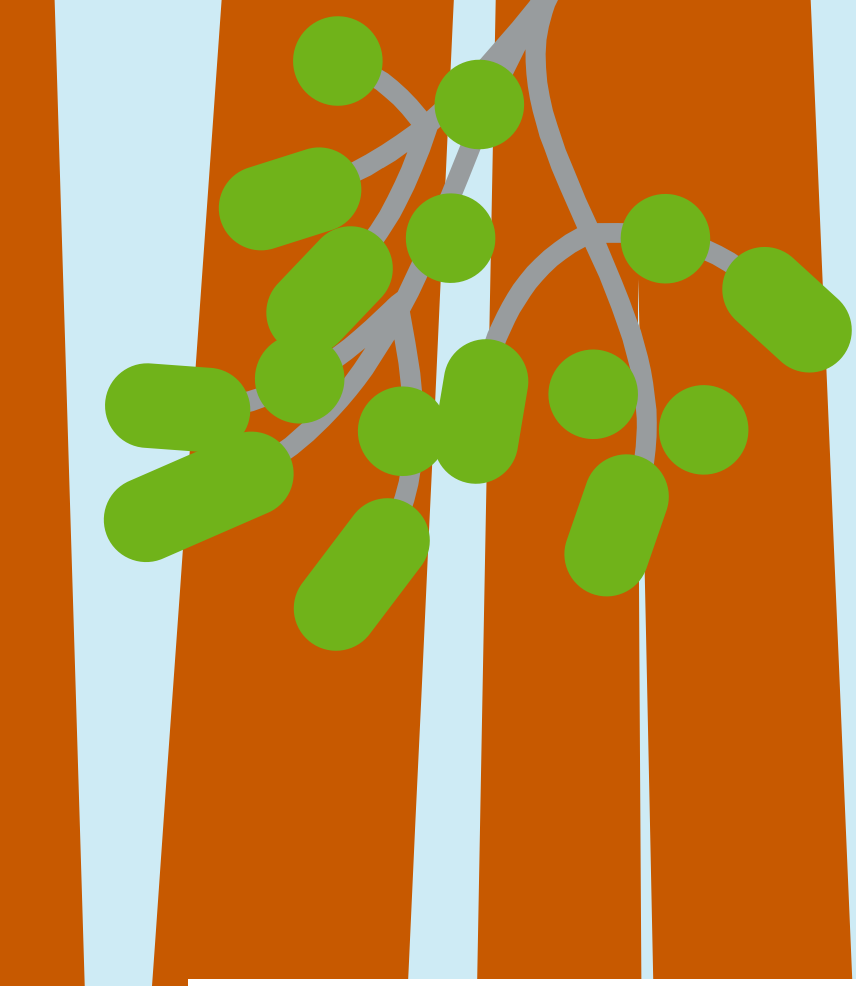


Luke
NATURAL RESOURCES
INSTITUTE FINLAND

CLIMATE SMART CARBON CYCLE
LUKE

Position paper

Three key messages concerning the proposal for EU Soil Monitoring Law

Eeva Vainio, Päivi Merilä, Hannu Ilvesniemi, Hanna Kekkonen, Raisa Mäkipää, Tiina M. Nieminen, Taina Pennanen and Anne Tolvanen

Soil health is a prerequisite to food and water security, wood and fiber production, climate change mitigation and adaptation, and biodiversity. Thus, the sustainable use of soils is crucial for the maintenance of human wellbeing.

The recently published proposal for EU Soil Monitoring Law supports the sustainable use of soils and facilitates effective measures to secure soil functions and ecosystem services. Still, there is a lot to do to combat the vicious cycle between deforestation, land degradation, biodiversity loss, decreased productivity, and climate change.

Besides effective monitoring and relevant soil descriptors for soil health, new thinking and policy measures to support sustainable use of soils are needed.

Luke addresses three key messages concerning the proposal for EU Soil Monitoring Law

1. Soil health is a local challenge - local solutions are needed.
2. EU-level soil sampling should be coordinated with monitoring networks tailored to local conditions.
3. Both societies and science are needed to safeguard soil health and biodiversity.

1. Soil health is a local challenge - local solutions are needed

Soil properties vary largely in Europe. For example, Finnish boreal forest soils are healthy, acid, and naturally rich in carbon. The share of forest land is large compared to many European countries (Fig. 1) and the proportion of peatlands is higher than in any other country in the world (Fig. 2). Finland also has the largest coverage of naturally formed acid sulfate soils in Europe.

Almost 60 percent of Finnish peatlands have been drained for agricultural and forestry use (Fig. 3). Drainage has increased GHG emissions and nutrient leaching due to continuous decomposition of peat layers.

Agricultural peat soils cover only about 10% of agricultural lands, but their greenhouse gas emissions

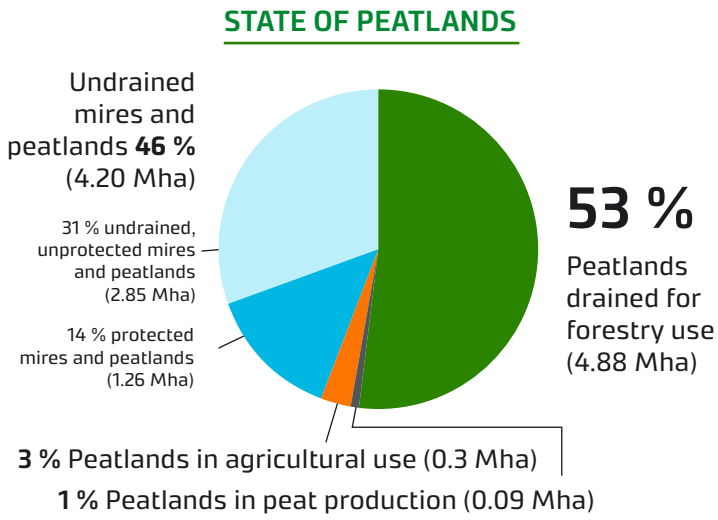


Fig 3. Utilization of peatlands in Finland. Data from NFI12, NFI13, GHGI 2019, GTK.

Fig 1. Share of forest area from country area in the European Union. Data from Eurostat.

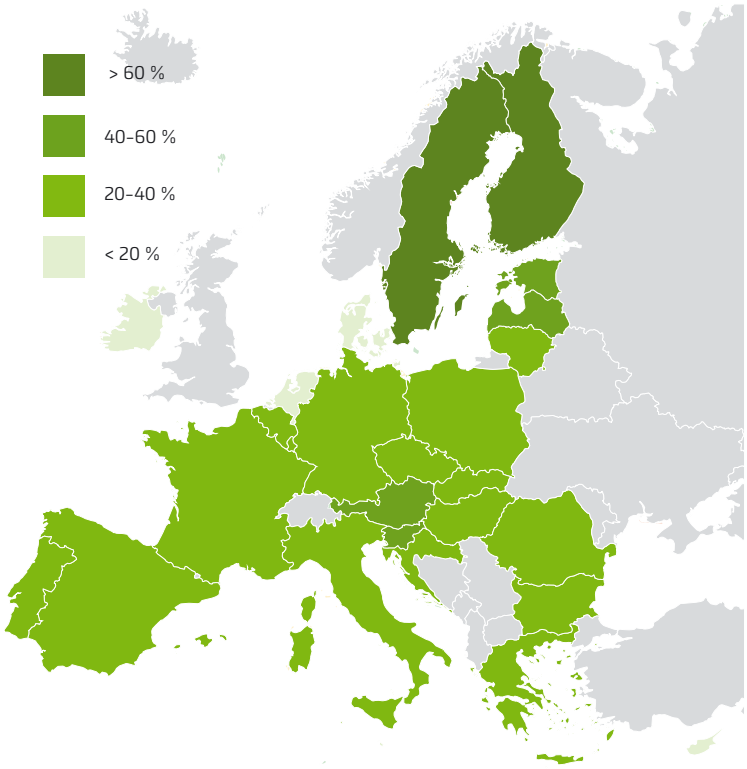
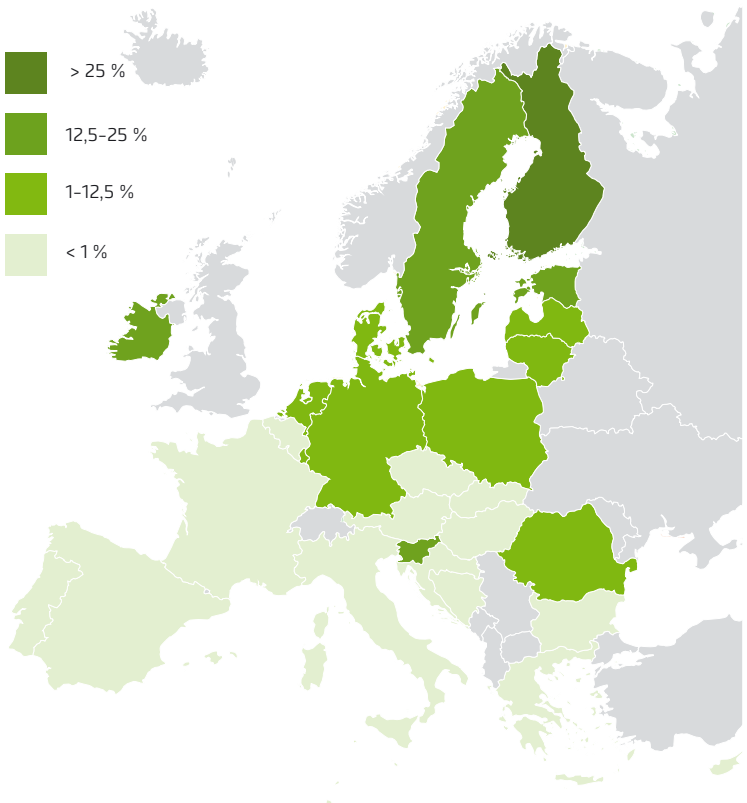


Fig 2. Share of peatland area from country area in the European Union.



constitute 60% of all agricultural emissions. Carbon loss occurs also from agricultural mineral soils due to historical land use, cultivation practices, and climate change.

Changes in land management are needed to ensure protection and sustainable use of soils. Local solutions are necessary to tackle the challenges caused by historical land use.

Suggested actions:

- On drained peatland forests continuous cover forestry and omitting ditch network maintenance should be promoted to maintain higher water table and mitigate carbon emissions to the atmosphere and waterbodies.
- On agricultural soils, modification of cultivation practices using paludiculture and continuous vegetation cover are needed to secure the preservation of carbon in the soil.
- In regions of acid sulfate soils, maintenance of water table above the sulfur-rich layers is crucial in agricultural and forestry use and precautionary actions are needed in construction of infrastructure and buildings.

2. EU-level soil sampling should be coordinated with monitoring networks tailored to local conditions

The determination of soil descriptors with criteria for healthy soils requires careful consideration based on soil research knowledge.

Concerning forests, long-term data series and advanced modelling techniques are needed to make predictions and scenarios on the productivity under the ongoing climate change and the decrease in forest growth. There is a knowledge gap on the inherent biodiversity of different types of forest soils, requiring new soil descriptors such as eDNA.

In agricultural soils, the increase in the size of agricultural machinery has led to the compaction of field soils and the deterioration of the growth conditions. There is a need for research evidence related to soil compaction, the true extent of water erosion and its impact on the condition of the fields.

The ongoing EU-level LUCAS sampling design is not optimal for soils in forests and peatlands, as deeper sampling is needed to obtain correct understanding of soil C stocks. It also lacks data on forest stand and management, which were included in the EU co-funded BioSoil project. Concerning agricultural soils, LUCAS is not as comprehensive and long-term as the Finnish monitoring scheme VALSE (Fig. 4).

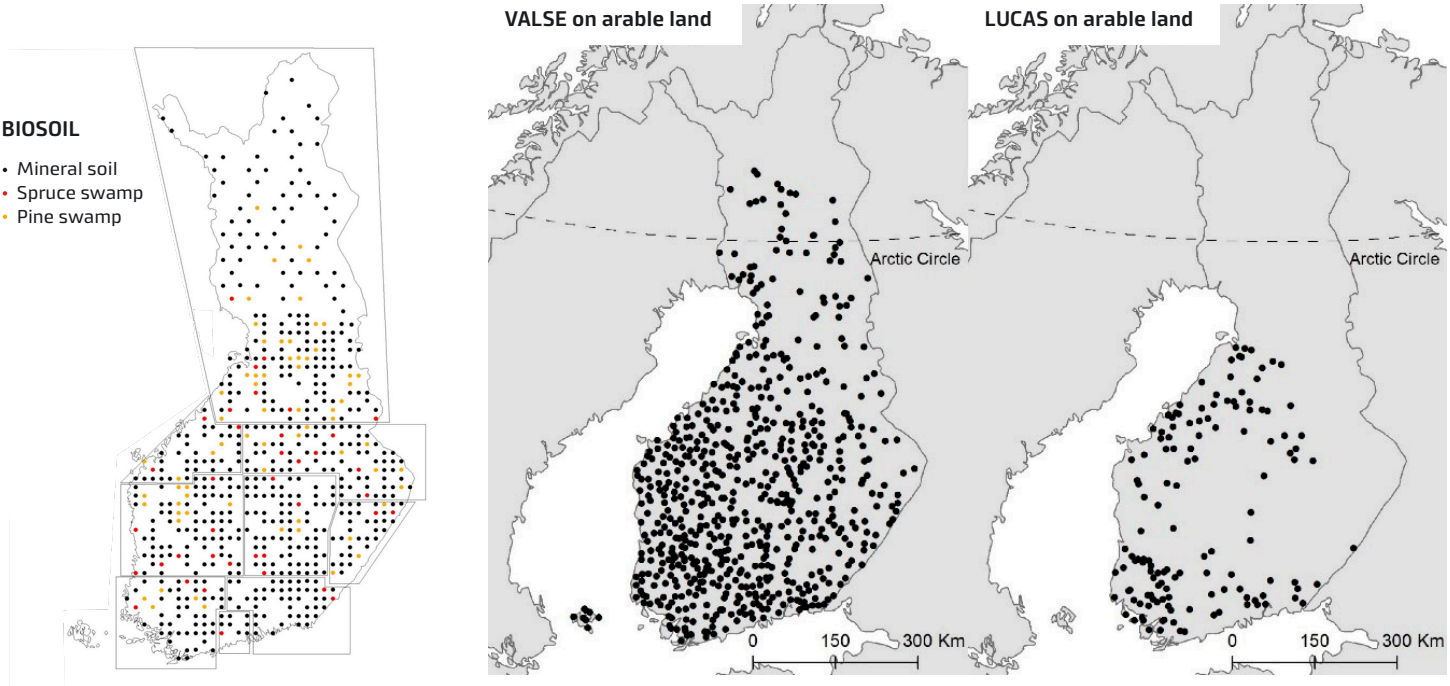
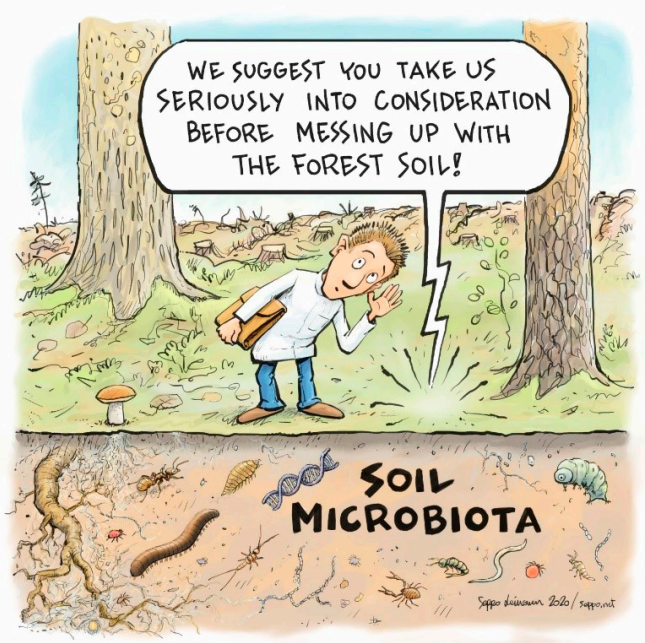


Fig 4. Monitoring programs covering soil health in Finland. Large scale forest soil monitoring has been conducted twice, in 1986–1995 and in 2006–2007 as part of the EU-wide BioSoil project. The project was a concerted action for determination of soil chemical characteristics and plant biodiversity and to provide understanding on forest ecosystem functioning under different management regimes. VALSE is an agricultural soil monitoring scheme including 630 sampling sites surveyed at ten-year intervals from 1974. It gives a comprehensive picture on the development of the carbon content and nutrient status of agricultural top soils. It has been expanded to cover also soil biodiversity and pesticide residues. LUCAS Soil monitoring is a European-wide program of EU's Joint Research Centre started in 2009 and repeated three times since then (the map shows LUCAS Soil sampling sites on arable land).

Suggested actions:

- In Finland, LUCAS sampling should be coordinated with sampling networks that have been created in the EU co-funded BioSoil network and national VALSE scheme (Fig. 4). Concerning the monitoring of forest soils, also piloting work is needed to develop a more cost-efficient monitoring scheme for the future. By jointly sharing information and data, long-term land-use data on environmental changes can be maximally utilized and combined with soil monitoring.
- eDNA-based knowledge on soil microbiome and meso-scale species diversity should be increased for assessing changes in soil biodiversity and soil multifunctionality (Fig. 5).

Fig 5. HE Holisoils project incorporates novel methodologies and expert knowledge on analytical techniques, data sharing, soil properties and biodiversity, and processes with model development.



Related links:

HE Holisoils project: holisoils.eu, project information

Soil as part of climate solution: https://doi.org/10.36333/pb7, policy brief

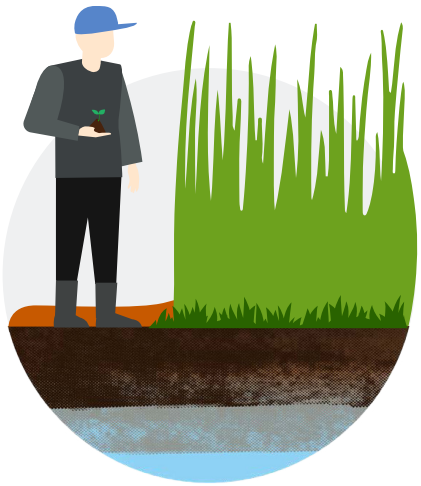
3. Both societies and science are needed to safeguard soil health and biodiversity

Changes in forest management and cultivation practices require changes in landowners' values and attitudes. Increasing soil literacy (understanding of the importance of soils) and willingness to pay for improved biodiversity and ecosystem services exist among citizens. Nevertheless, current policy measures are not sufficient to promote measures that respond to this development.

Suggested actions:

- Policy measures targeting improvement of forest soil health should concentrate on measures that benefit water and soil protection, including soil microbiome and carbon sequestration.
- Agricultural policy should be renewed so that subsidies are conditional and dependent on achieved environmental benefits instead of production area basis.
- Restoration or paludiculture should be supported in agricultural peat soils that are not necessary for national food self-sufficiency (Fig. 6). Conversion of peatlands to agricultural land should be prohibited or liable to charge.
- The implementation of management changes should be planned locally to support fair transition.

Fig 6. Paludiculture on agricultural peat soils.



You can find us online
> luke.fi

Luke Position Paper
Three key messages concerning
the proposal for EU Soil Monitoring Law
http://urn.fi/URN:NBN:fi-fe20230831114124

Natural Resources Institute Finland (Luke) | Latokartanonkaari 9, FI 00790 HELSINKI
Phone: +358 29 532 6000