

# Greenhouse gas (GHG) emissions from peatlands & organic soil related research in Latvia



*The Baltic Peat Producers Forum  
Riga, Latvia  
September 14, 2017*

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*The studies presented here are implemented with support of the LIFE REstore project  
LIFE14 CCM/LV/001103*



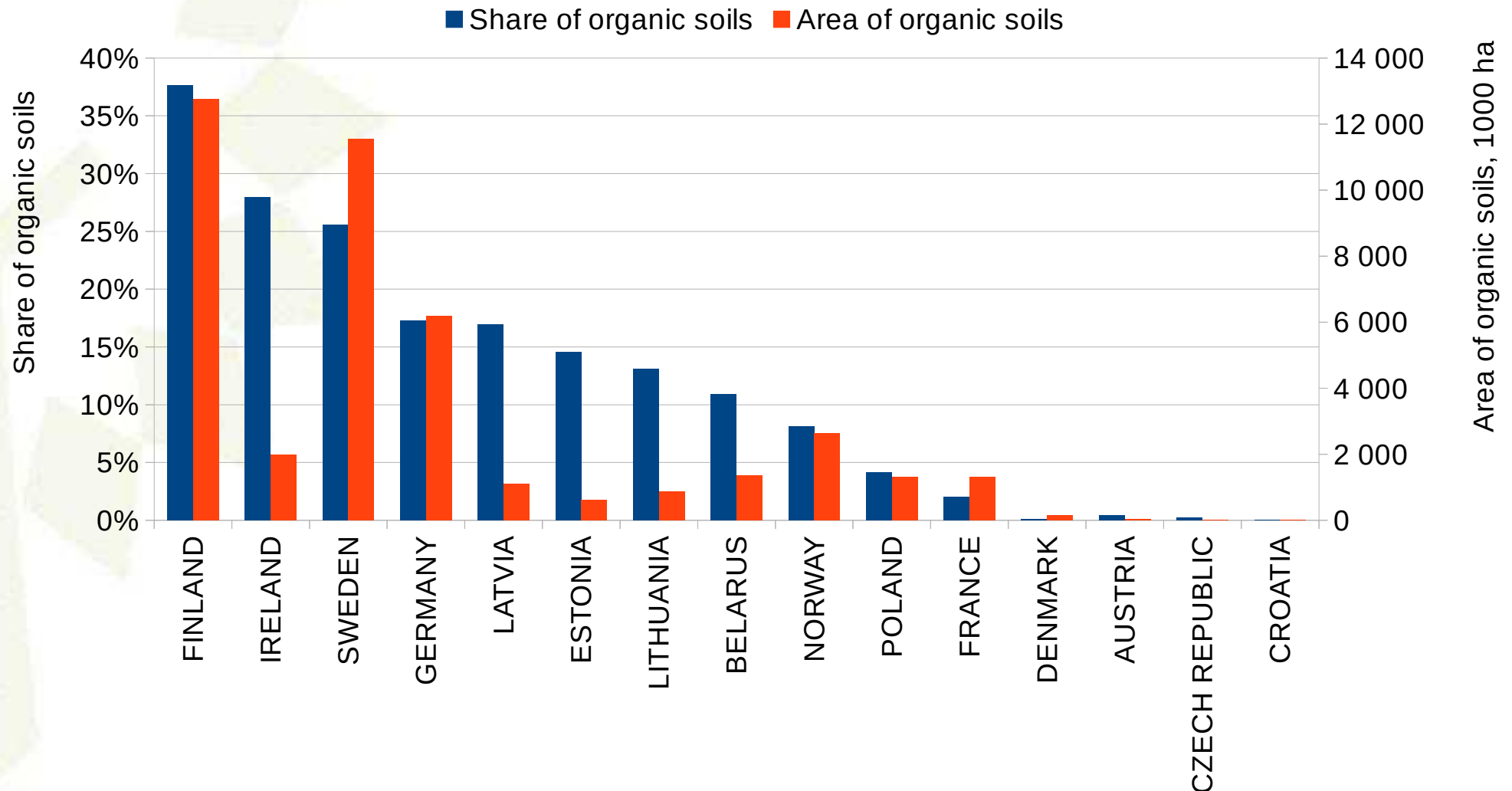
Latvijas  
vides  
aizsardzības  
fonds



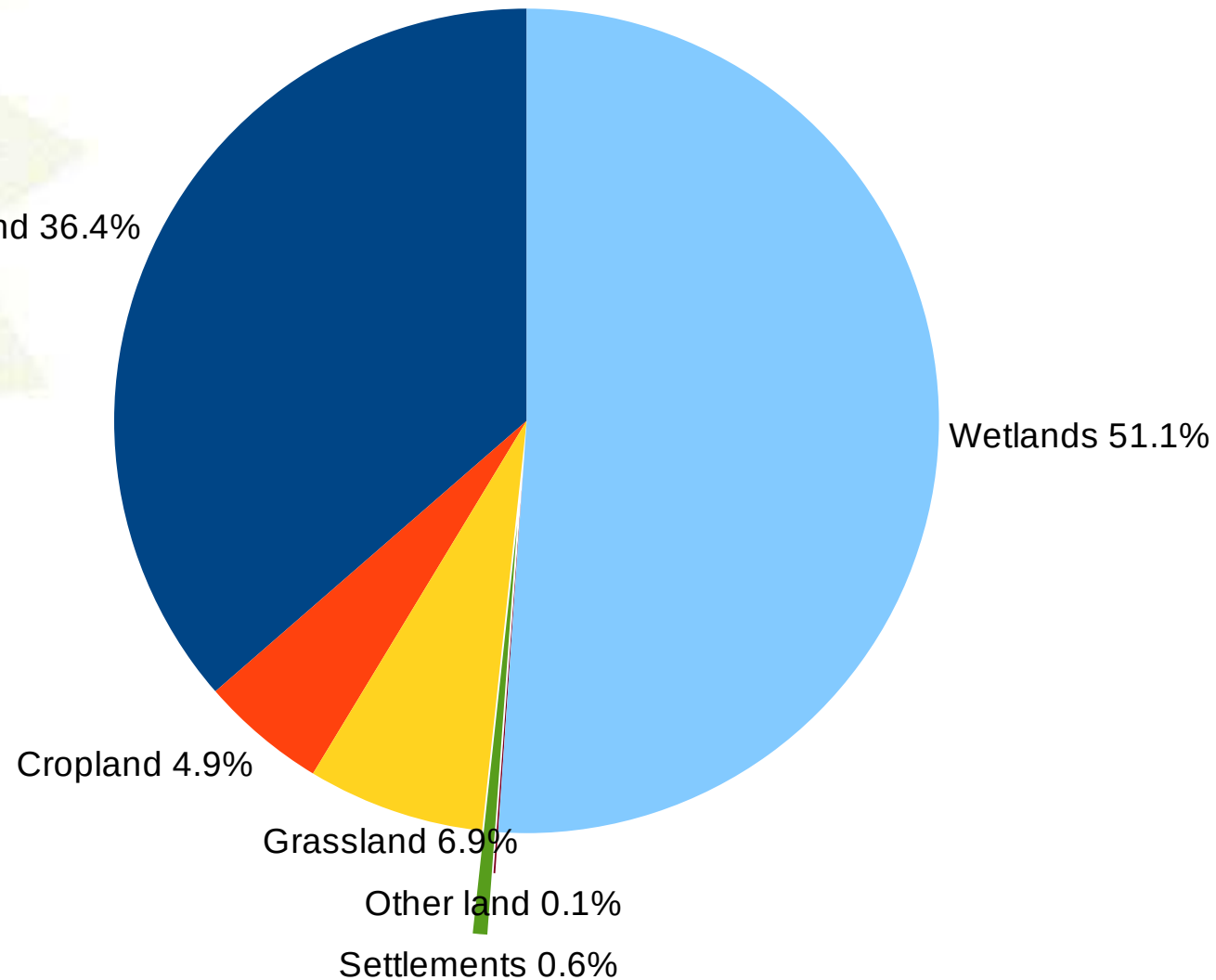
Latvijas  
Kūdras ražotāju  
asociācija



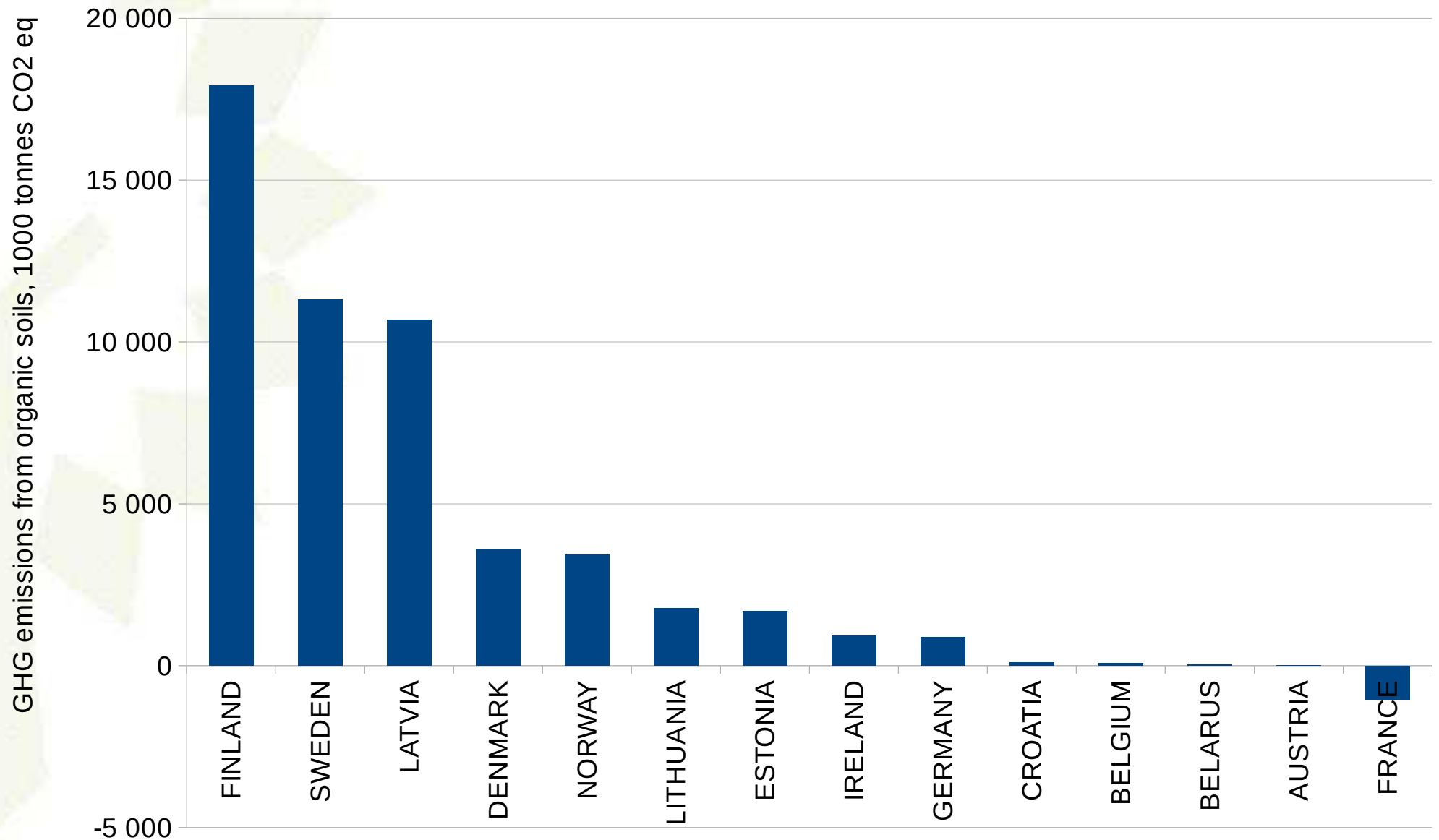
# Area & share of organic soils in European countries according to GHG inventory reports



# Distribution of organic soils in European Union



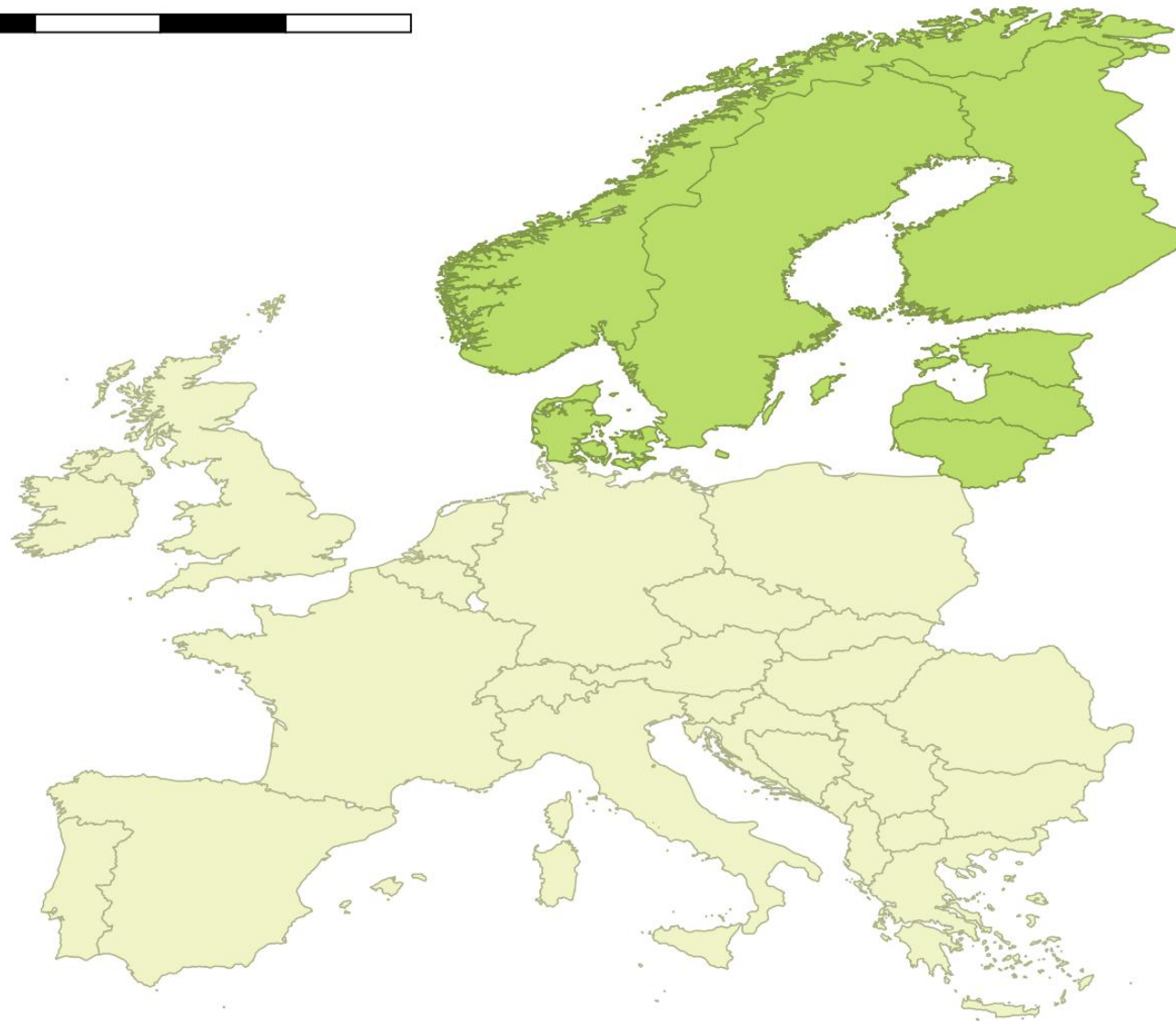
# GHG emissions from managed organic soils in 2015



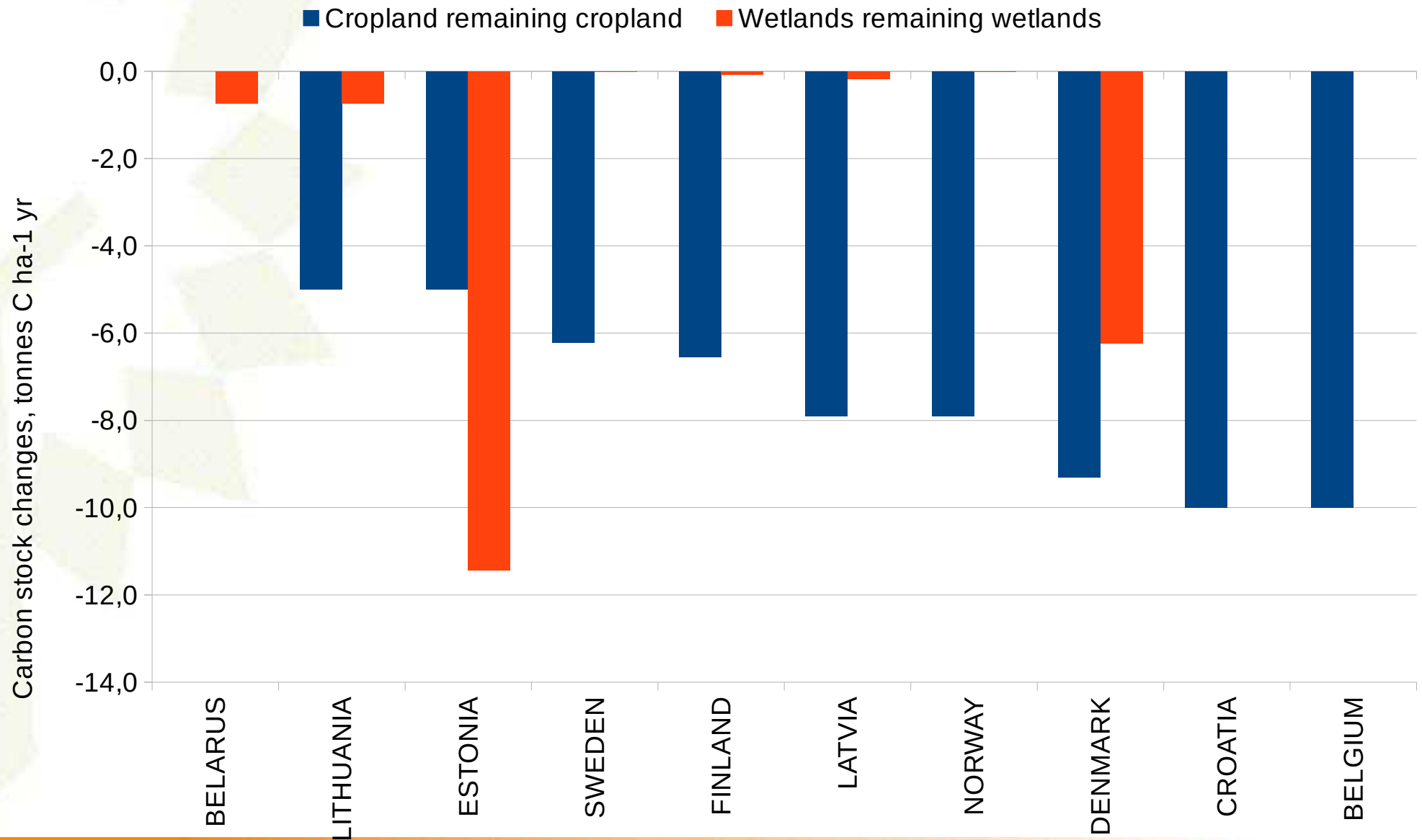
# Countries with the largest emissions from **managed** organic soils



500 0 500 1000 1500 2000 km



# Carbon stock changes in managed organic soils in European countries according to GHG inventories



# Emission factors for **cool temperate moist climate zone** according to IPCC 2014

## Wetlands supplement



GHG	Nutritional regime	Forest	Cropland	Grassland	Rewetted area	Peat extraction fields
<b>CO<sub>2</sub></b>	Poor	9.53	28.97	19.43	-0.84	10.27
	Rich	9.53	28.97	22.37	1.83	10.27
<b>DOC</b>	Poor	1.1	1.1	1.1	0.84	0.77
	Rich	1.1	1.1	1.1	0.84	0.77
<b>CH<sub>4</sub></b>	Poor	0.06	0	0.04	6.9	0.14
	Rich	0.06	0	0.38	16.2	0.14
<b>CH<sub>4</sub> from ditches</b>	Poor	0.14	1.46	1.46	0	0.68
	Rich	0.14	1.46	1.46	0	0.68
<b>N<sub>2</sub>O</b>	Poor	1.31	6.09	2.01	0	0.14
	Rich	1.31	6.09	3.84	0	0.14
<b>Kopā</b>	<b>Poor</b>	<b>12.14</b>	<b>37.61</b>	<b>24.05</b>	<b>6.9</b>	<b>12</b>
	<b>Rich</b>	<b>12.14</b>	<b>37.61</b>	<b>29.14</b>	<b>18.88</b>	<b>12</b>



# Afforestation of transitional bog in early 60<sup>th</sup> in Jaunkalsnava area, Veseta river basin





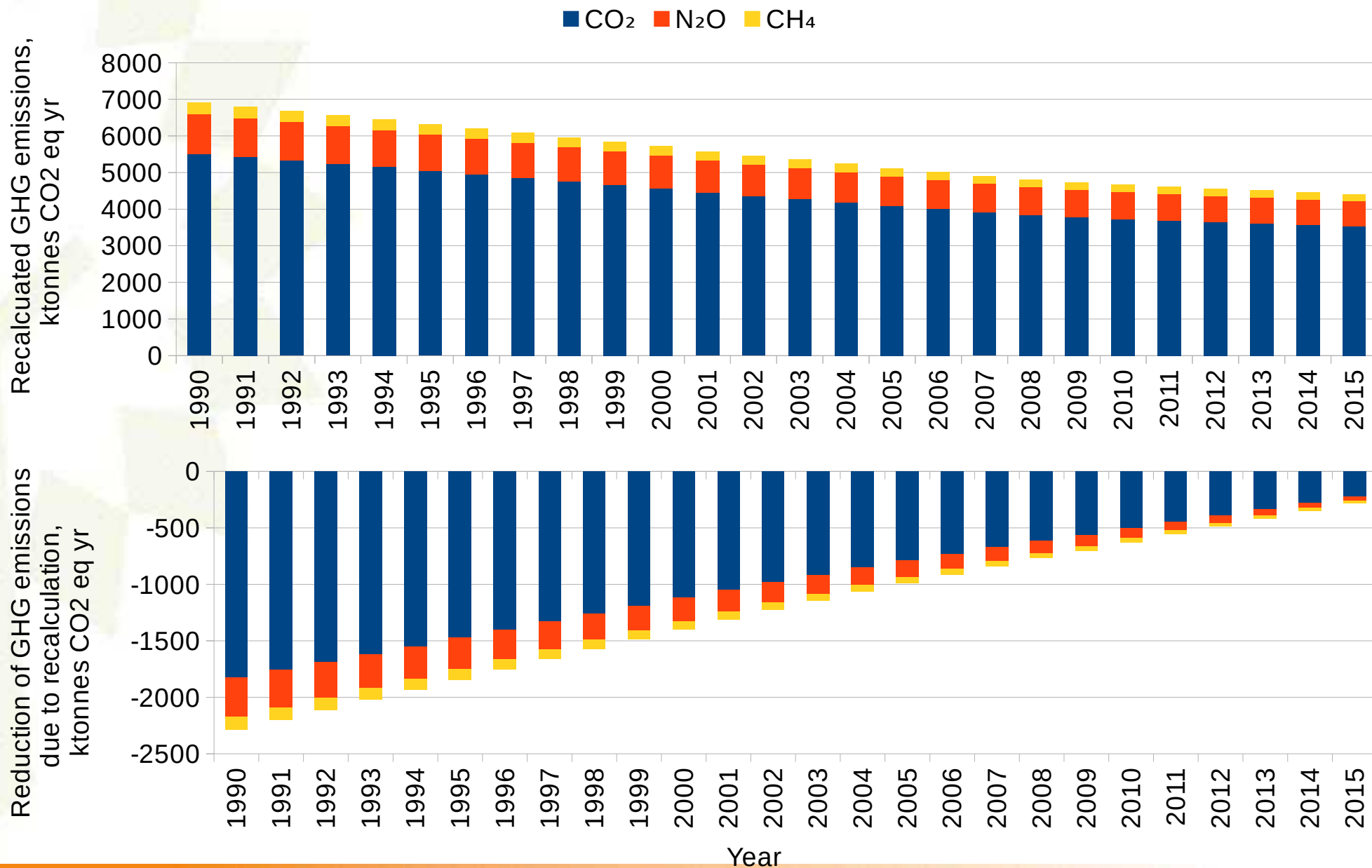
# Carbon stock changes in soil



Growth conditions	Dominant species	0-10 cm	10-20 cm	20-40 cm	40-80 cm	Total
Drained forest	Norway spruce	80.4	70.4	133.0	248.9	<b>537.0</b>
	Scots pine	65.5	63.1	116.9	226.0	<b>477.5</b>
	<b>Average</b>	<b>74.4</b>	<b>67.5</b>	<b>126.6</b>	<b>239.7</b>	<b>513.2</b>
Transitional bog	Norway spruce	35.3	31.7	61.0	174.6	<b>302.6</b>
	Scots pine	39.3	38.3	83.5	196.6	<b>357.6</b>
	<b>Average</b>	<b>38.0</b>	<b>36.1</b>	<b>76.0</b>	<b>189.3</b>	<b>339.3</b>

- **Carbon stock in soil increased** significantly after drainage. even if the upper 25.7 cm layer is considered to have zero carbon.
- The increase of carbon stock in all pools is **106 tons ha<sup>-1</sup>** (*corresponding to removals of 7.6 tons CO<sub>2</sub> ha<sup>-1</sup> annually*).
- CO<sub>2</sub> emissions according to study equals to 0.52 tonnes CO<sub>2</sub>-C ha<sup>-1</sup> yr. Reduction of emissions due to implementation of the study results equals to 3.7 mill. tonnes CO<sub>2</sub> eq yr (*about 56 mill € according to projected cost of the removal unit in 2020*).

# Estimation of area of organic soils in Latvia in cropland & grassland





# LIFE REstore project

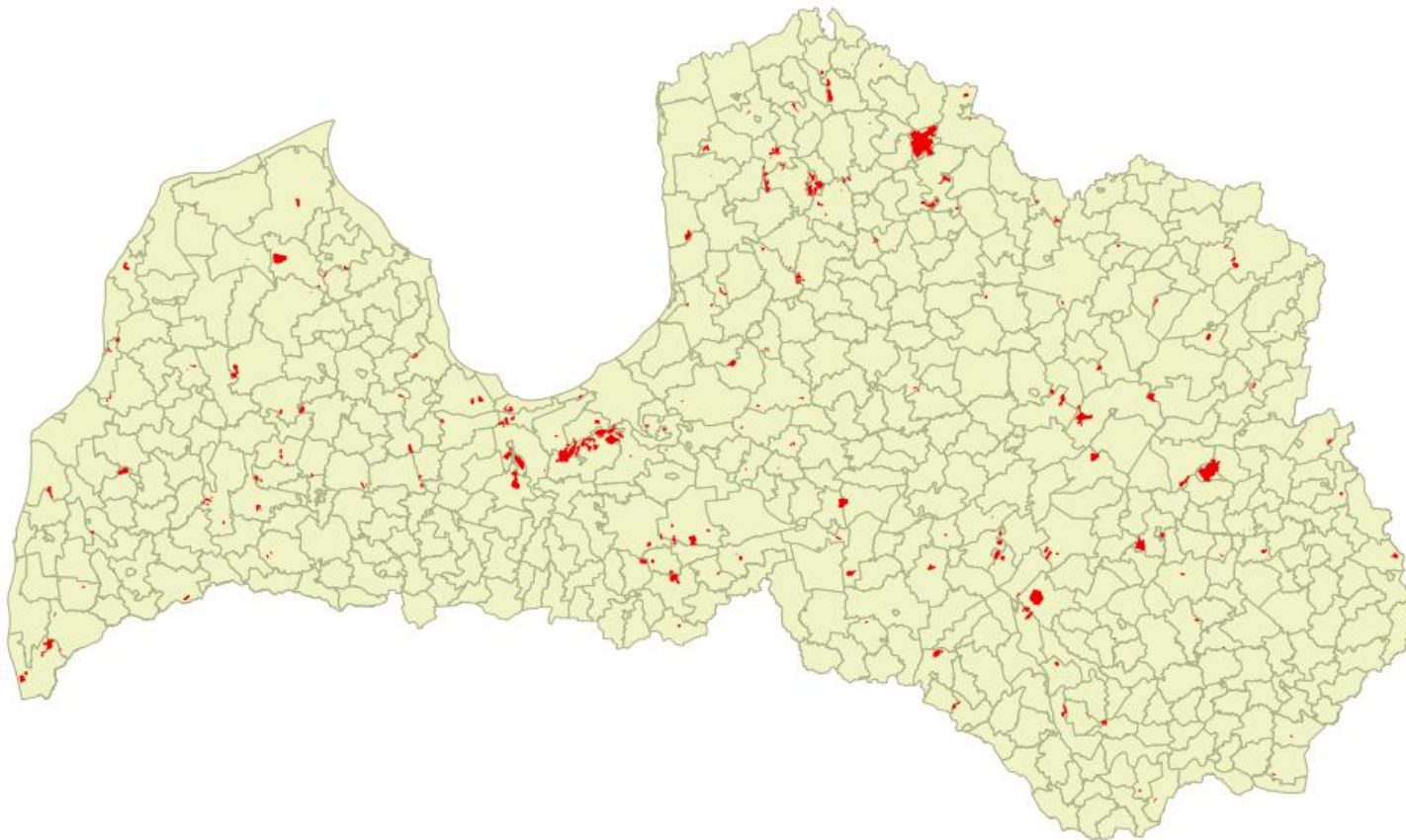




# Identification of areas of extracted peatlands



50 0 50 100 150 200 km

A horizontal scale bar with alternating black and white segments, used to indicate distances in kilometers.



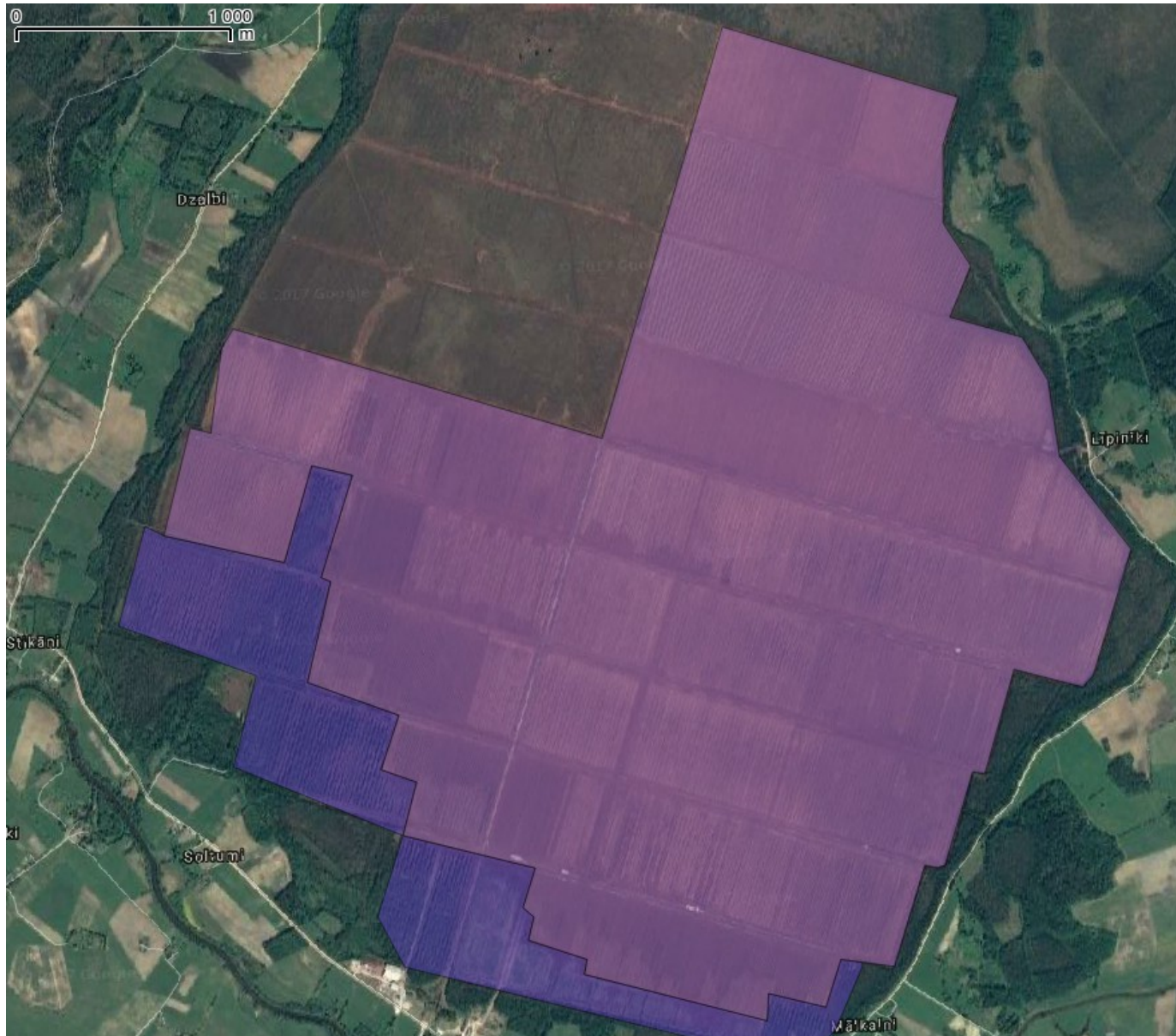
# Main activity data in Latvia characterizing impact of peat industry on GHG emissions

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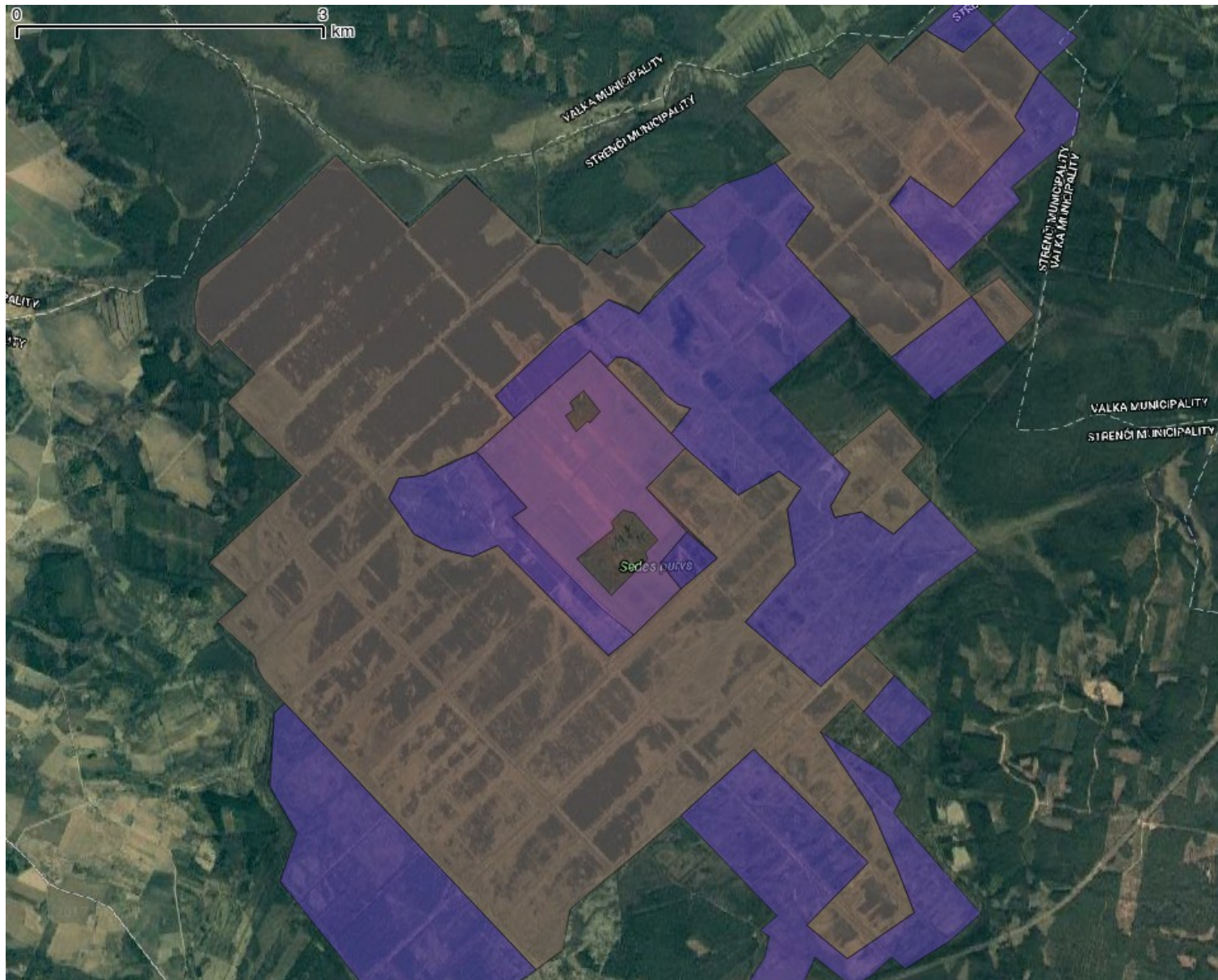
- Total area of extracted peatlands – **50.5 kha**, including:
  - relatively dry areas where peat extraction is terminated – **20.8 kha**;
  - areas where peat extraction continues or is terminated recently – **15.0 kha**;
  - water bodies – **5.8 kha**;
  - former peat quarries – **2.5 kha** (*mostly afforested areas*);
  - flooded areas – **1.4 kha**;
  - ponds – **0.4 kha**.
- We still don't know remaining area of organic soils.

# Areas where peat extraction is continuing



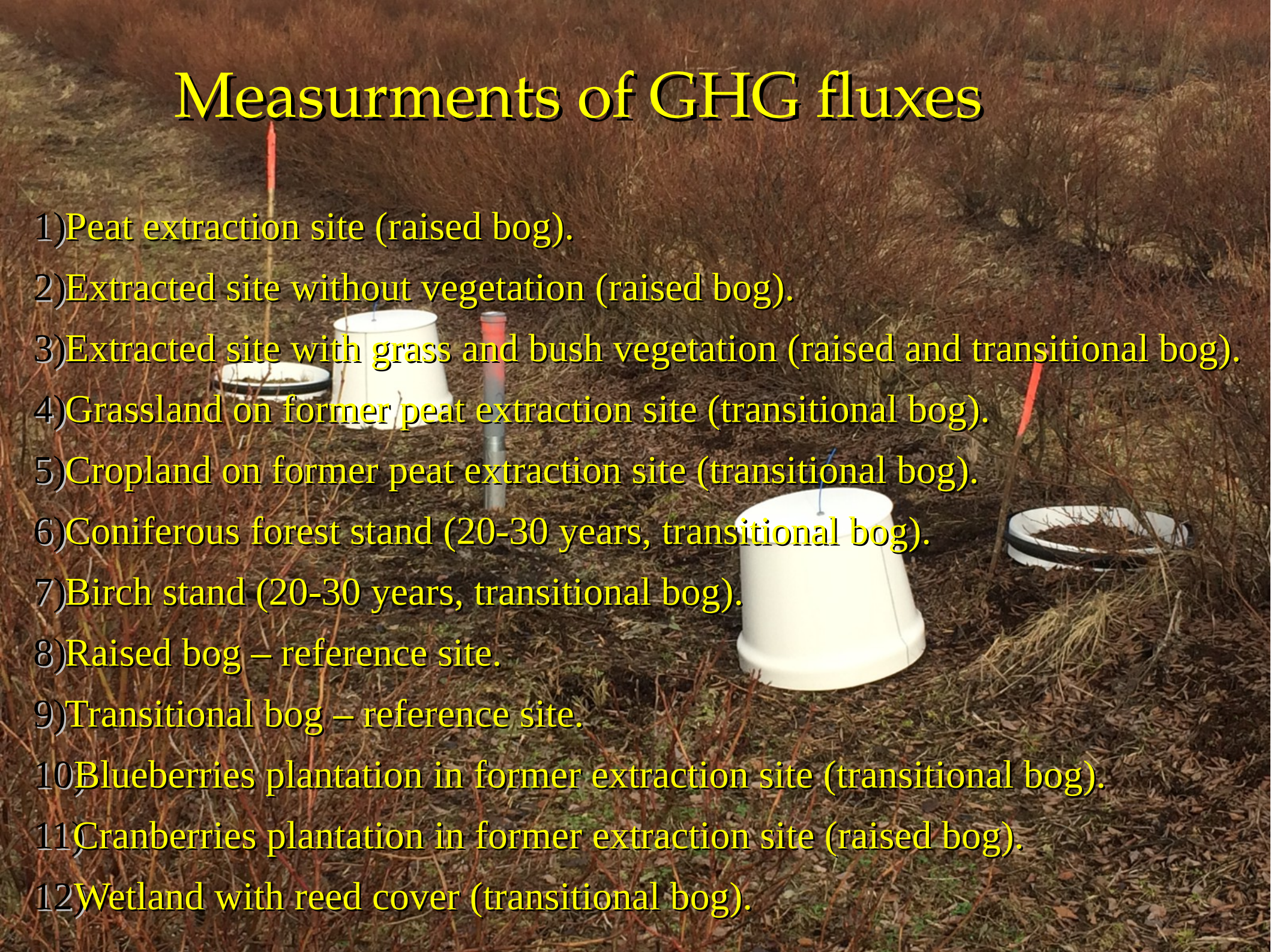


# Flooded areas





# Measurements of GHG fluxes

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- The background image shows a bog landscape with dry, brown vegetation. In the foreground, there are several white, conical measurement chambers (flux chambers) placed on the ground. Some chambers have red or blue flags attached to them. The chambers are used for measuring greenhouse gas (GHG) fluxes from the soil or vegetation. The list of measurement sites is overlaid on the image.
- 1) Peat extraction site (raised bog).
  - 2) Extracted site without vegetation (raised bog).
  - 3) Extracted site with grass and bush vegetation (raised and transitional bog).
  - 4) Grassland on former peat extraction site (transitional bog).
  - 5) Cropland on former peat extraction site (transitional bog).
  - 6) Coniferous forest stand (20-30 years, transitional bog).
  - 7) Birch stand (20-30 years, transitional bog).
  - 8) Raised bog – reference site.
  - 9) Transitional bog – reference site.
  - 10) Blueberries plantation in former extraction site (transitional bog).
  - 11) Cranberries plantation in former extraction site (raised bog).
  - 12) Wetland with reed cover (transitional bog).



# Extracted site without vegetation





# Blueberry plantation





# SNS120: Anthropogenic GHG emissions from organic forest soils...

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- Synthesis report of the CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub> and DOC emissions from organic forest soils in the Nordic and Baltic countries.
- Improved literature review based tier 2 EFs for the key sources of GHG emissions in organic forest soils in the Nordic and Baltic countries.
- A catalogue of GHG mitigation measures for forest management on organic soils.
- A common research agenda for future research to fill in any identified major data gaps.



# Spreading of wood ash on organic soils

- **Valtra 6350 + modular spreader + wheel loader:**
  - 20 tonnes of ash, 10 ha;
  - Dose – 3 tonnes ha<sup>-1</sup>;
  - Productivity 0.57 ha h<sup>-1</sup> (1.14 tonnes h<sup>-1</sup>);
  - Cost 88 EUR ha<sup>-1</sup>;
- **Deposition costs 39.50 EUR per tonne, savings – 30 EUR ha<sup>-1</sup>.**







# Applications & future plans

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- LIFE OrgBalt Demonstration of climate change mitigation measures in nutrients rich drained organic soils in Baltic States and Finland.
- European Climate Initiative 2017: INVESTIGATE Improving national GHG inventories for organic soils and mitigation potential of wet land use.
- ELFLA: Elaboration of equations for characterization of impact of wood ash on GHG emissions in deep drained organic soils.
- One of the most significant problems – lack of funding sources for regional, climate change mitigation targeted projects.
- Organic soils are recognized as an issue in relatively small region.

# Home works to do before setting post-2030 commitments in wetlands management



- **CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission factors** for nutrient and organics rich (incl. semi-hydromorphic soils) forest (different ages and species), cropland and grassland soils.
- **Activity data (litter, ground floor)** for modelling of carbon input in forest soils.
- **CH<sub>4</sub> emission factor** for drainage ditches in forest land, cropland, grassland and wetland.
- **CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission factors** for rewetted forest lands and grassland.
- **DOC emission factors** for drained organic rich soils in cropland, grassland and forest land.

# Home works to do before setting post-2030 commitments in wetlands management (cont.)

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- Evaluation of impact of **harvesting method** (small openings, continuous forest cover) impact on GHG emissions from drained organic soils.
- Evaluation of impact of **wood ash and mineral fertilizers in forest** on GHG emissions at different stand development stages.
- **Impact of afforestation** on GHG emissions from drained and rewetted organics rich soils.
- Impact on GHG emissions of **innovative methods of crop management** on organic soils.





*Thank you for attention!*