



REPUBLIC OF ESTONIA  
ENVIRONMENT AGENCY

# Methodology for GBF Indicator A.2 using the ecosystem condition information

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# Indicator A.2 'Extent of natural ecosystems'



- **Headline indicator** of the Kunming-Montreal Global Biodiversity Framework (GBF).
- Derived directly from **ecosystem extent** accounts.
- Provides information about the **area** and proportion of **natural** and **semi-natural ecosystem** types relative to **anthropogenic ecosystems**.
- **Does not aim to address the ecological condition or integrity of natural ecosystems** meaning that ecosystems do not have to be in good ecological condition to be included in the indicator as natural or semi-natural.
- Addresses Goal A and Target 1 of the GBF, which aim to contribute to maintaining the **integrity, connectivity and resilience of ecosystems**.
- **Ecological condition** (reflected in **structure, composition** and **function** of an ecosystem) can vary significantly within an ecosystem type
  - classifying an entire ecosystem type as 'natural' or 'semi-natural' may hide essential information on the **deterioration and thus loss of ecologically valuable ecosystems**, which in turn is reflected in the **supply of a different set of ecosystem services**.
- Combining ecosystem **extent** and **condition** data helps to demonstrate how within an ecosystem type there may be areas that have been so intensively modified by human activities that their classification as 'natural' or 'semi-natural' should be questioned.

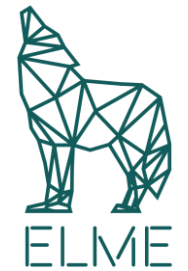
# Mapping and assessment of terrestrial ecosystems and their services – ELME project\*



*Estonian national MAES project*

ELME's main objectives were **countrywide mapping and assessment of the main terrestrial ecosystems and their services**:

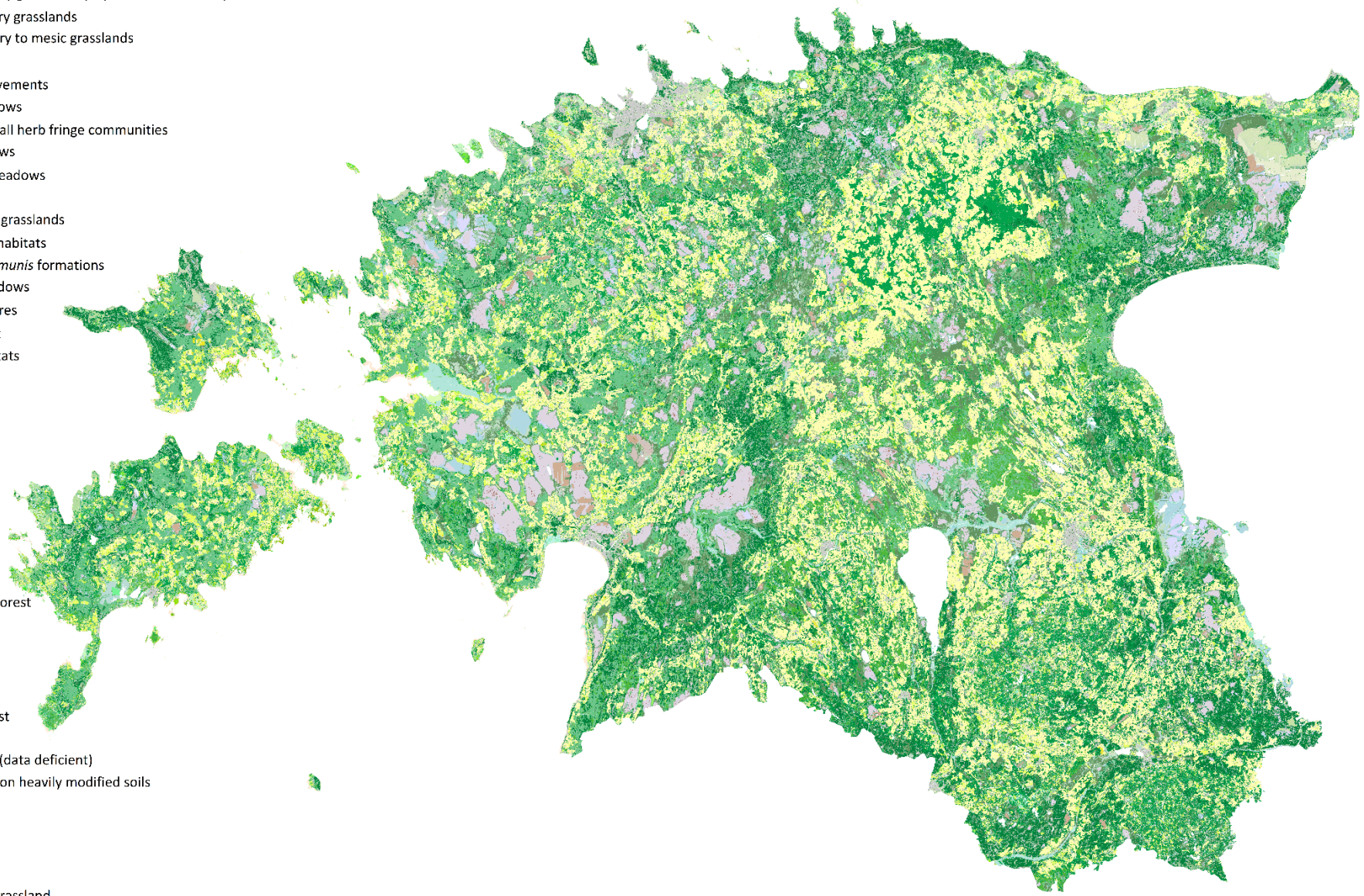
- 2019–2020: base levels of **extent, condition** and **services** (biophysical assessments, potential supply)
- 2021–2023 **socioeconomic** valuation and mapping
- 2024 – ... continued by Estonian Environment Agency



\* „Establishment of tools for integrating socioeconomic and climate change data into assessing and forecasting biodiversity status, and ensuring data availability“.  
Funded by the EU Cohesion Fund and the foundation Environmental Investments Centre

# ELME1 base map – map of ecosystems and their extent

- 1630\* – coastal meadows
- 2320 – dry sand heaths with *Calluna* and *Empetrum nigrum*
- 4030 – dry heaths
- 6210\* – seminatural dry grasslands (important orchid sites)
- 6210 – seminatural dry grasslands
- 6270\* – species-rich dry to mesic grasslands
- 6280\* – alvars
- 8240\* – limestone pavements
- 6410 – *Molinia* meadows
- 6430 – hydrophilous tall herb fringe communities
- 6450 – alluvial meadows
- 6510 – lowland hay meadows
- 7230 – alkaline fens
- other open paludified grasslands
- other open grassland habitats
- 5130 – *Juniperus communis* formations
- 6530\* – wooded meadows
- 9070 – wooded pastures
- other grazing in forest
- alluvial peatland habitats
- fen
- transition mire
- raised bog
- cut-over peatland
- peat extraction field
- bog pool
- Alvar forest
- Boreal heath forest
- Dry boreal forest
- Fresh boreal forest
- Fresh boreo-nemoral forest
- Rich paludified forest
- Poor paludified forest
- Swamp forest
- Bog forest
- Drained peatland forest
- Small-area stands
- Other (forest) habitat (data deficient)
- Other (forest) habitat on heavily modified soils
- Other agricultural use
- Crop
- Permanent crop
- Permanent grassland
- Valuable permanent grassland
- Open areas in quarries and dumpsites
- Artificial land cover



# DEFINING AND MAPPING ECOSYSTEM CONDITION

## GRASSLANDS, 4 (+1) classes:

- ✓ Protection status
- ✓ Validity of data
- ✓ Nature protection value estimation, preservation of functions, structure
- ✓ Maintenance: mowing, grazing
- ✓ Historical habitat continuity
- ✓ Overgrowth rate
- ✓ Restoration status/potential

## WETLANDS, 5 (+3) classes:

- ✓ Protection status
- ✓ Distance to the nearest drainage system
- ✓ (Rate of) human impact (cutting, mowing, grazing)
- ✓ Restoration status/potential

## AGRO-ECOSYSTEMS, 4 classes:

- ✓ Landscape elements on and bordering the field
- ✓ Organic/non-organic farming
- ✓ Presence of grasslands in good condition in the vicinity
- ✓ Environment-friendly management, subsidies
- ✓ Etc.

## FORESTS, 6 (+2) classes:

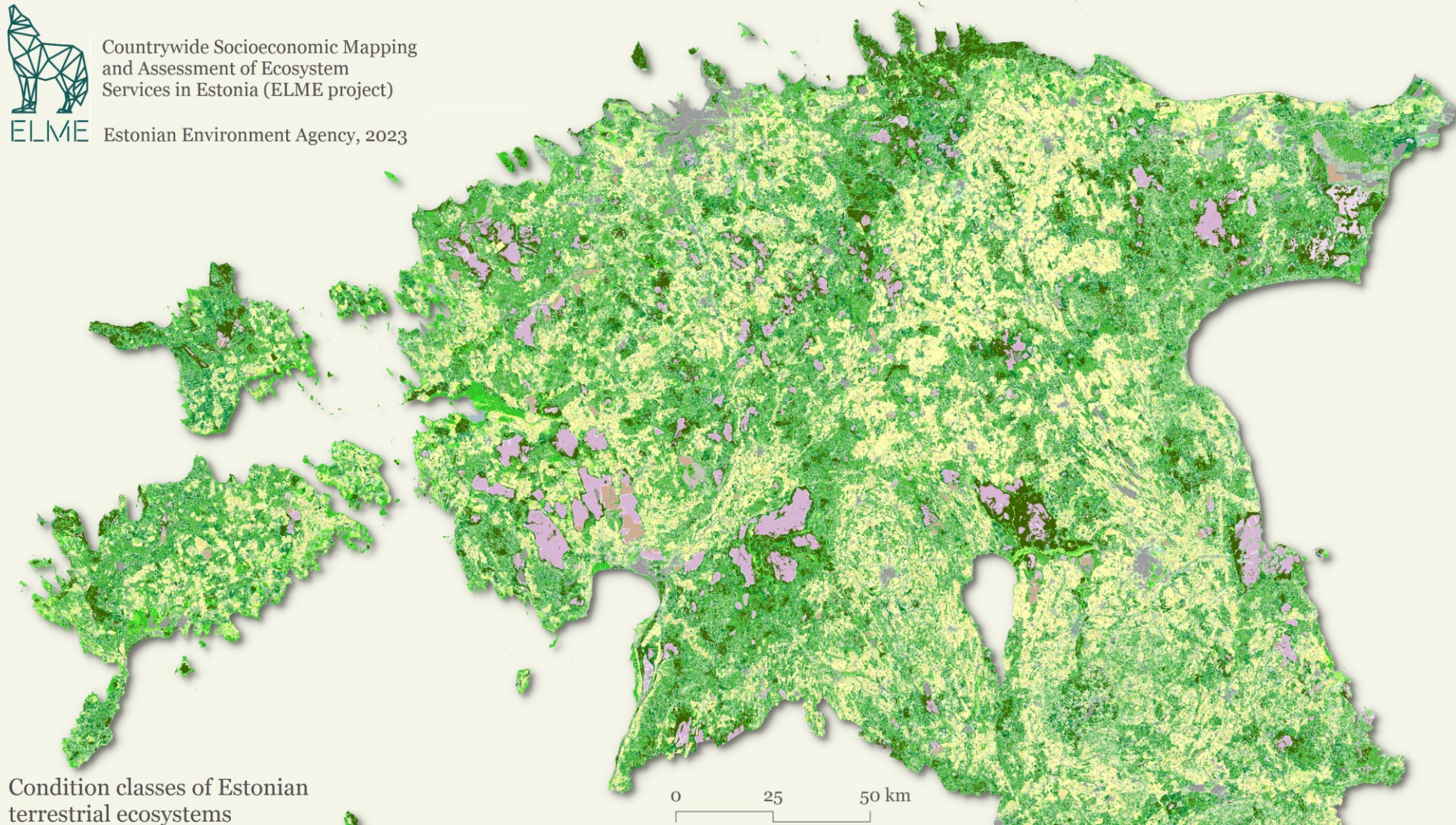
- ✓ Protection status
- ✓ Validity of data
- ✓ Nature protection value estimation
- ✓ Historical habitat continuity
- ✓ Cutting information
- ✓ Drainage
- ✓ Stand composition
- ✓ Alien tree species
- ✓ Deadwood
- ✓ Age



Countrywide Socioeconomic Mapping  
and Assessment of Ecosystem  
Services in Estonia (ELME project)

ELME Estonian Environment Agency, 2023

# ELME2 condition



Condition classes of Estonian  
terrestrial ecosystems

- |                           |                       |  |
|---------------------------|-----------------------|--|
| grassland A (GOOD)        | forest A (GOOD)       | agricultural ecosystem A (GOOD)            |
| grassland B (GOOD)        | forest B (MODERATE)   | agricultural ecosystem B (MODERATE)        |
| grassland C (MODERATE)    | forest A-B (MODERATE) | agricultural ecosystem C (POOR)            |
| grassland D1 (POOR)       | forest C (MODERATE)   | agricultural ecosystem D (POOR)            |
| grassland D2 (POOR)       | forest A-C (MODERATE) | grassland (CONDITION UNKNOWN)              |
| wetland A1, A2 (GOOD)     | forest D (POOR)       | forest (CONDITION UNKNOWN)                 |
| wetland B1, B2 (MODERATE) | forest E (POOR)       | agricultural ecosystem (CONDITION UNKNOWN) |
| wetland C1, C2 (POOR)     | forest F (POOR)       | wetland (CONDITION UNKNOWN)                |
| wetland D (POOR)          |                       | coastal ecosystem (NOT ASSESSED)           |
| wetland E (POOR)          |                       | other (NOT ASSESSED)                       |

Generalized condition  
of Estonian terrestrial ecosystems

- Good
- Moderate
- Poor
- Unknown
- Not assessed



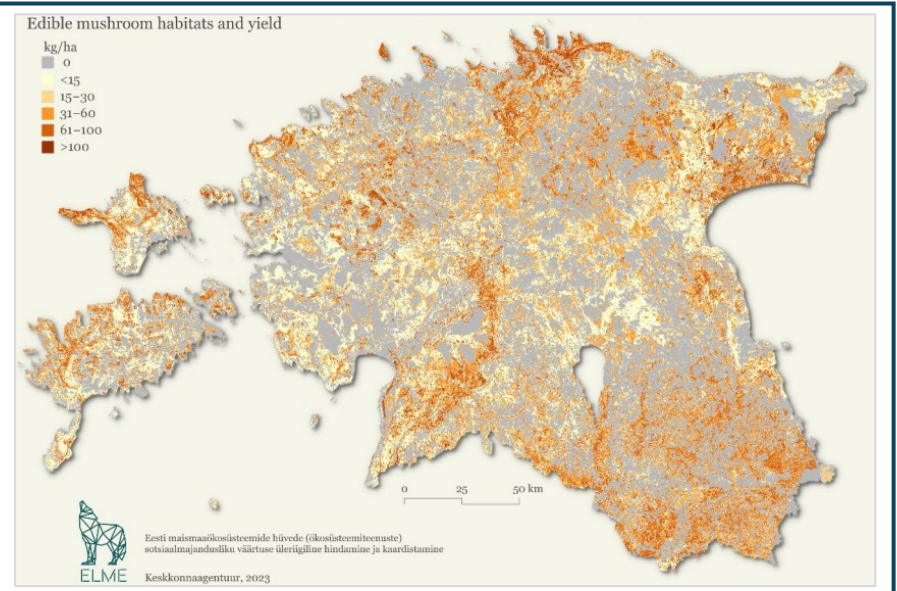
**ELME2  
generalized  
condition**



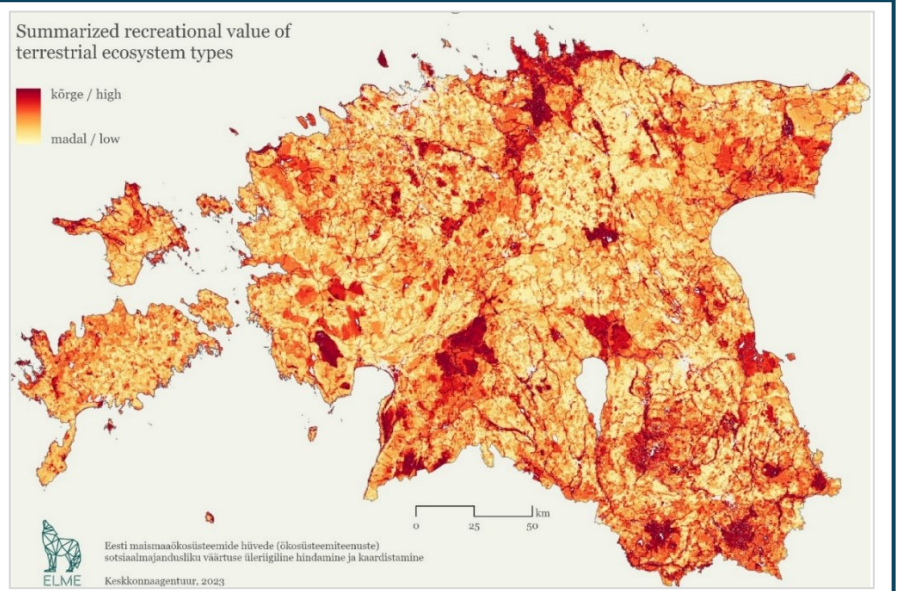
Countrywide Socioeconomic Mapping and Assessment of Ecosystem Services in Estonia (ELME project)  
Estonian Environment Agency, 2023

**ELME1 – 27, ELME2 – 22 assessed and mapped ecosystem services (ca 100 maps of respective indicators)**

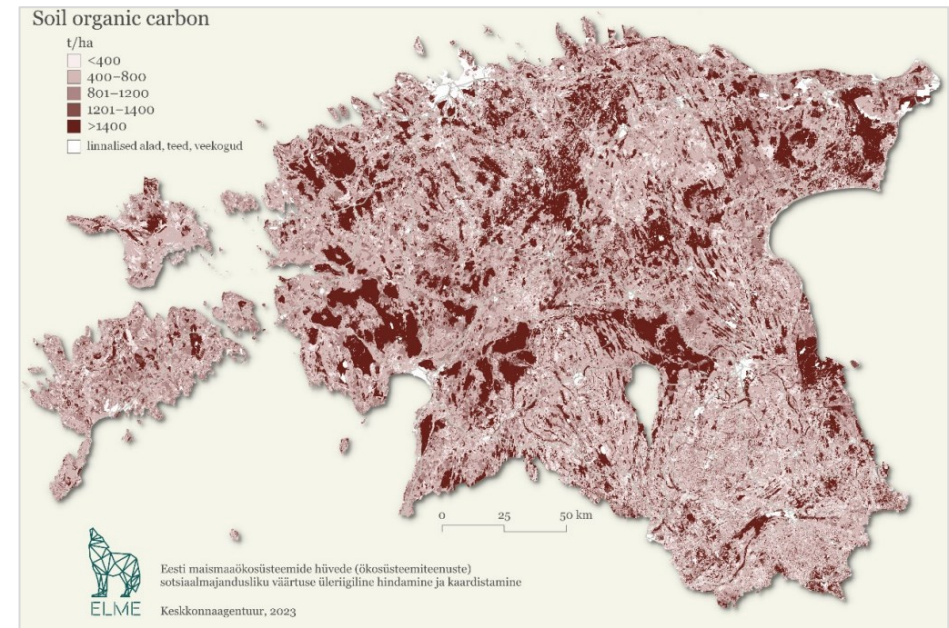
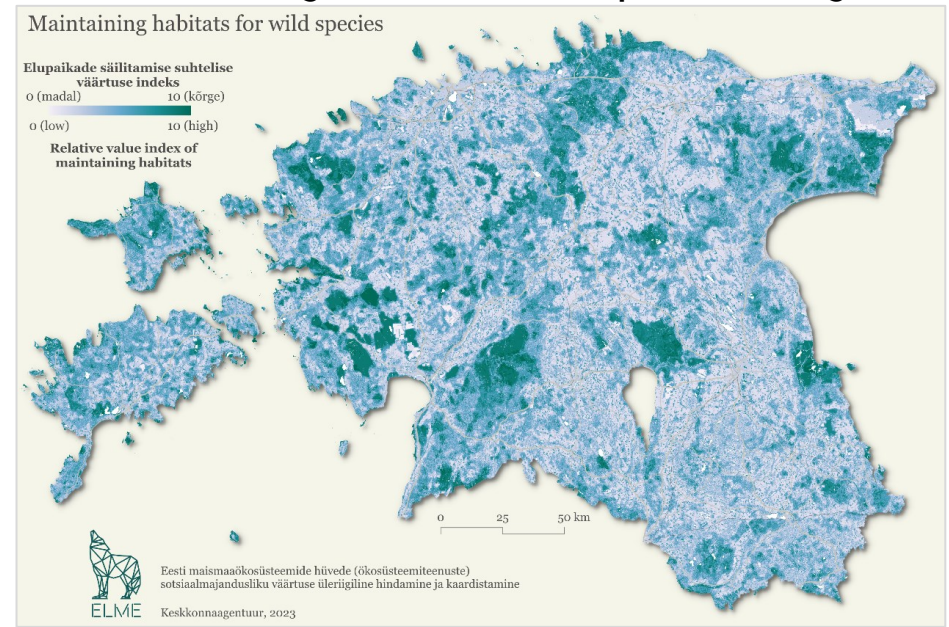
**Provisioning services** – crops, timber, mushrooms, wild berries, etc.



**Cultural services** – nature-based tourism and recreation, hunting, nature observations, orienteering, etc.



**Regulating and maintenance services** – pollination, flood control, climate regulation, habitat provisioning, etc.



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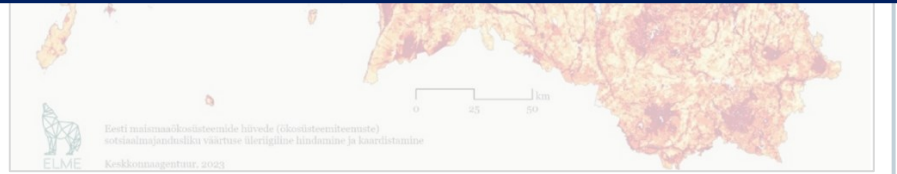
Provisioning

Generalized condition of Estonian terrestrial ecosystems

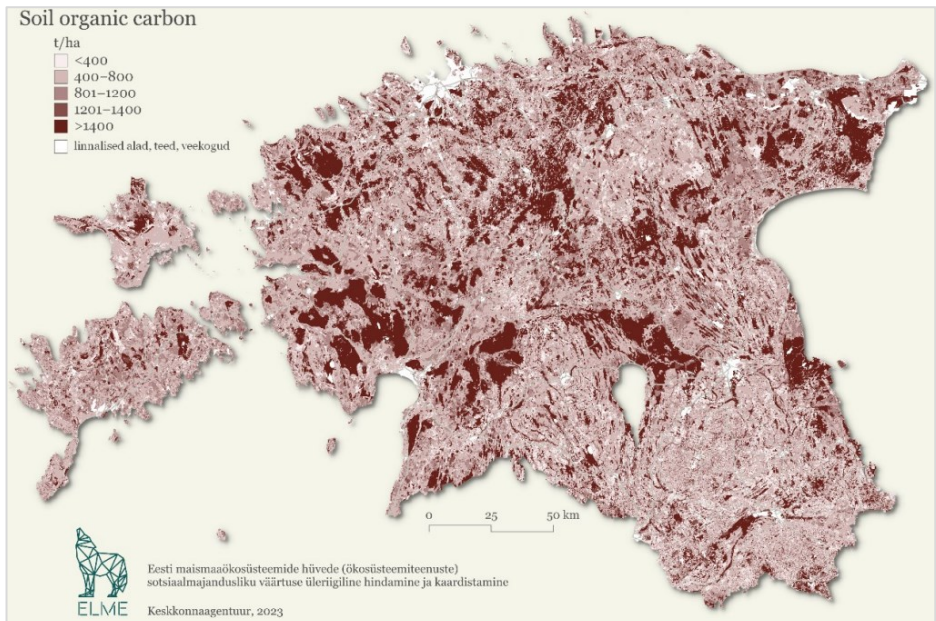
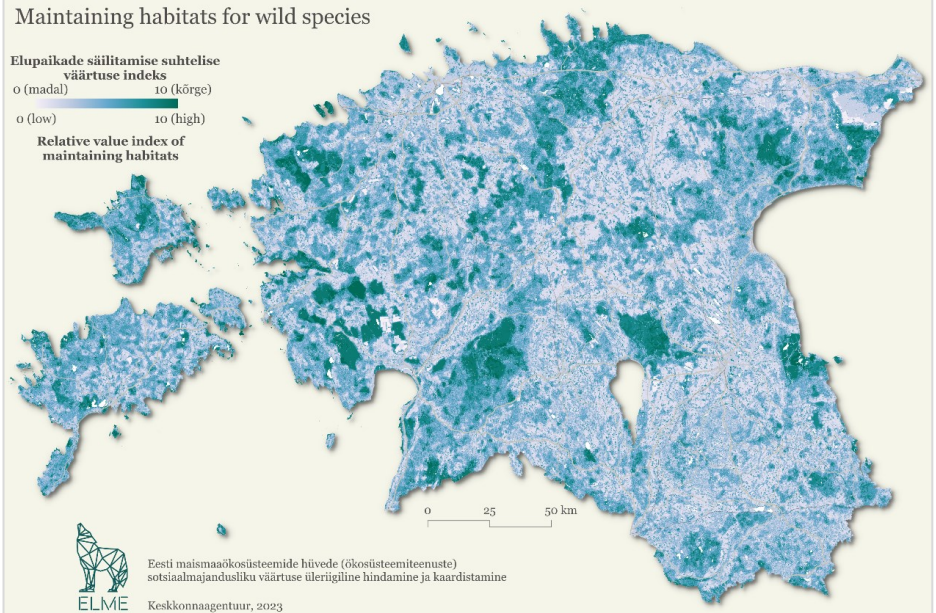
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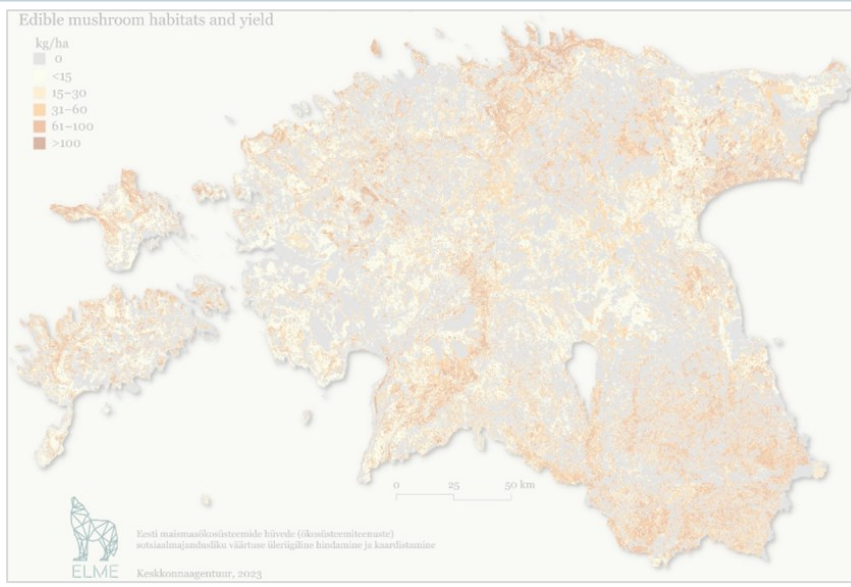


Regulating and maintenance services – pollination, flood control, climate regulation, habitat provisioning, etc.



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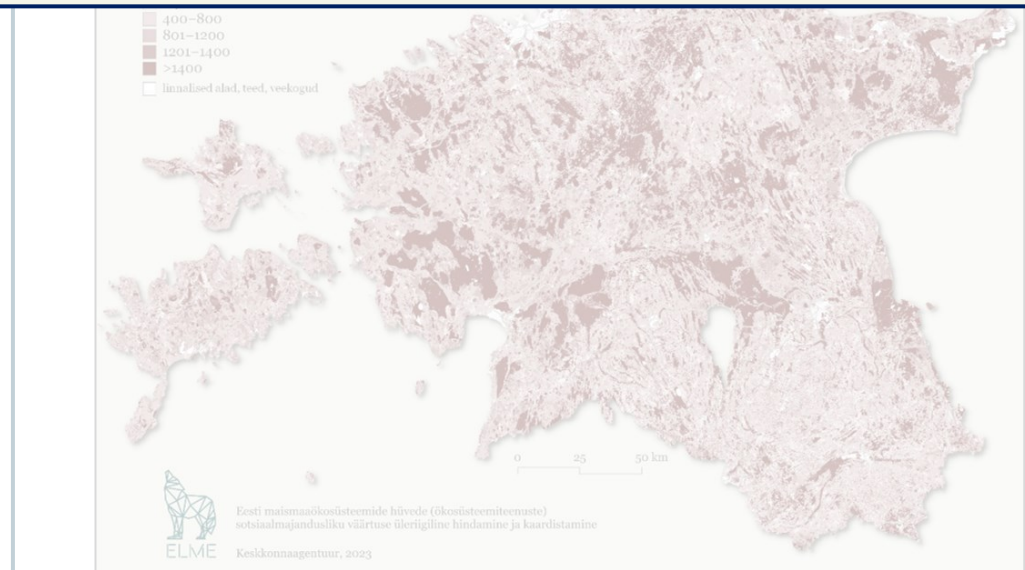
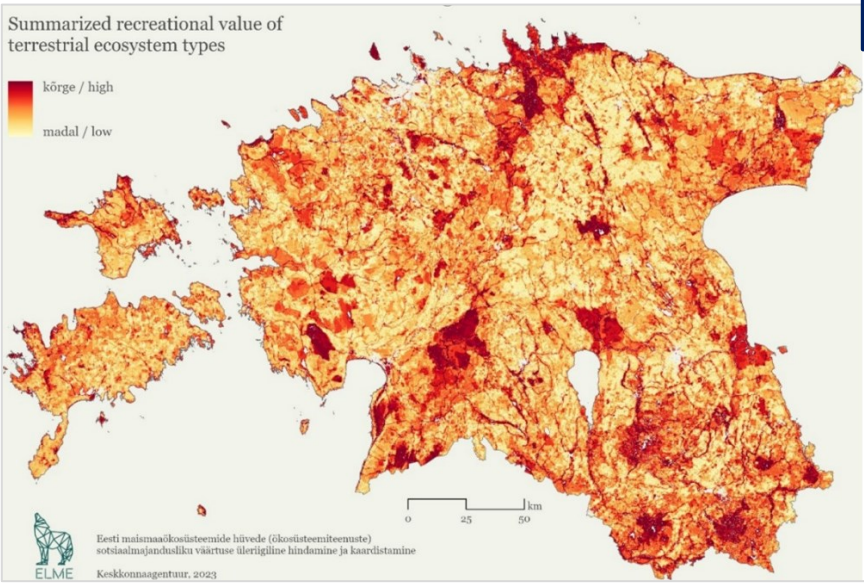
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Generalized condition of Estonian terrestrial ecosystems

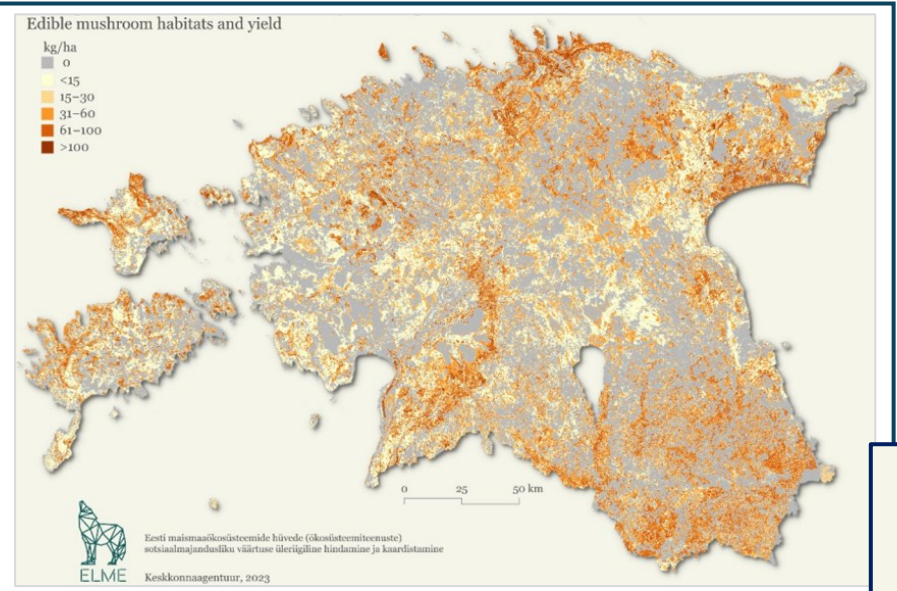


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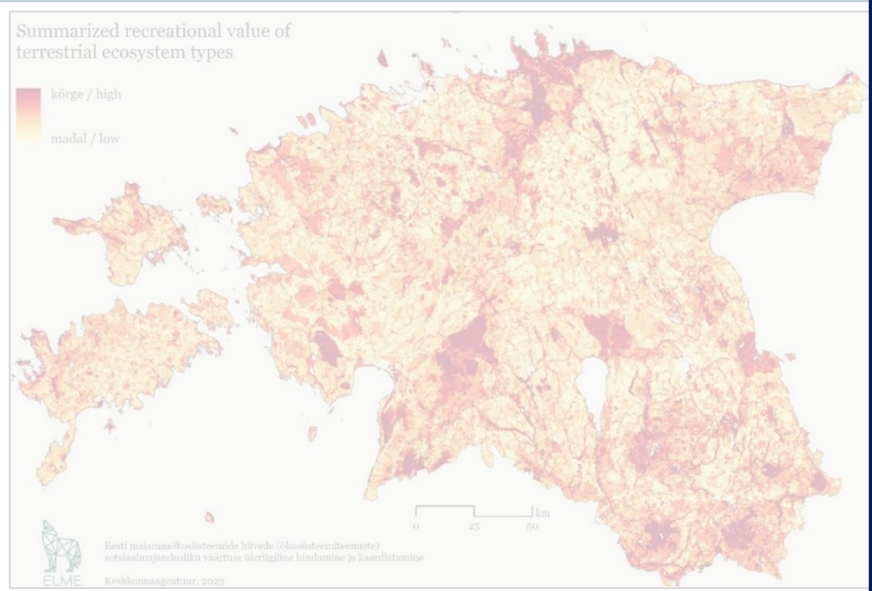
**Provisioning services** – crops, timber, mushrooms, wild berries, etc.



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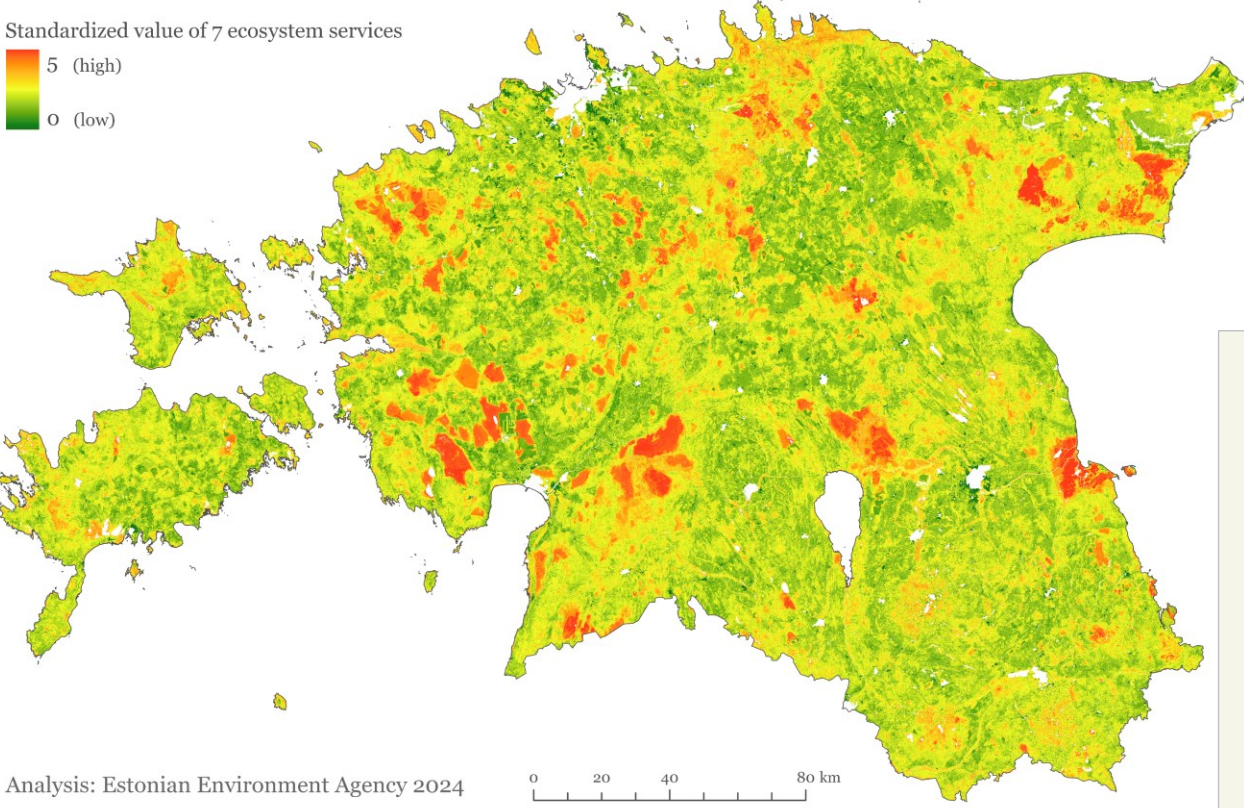
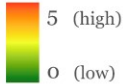


**Generalized condition of Estonian terrestrial ecosystems**



### Summarized ecosystem services values (hotspots)

Standardized value of 7 ecosystem services



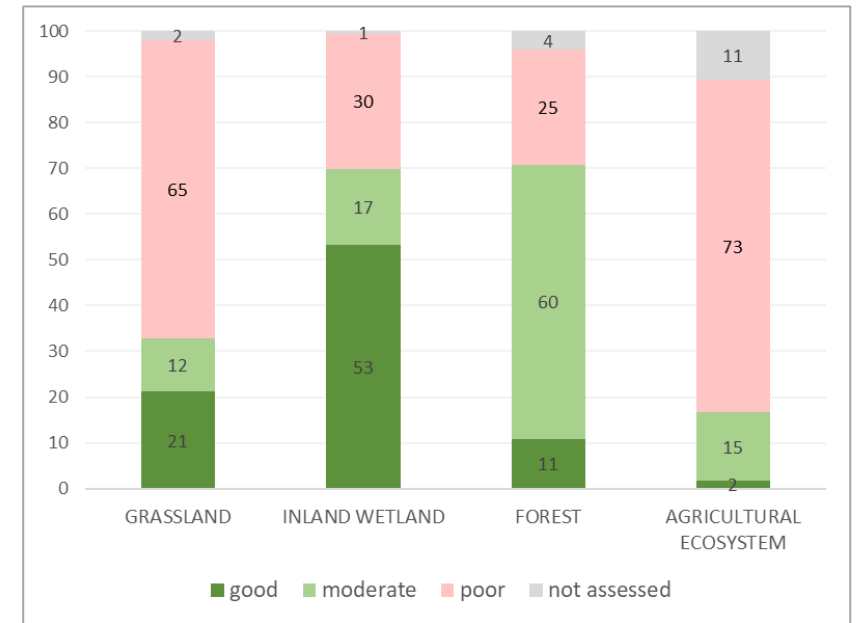
Analysis: Estonian Environment Agency 2024

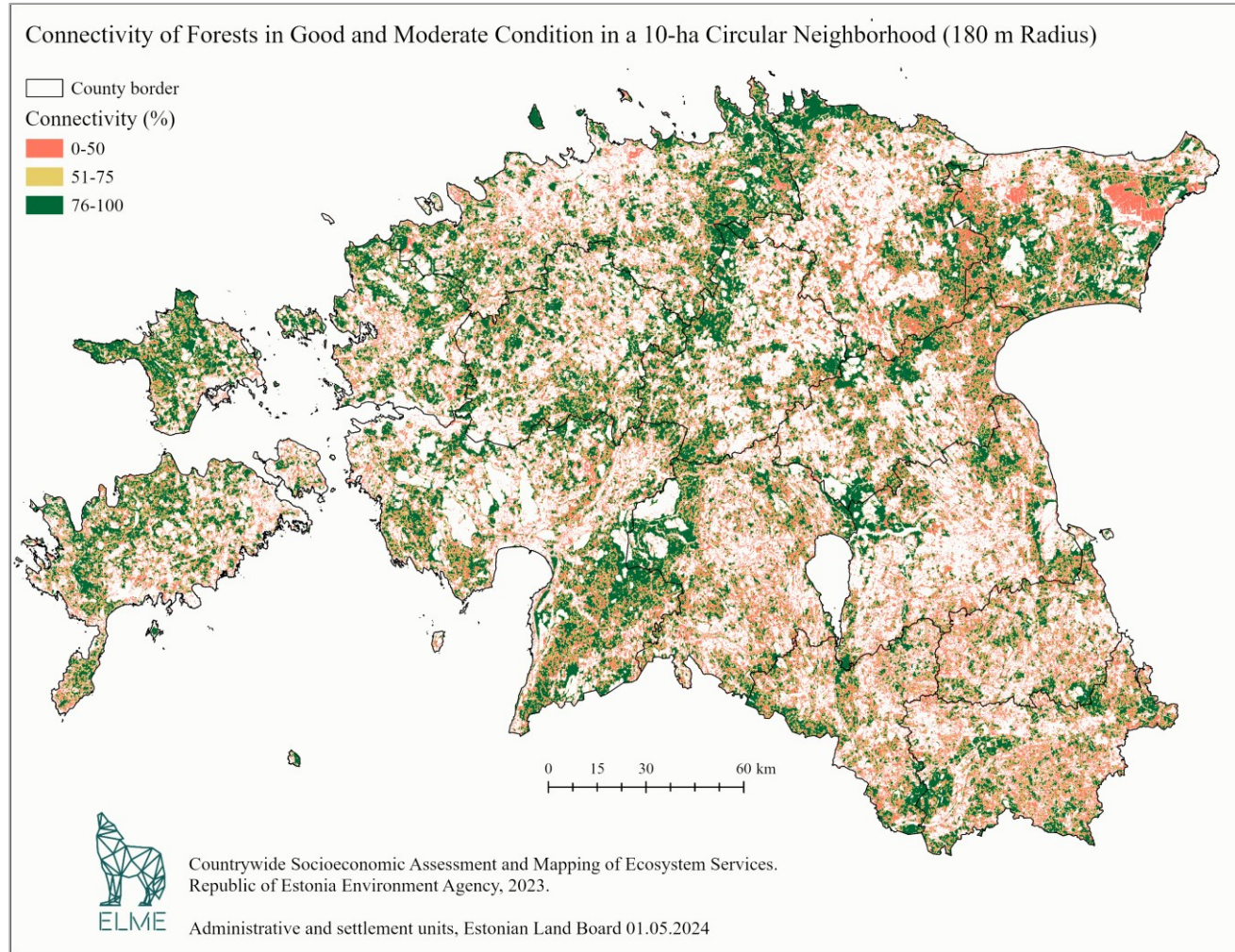
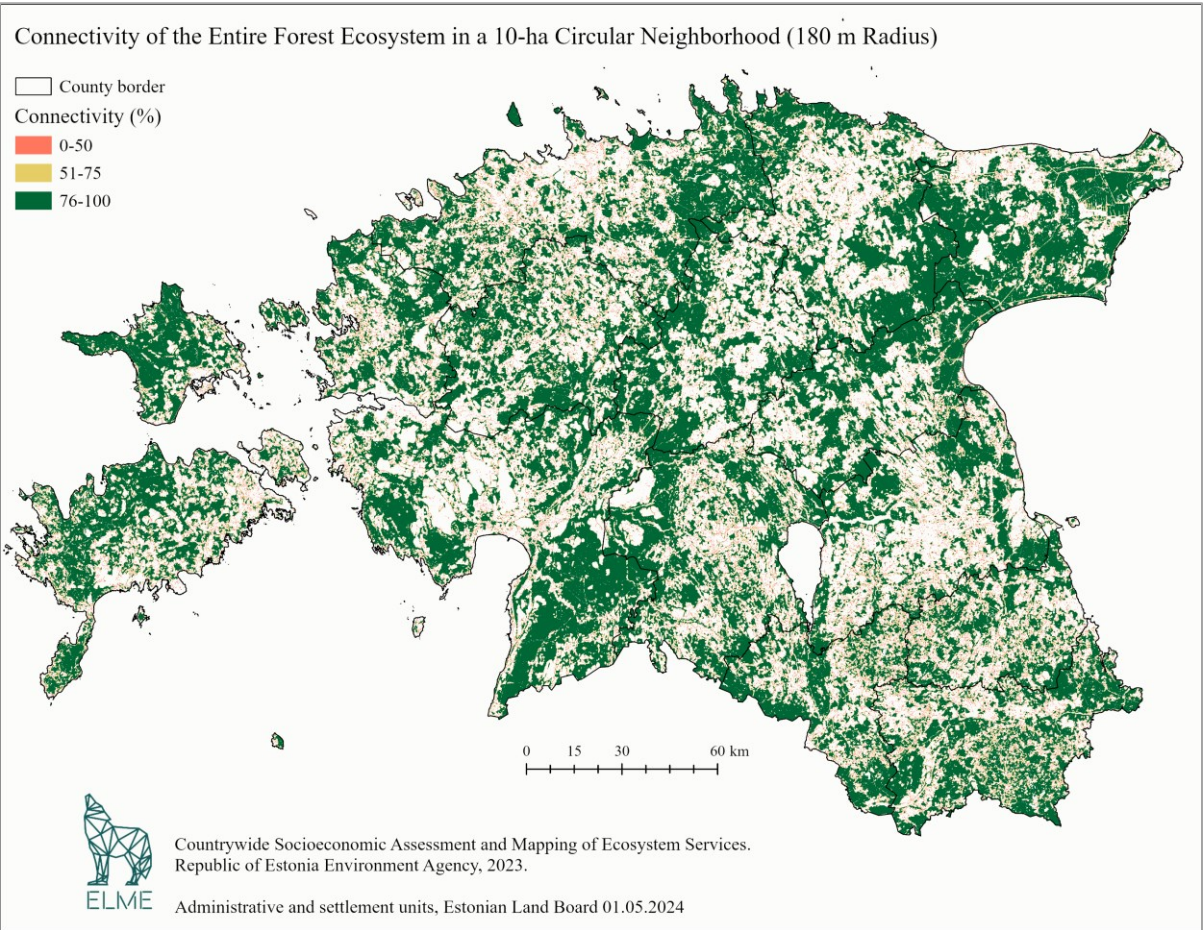
### Generalized condition of Estonian terrestrial ecosystems



Countrywide Socioeconomic Mapping and Assessment of Ecosystem Services in Estonia (ELME project)  
Estonian Environment Agency, 2023

General ecosystem type	detailed condition class	% of the area of the ecosystem type	generalized condition class	% of the area of the ecosystem type
GRASSLANDS	A	13	good	21
	B	8		
	C	12	moderate	12
	D1	40	poor	65
	D2	25		
	not assessed	2	not assessed	2
INLAND WETLANDS	A	53	good	53
	B	17	moderate	17
	C	13	poor	30
	D	8		
	E	9		
	not assessed	1	not assessed	1
FORESTS	A	11	good	11
	A-B	0.02	moderate	60
	A-C	7		
	B	12		
	C	41		
	D	12	poor	25
	E	11		
	F	2		
	not assessed	4	not assessed	4
AGRICULTURAL ECOSYSTEMS	A	2	good	2
	B	15	moderate	15
	C	29	poor	73
	D	44		
	not assessed	11	not assessed	11







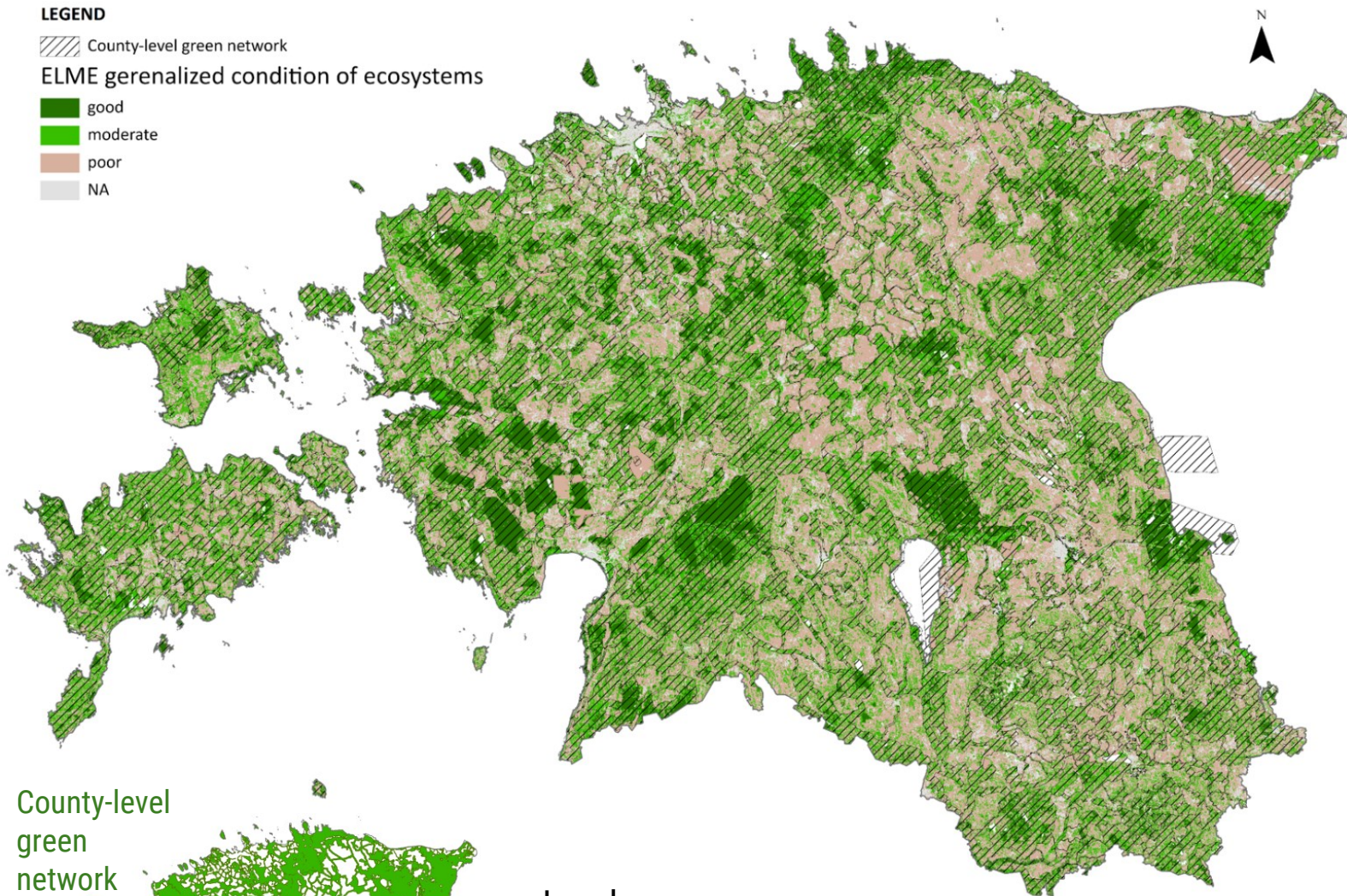
# Green network planning

## LEGEND

 County-level green network

ELME generalized condition of ecosystems

-  good
-  moderate
-  poor
-  NA

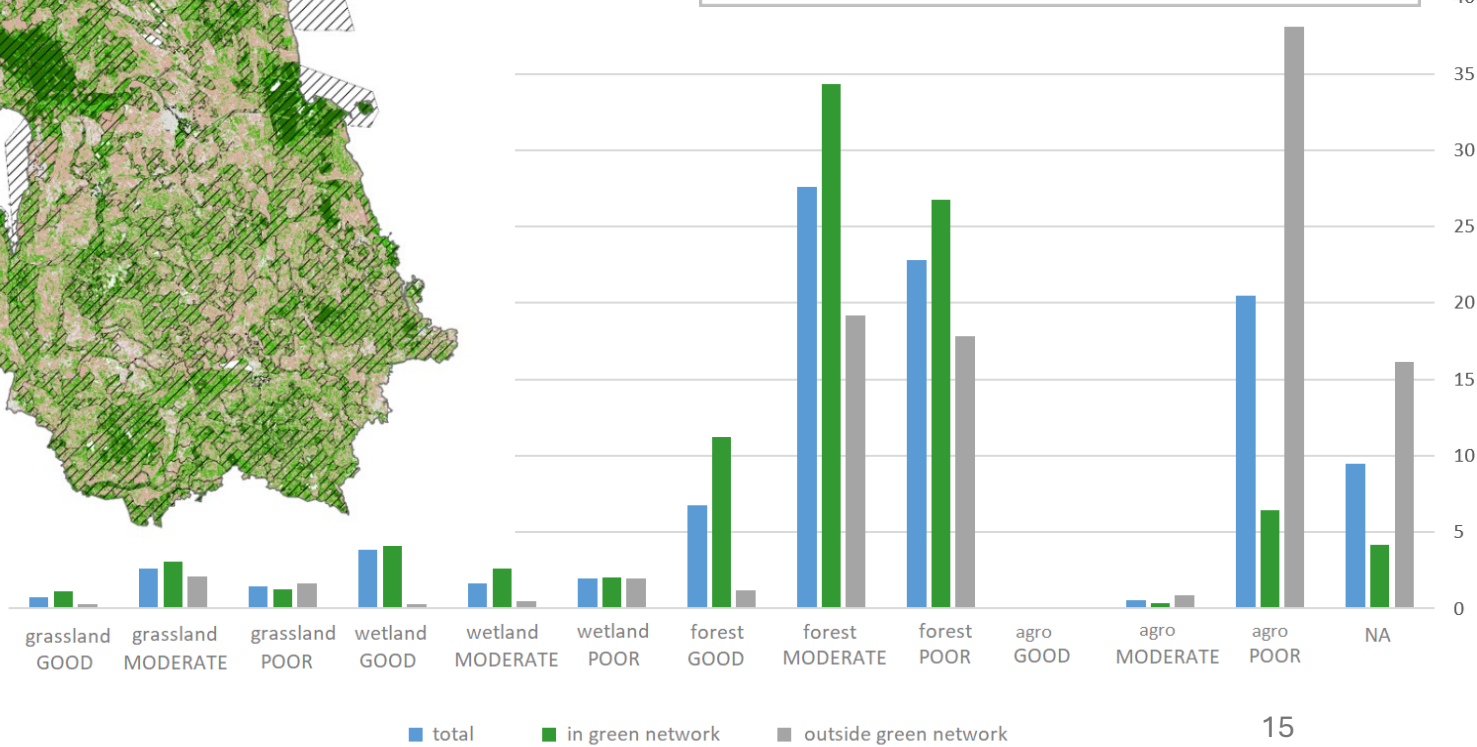
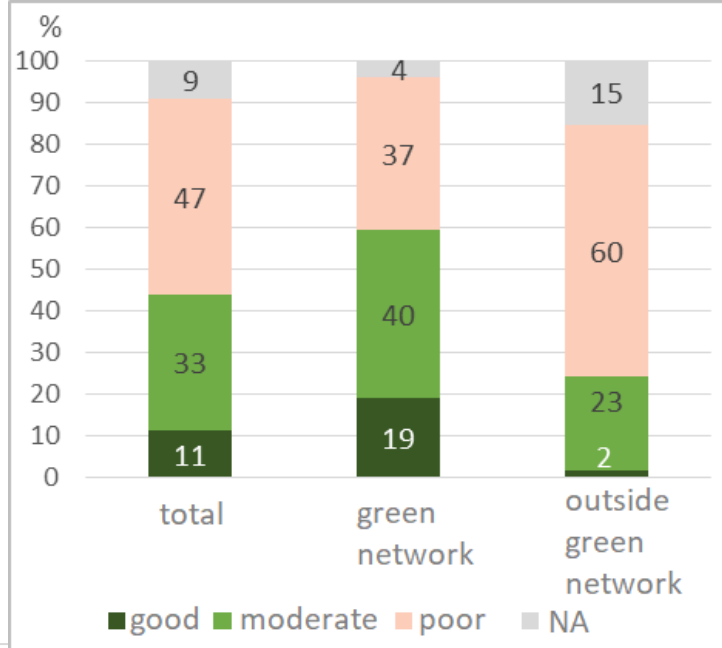


County-level green network





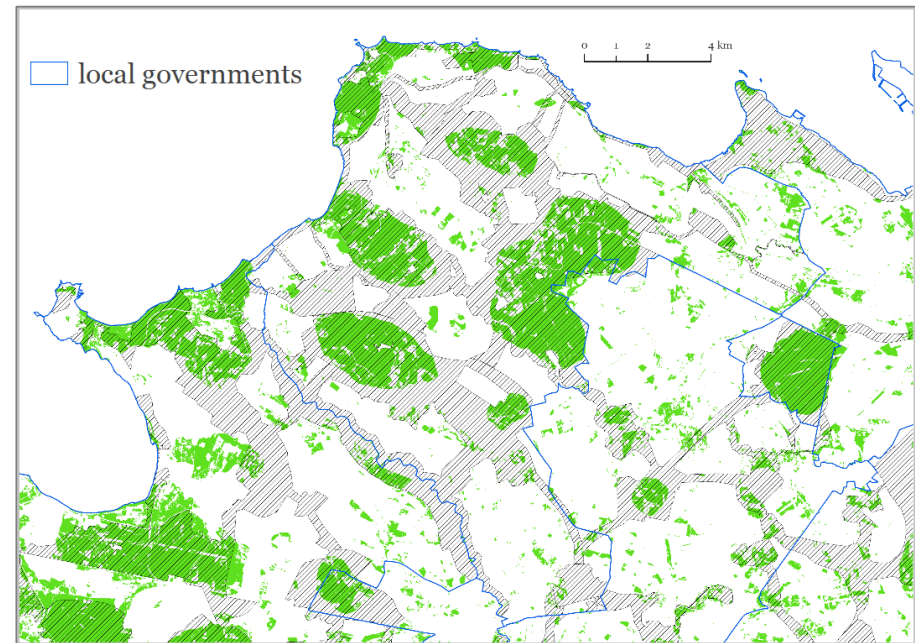
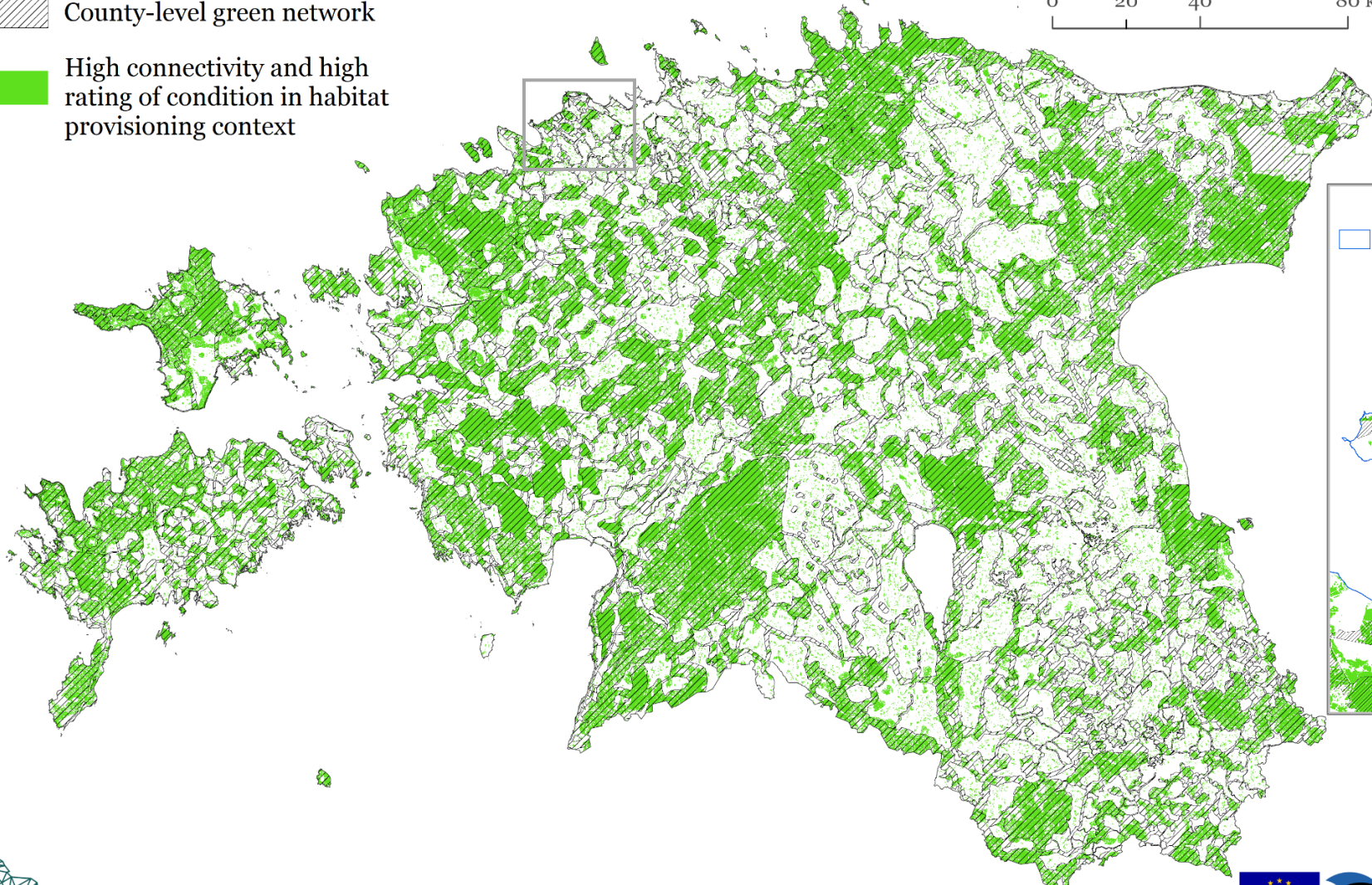
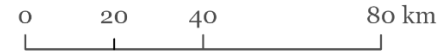
Levels:

- state
- county
- local government



# Green network planning

-  County-level green network
-  High connectivity and high rating of condition in habitat provisioning context

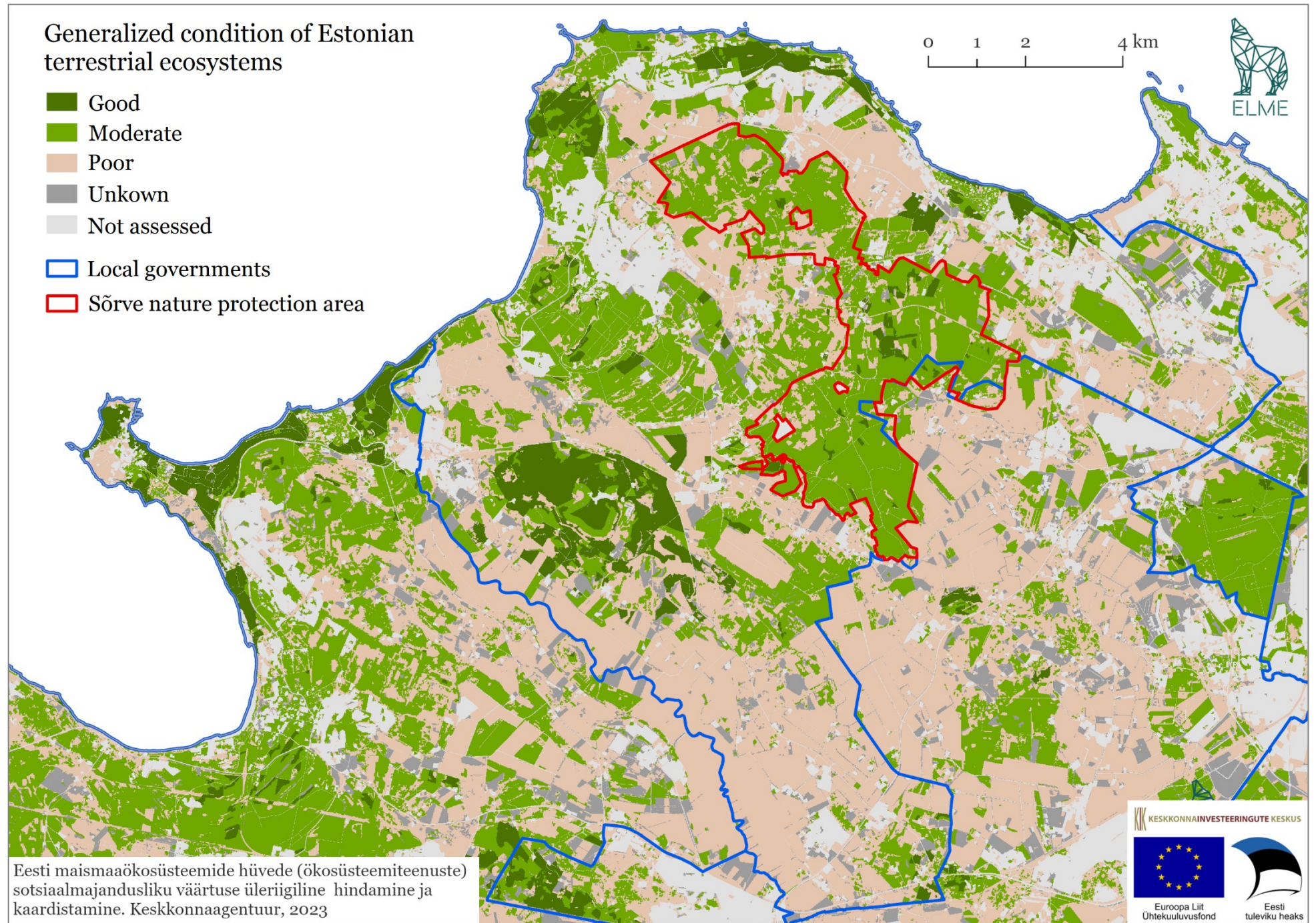


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Ecosystem condition / connectivity	total	in green network	outside green network
good condition / good connectivity	5.9	10.5	0.1
good condition / moderate connectivity	4.5	7.3	1.0
moderate condition / good connectivity	2.3	4.1	0.1
moderate condition / moderate connectivity	14.1	20.2	6.5
good condition / poor connectivity	0.9	1.2	0.6
poor condition / good connectivity	1.0	1.6	0.1
moderate condition / poor connectivity	16.0	16.0	16.0
poor condition / moderate connectivity	12.6	15.7	8.8
poor condition / poor connectivity	33.6	19.5	51.3

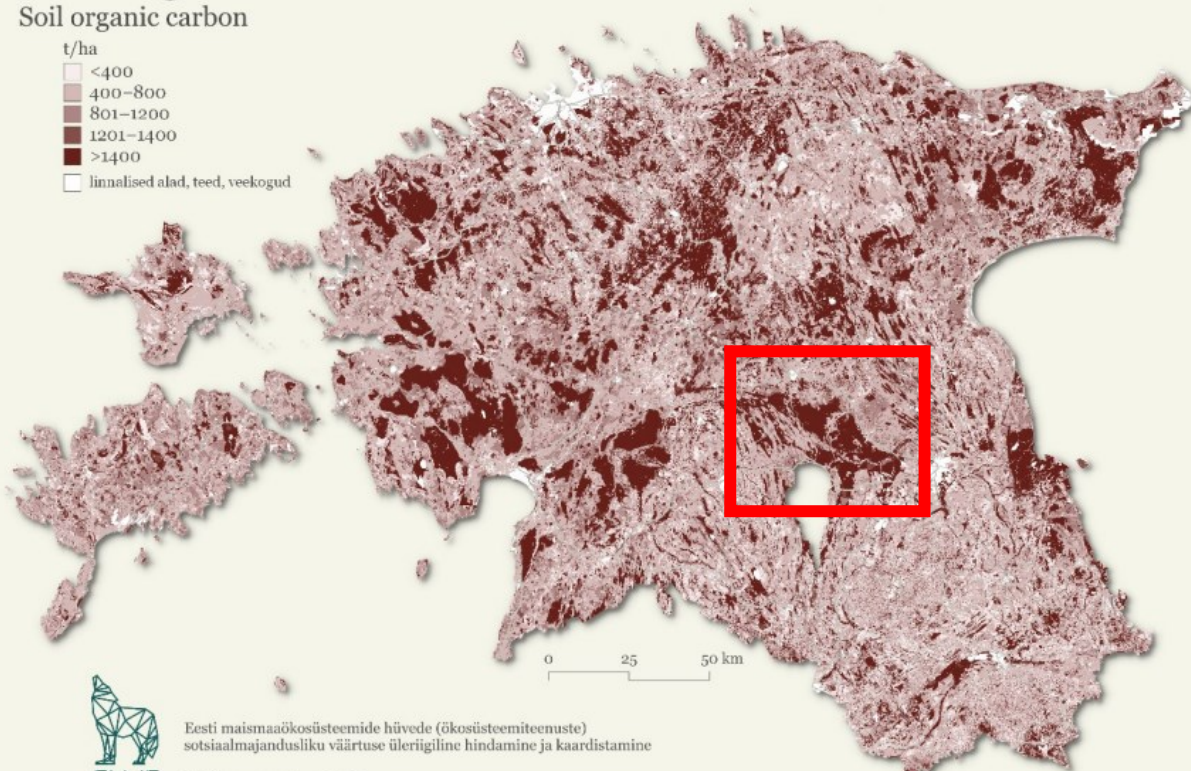
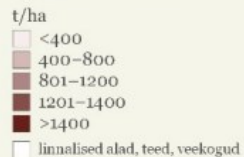
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# Nature conservation planning



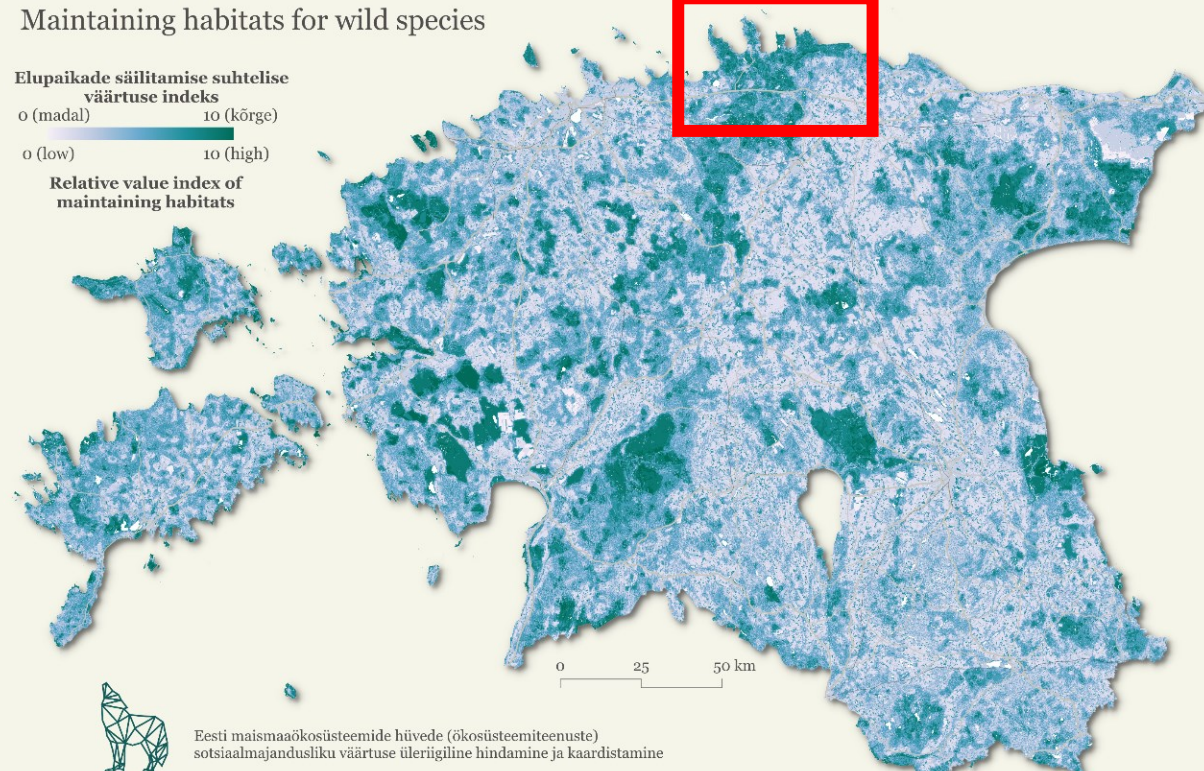
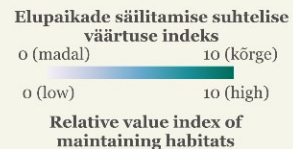
Eesti maismaaökosüsteemide hüvede (ökosüsteemiteenuste) sotsiaalmajandusliku väärtuse üleriigiline hindamine ja kaardistamine. Keskkonnaagentuur, 2023

### Soil organic carbon



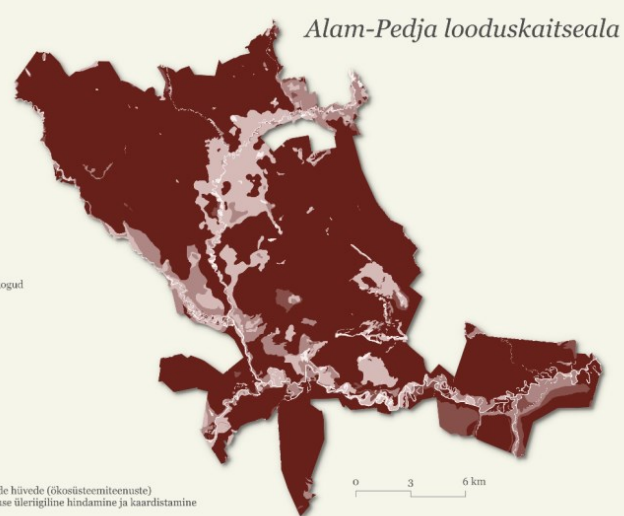
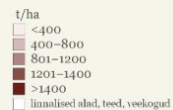
Eesti maa- ja metsandusministeeriumi (ELME) sotsiaalmajandusliku väärtuse üleriigiline hindamine ja kaardistamine  
Keskkonnaagentuur, 2023

### Maintaining habitats for wild species



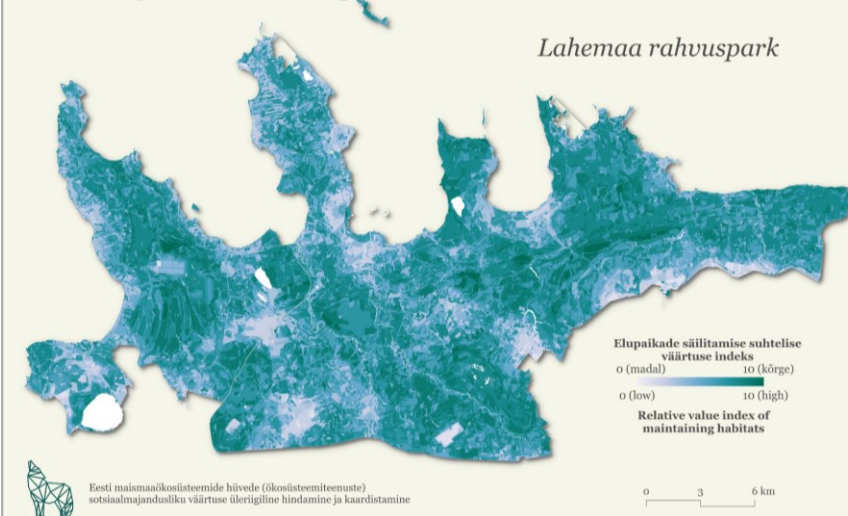
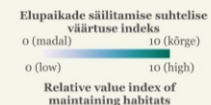
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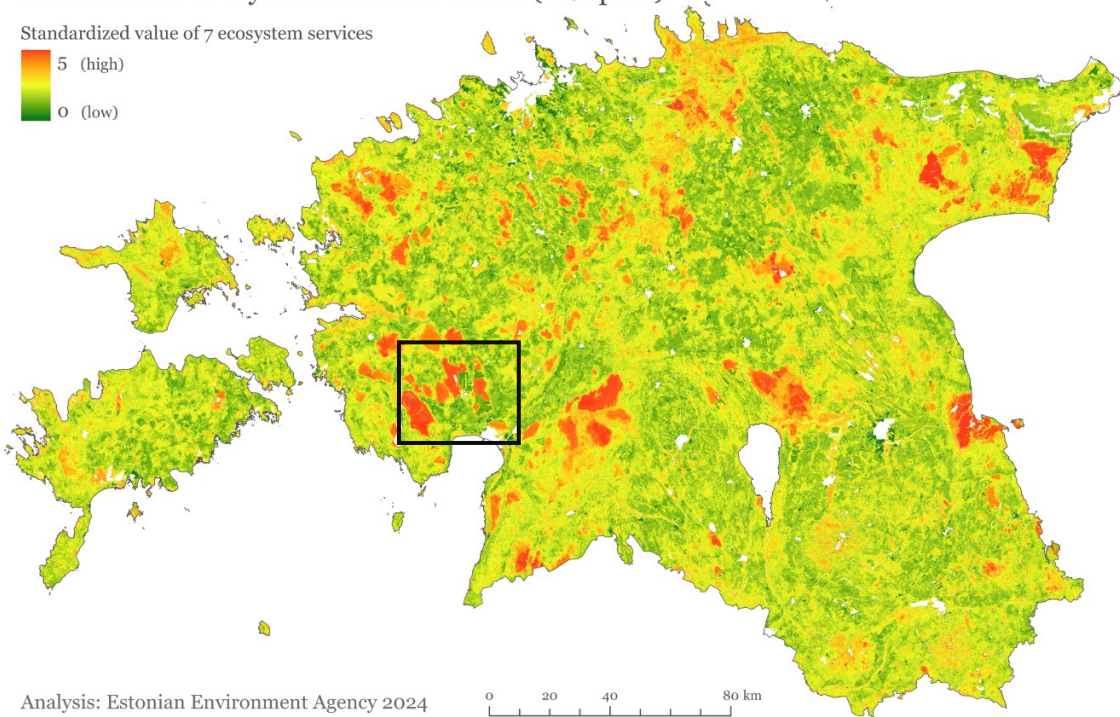
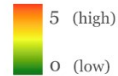
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Keskkonnaagentuur, 2023

## Summarized ecosystem services values (hotspots)

Standardized value of 7 ecosystem services

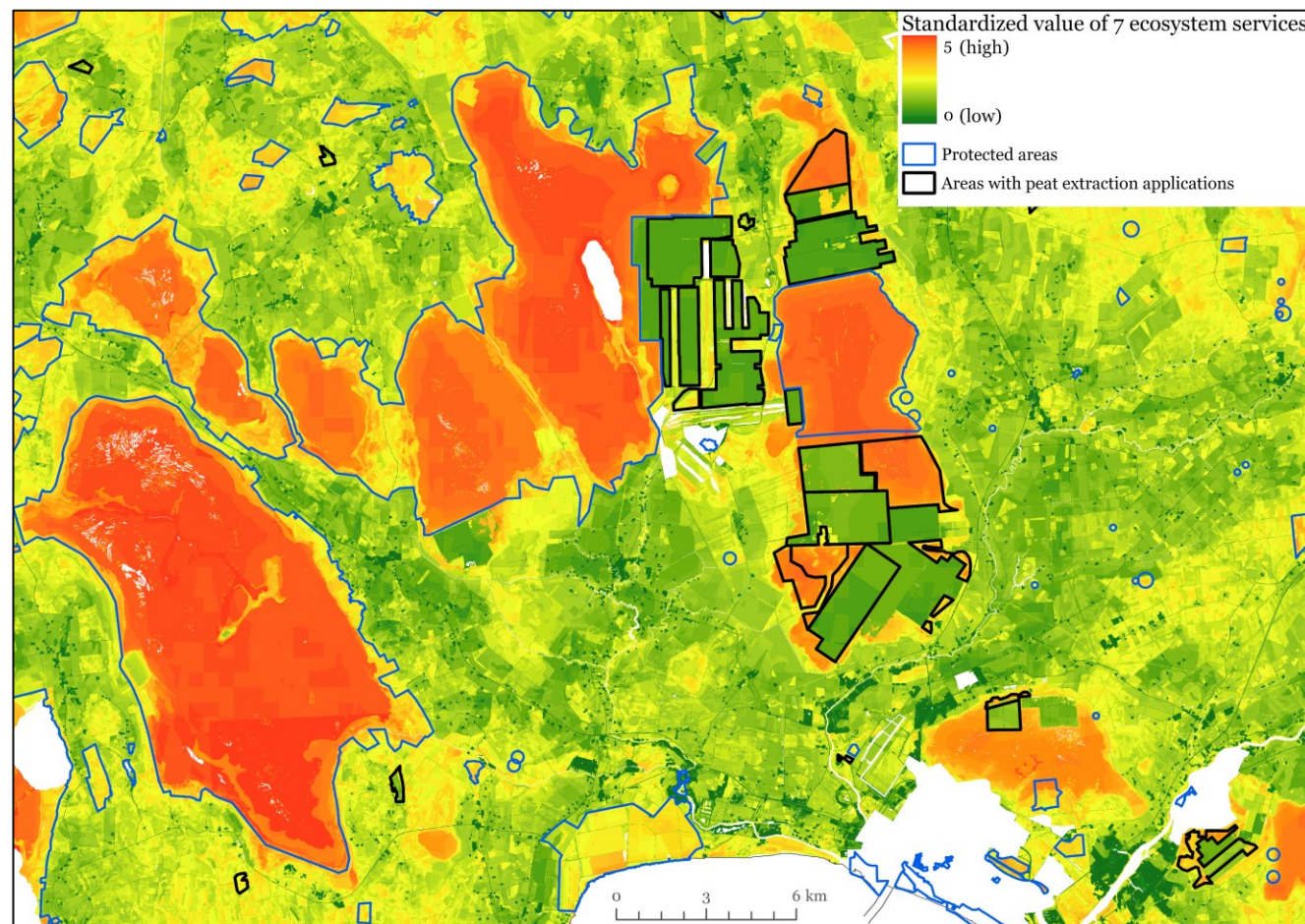


Analysis: Estonian Environment Agency 2024



Condition class of ecosystem services		Preconditions for issuing peat extraction permits
5	Very good	Permits are not issued. <b>Priceless ecological value</b>
4	Good	Financial benefits must be <b>significantly greater</b> than the potential ecological damage
3	Moderate	Financial benefits must be <b>greater</b> than the possible ecological damage
2	Poor	Financial benefits must be <b>equal to</b> the potential ecological damage
1	Very poor	Financial benefits may be <b>less than</b> the potential ecological damage

## Peat extraction permits



### 7 services relevant in peatlands:

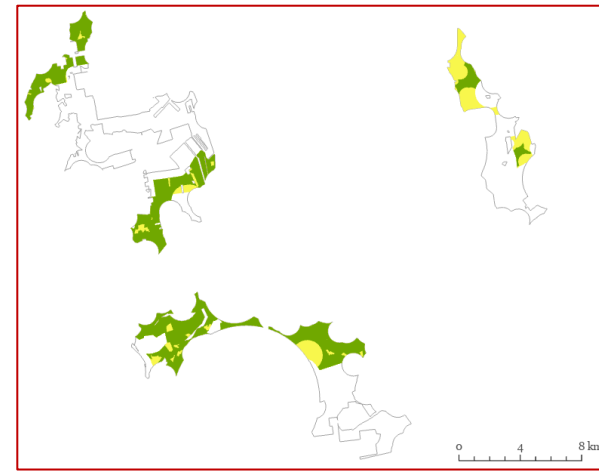
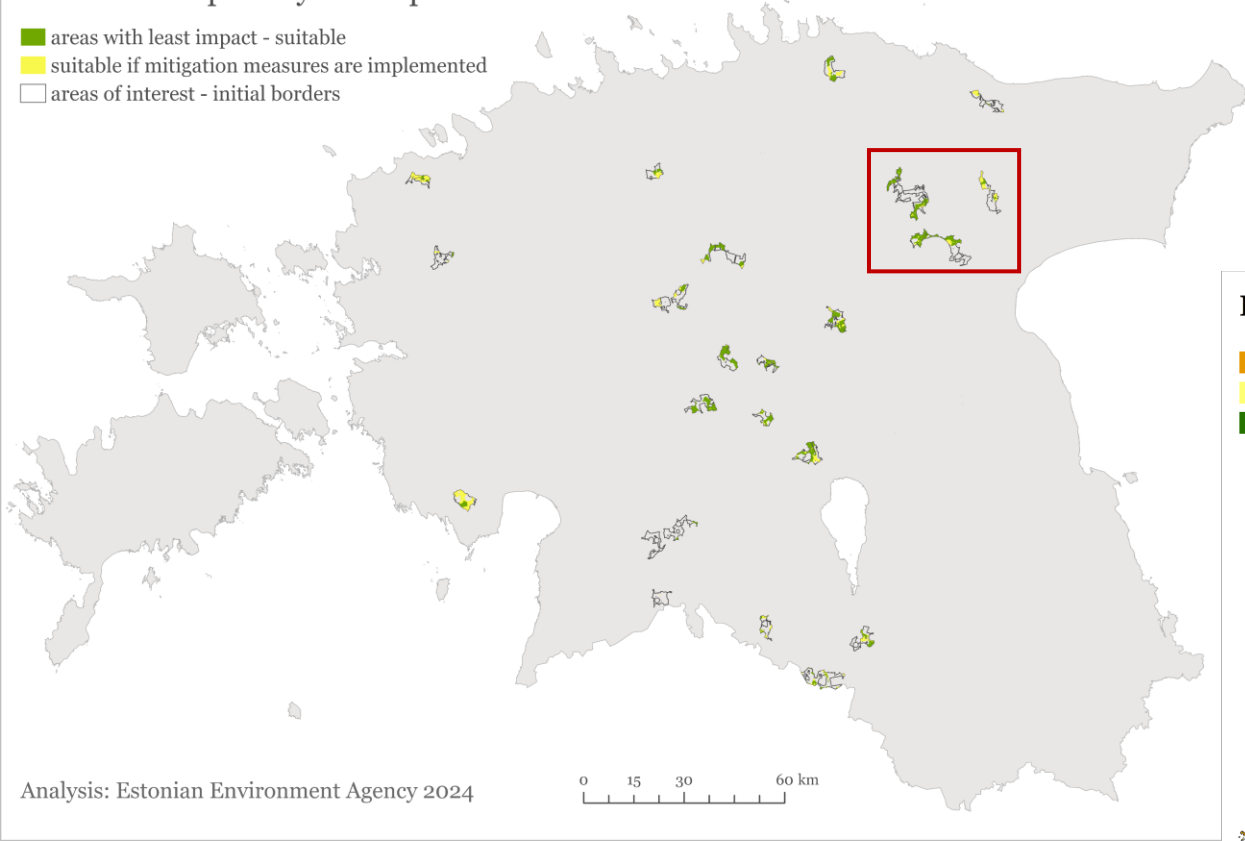
- soil organic C
- water flow regulation capacity
- cranberries
- nature tourism
- recreational value
- [habitat maintenance service](#)
- [local climate regulation](#)

Peat extraction site	Sum of the value of the ecosystem services
Peningi II	44 778 641 €
Rabivere	52 187 313 €
Elbu IV	264 664 023 €

# REPowerEU

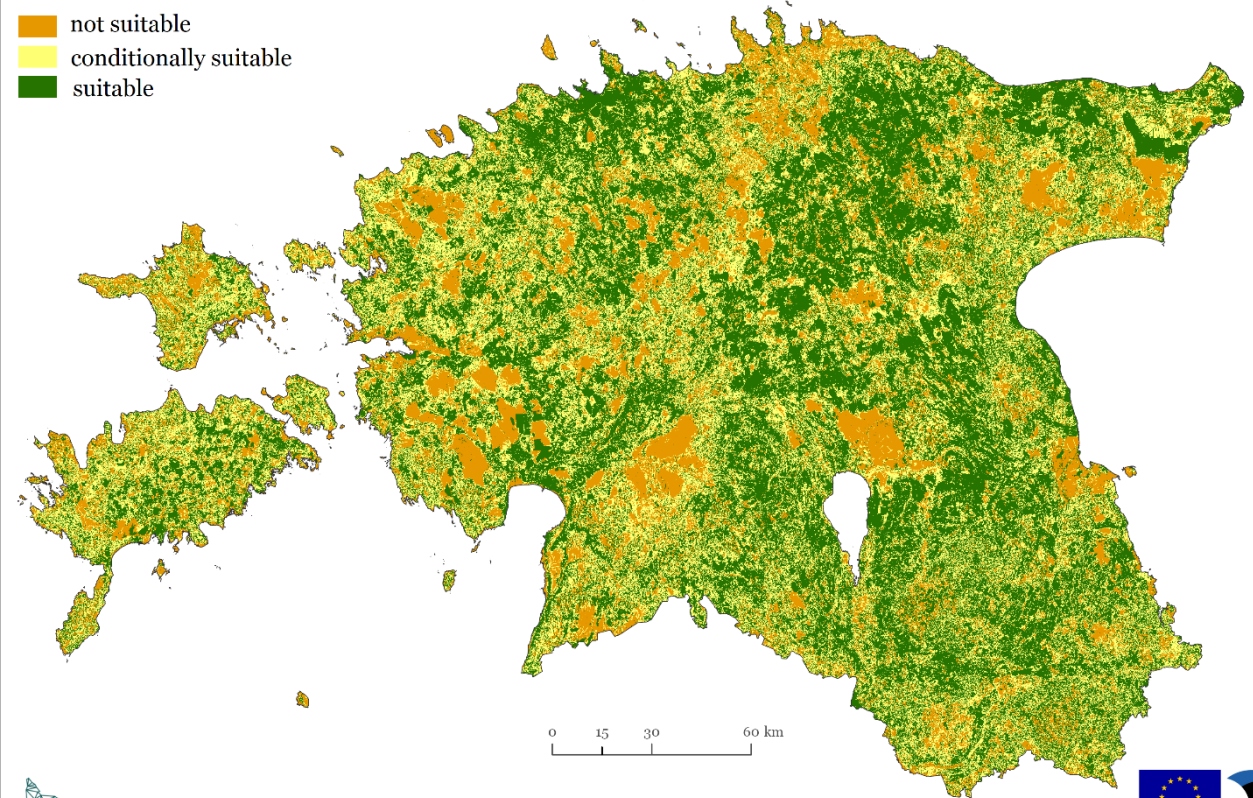
## REPowerEU priority development areas

- areas with least impact - suitable
- suitable if mitigation measures are implemented
- areas of interest - initial borders



## Ecological condition-based suitability for wind farm development in terrestrial ecosystems

- not suitable
- conditionally suitable
- suitable





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*Many thanks to the entire ELME team of researchers  
and to those currently working on ecosystem assessments!*

