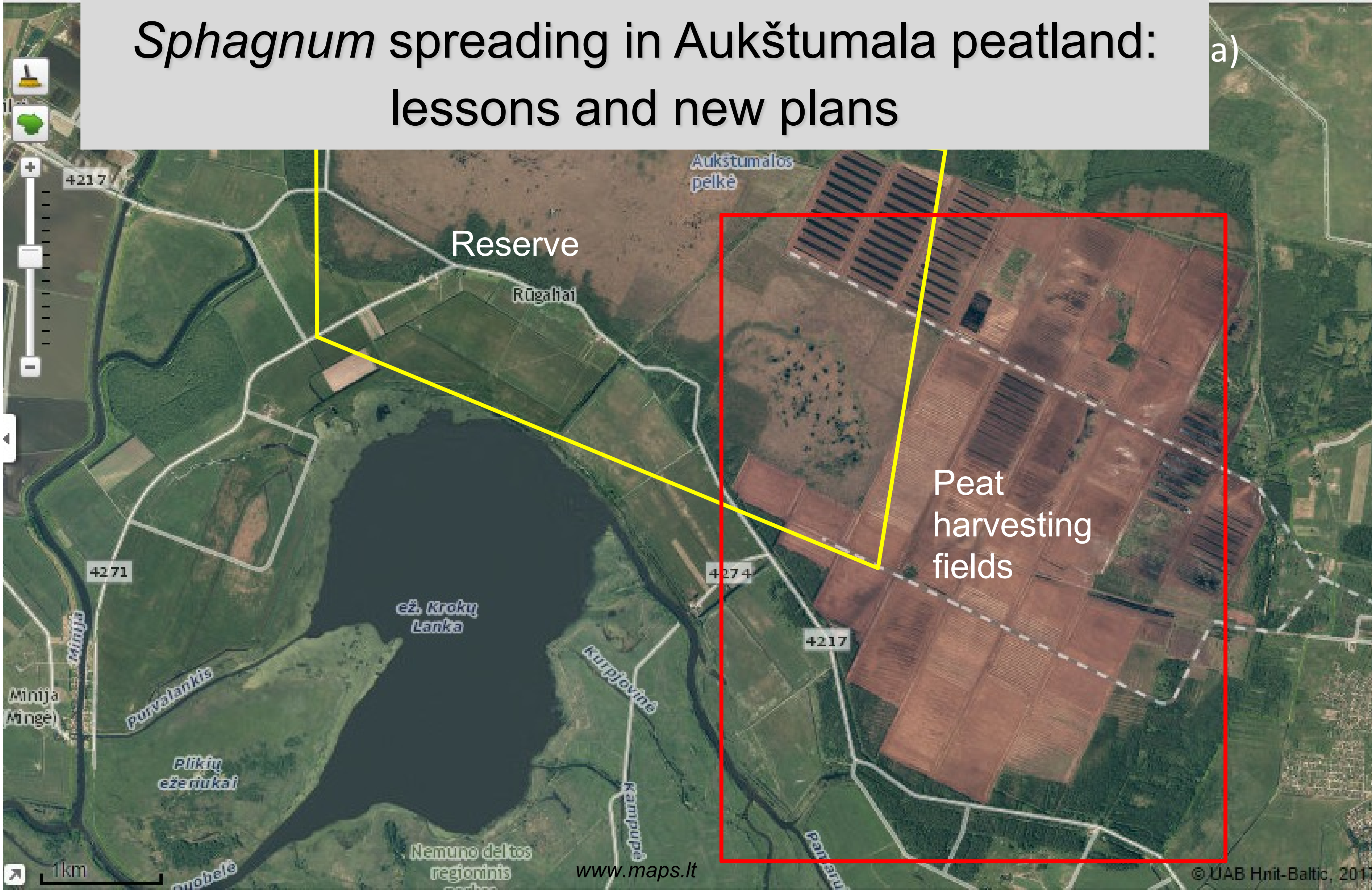


Biggest in size areas, suitable for paludiculture exist in abandoned peatlands



Totally 1,4 mio. units
1,2 mio. units, less than 1 ha

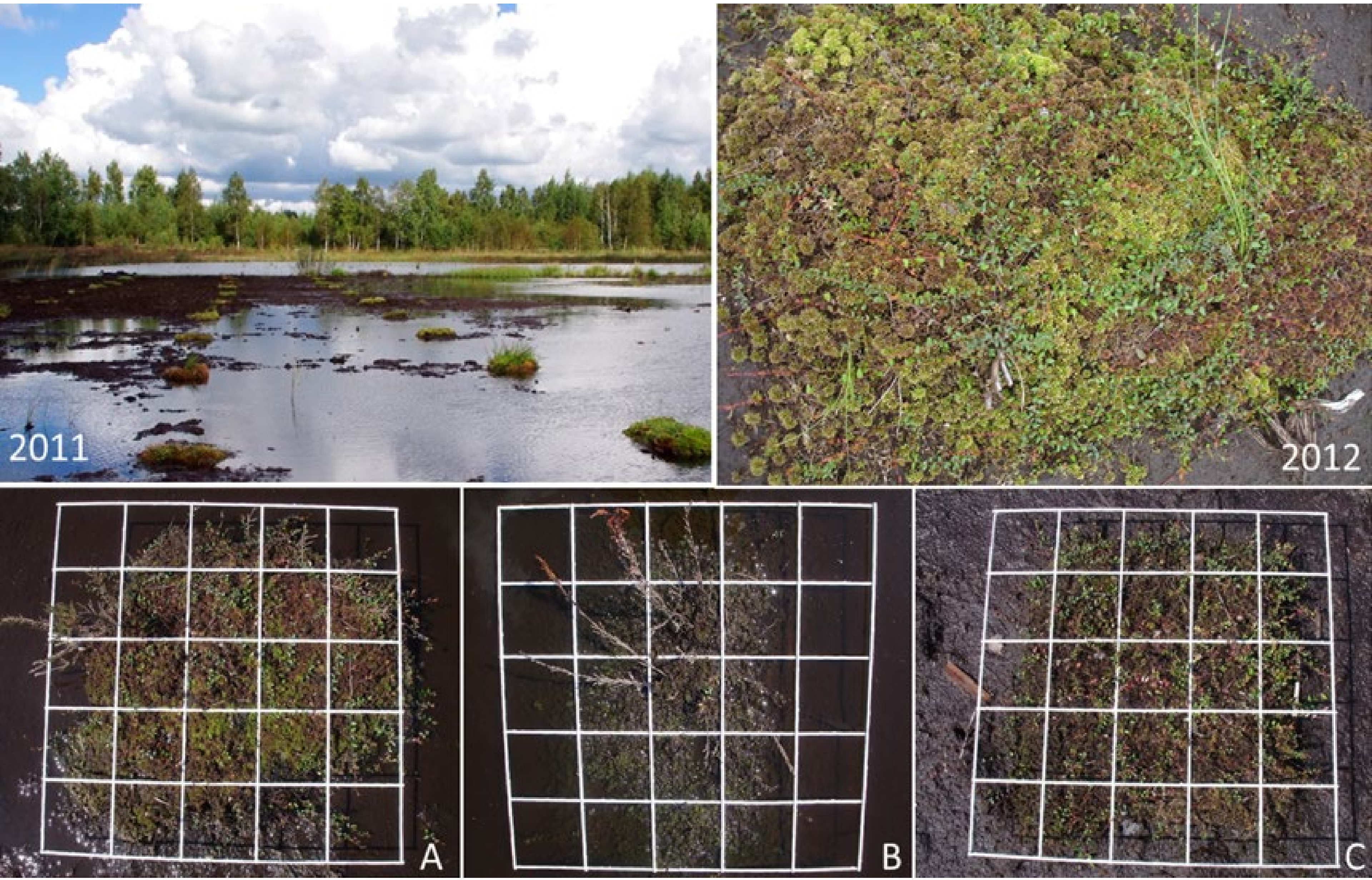
Sphagnum spreading in Aukštumala peatland: lessons and new plans



1993: wetland of international importance (Ramsar Convention)

1995: Aukštumala Telmological Reserve

2004: Nemunas Delta – NATURA 2000 site



Within the first years of vegetation planting, 93% of all donor fragments of raised bog vegetation cover successfully established; *Sphagnum* spp. was dominant species (up to 53% of all plant cover)

Activities in Klasmann-Deilmann managed peatland in LIFE PEAT RESTORE

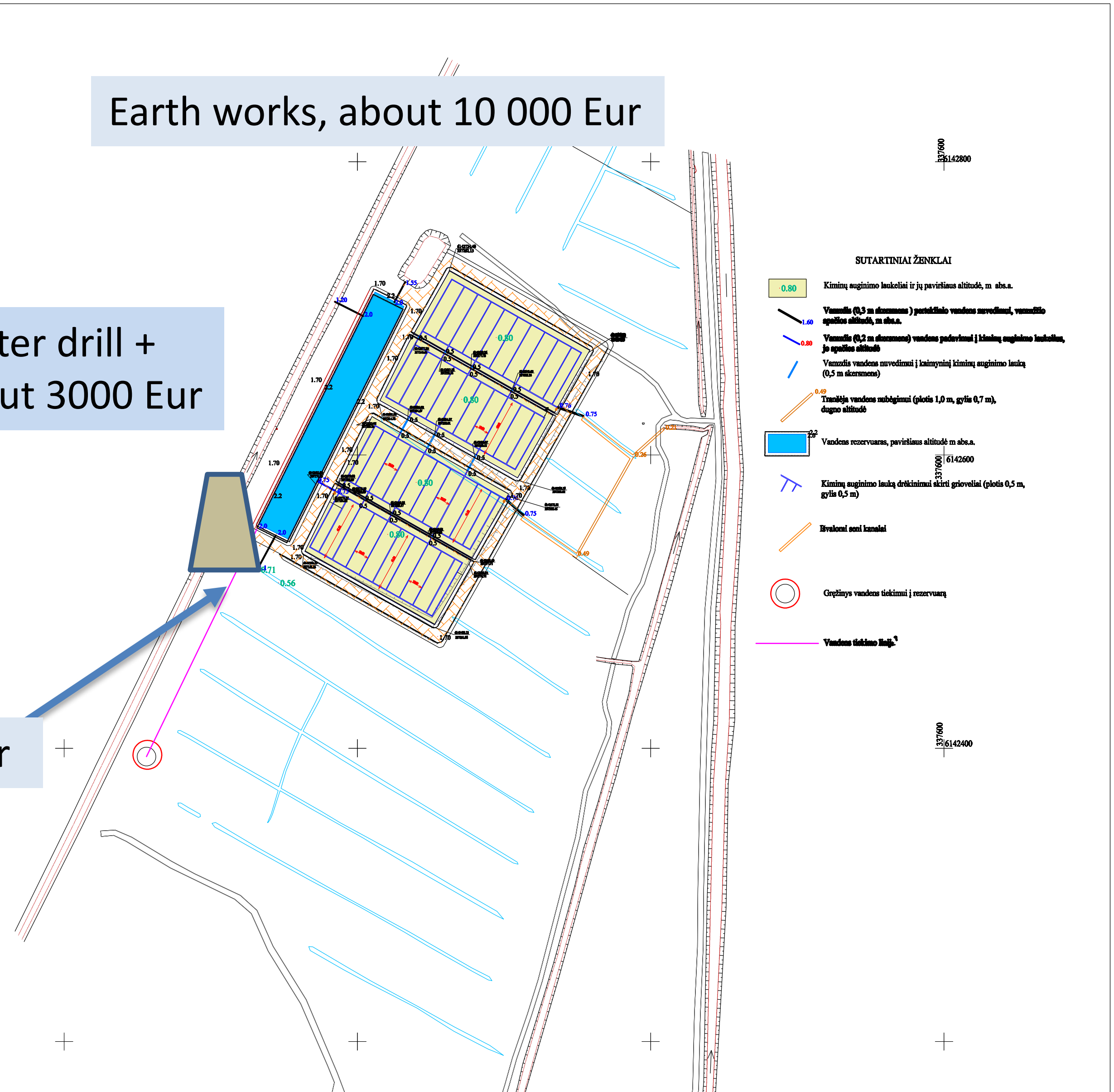
10 ha of sphganum to be reintroduced again

Installed automatic loggers TD Divers to monitor water level
Drained the site to get “initial” stage of the site
Detailled topography measuring ongoing, technical proposals for establishment of the site ready for spahgnum to be ready in autumn 2018.
Sphagnum spreading to start in spring 2019.

Earth works, about 10 000 Eur

Ground water drill + pumps about 3000 Eur

Electricity – 20-25 thous. Eur



All together ending in 2-3 eur/m2 which is lower than sphagnum farming costs in Germany (8-12 Eur/m2), but if the cost for raw material of sphagnum mosses would be taken away in German cases, then we would get almost the same cost.

Life

peat restore

Conclusions

- Cover of peatlands significantly diminished in last decades, we have to conserve what we have.
- Nature conservation did benefit from the restoration activities, but mainly raised bogs restored.
- There is not so much focus on climate change mitigation in peatland management. Agriculture takes the lions part, then the forestry, and Peat extraction getting honorable third place.
- New challenges for the next common agriculture policy reform.
- Paludiculture is an alternative in a global context. And a challenge for peat industry.


Thank you for attention