Luke
NATURAL RESOURCES
INSTITUTE FINLAND

CLIMATE SMART CARBON CYCLE / LUKE \

ADAPTIVE AND RESILIENT BIOECONOMY / LUKE \

Position paper

Solutions to mitigate climate change and biodiversity loss in the land use sector

Finland aims to be carbon neutral by year 2035 and the EU by the year 2050. EU's Biodiversity strategy for 2030 aims at reversing the degradation of ecosystems through increased protection and restoration of ecosystems.

How will we reach these targets by simultaneously boosting economy?

Key messages

1. **Climate change mitigation must be economically feasible**
   - → New management measures are needed for peat soils (croplands and forests)
   - → Policy incentives and carbon markets must support the adoption of new management measures
2. **Safeguarding biodiversity should be incorporated into the natural resources use**
   - → Integrated monitoring systems and biodiversity indicators should be developed to support state-of-the-art science for solid knowledge base
   - → Innovative measures are needed to support both biodiversity and material sourcing for bioeconomy in a balanced manner
3. **Research aims to find solutions to boost economy and ensure security of supply simultaneously with reaching climate and biodiversity targets**
   - → Models and tools are needed to identify synergies and trade-offs
   - → Co-created knowledge, solutions and governance mechanisms advance just transformation

Luke's expertise – from science to policy

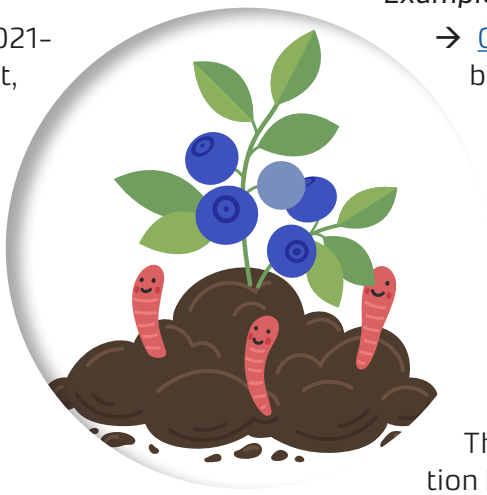
1. Climate change mitigation must be economically feasible

New management measures are needed in croplands and forests on peat soils

In Finland, the largest emission sources in the land use sector are croplands on peat soils and soils in drained peatland forests. Control of water table level is the key for reduced emissions. Emissions in croplands may be reduced by changing the cultivation from annual to perennial crops or to paludiculture. In peatland forests continuous cover forestry and ash fertilization can be used to reduce need of ditch network maintenance operations after wood harvest. New management measures can increase the cost-effectiveness of the production by converting unproductive measures towards more sustainable practices.

Example project in Luke:

→ HoliSoils H2020 project (2021-2025) focuses on management, modelling and monitoring for European forest soils to provide an improved, integrated, and harmonised monitoring and modelling framework across Europe. Partners from South America (Uruguay) and Asia (Japan) broaden the perspective globally



Policy incentives and carbon markets must support the adoption of new management measures

Incentives should support the reduction of greenhouse gas emissions and the increase of carbon sequestration. Setting aside cultivation of unproductive, high-emission peat soils, preventing the clearing peatlands for new fields and restoration of low-productive peatland forests could be promoted by farm-level compensations that fulfill transparent high-criteria carbon markets.

Example in Luke:

→ Policy brief: Soil as part of climate solution - agricultural policy reform to promote climate-smart agriculture

2. Safeguarding biodiversity should be incorporated into the natural resources use

Integrated monitoring systems support state-of-the-art science

Integrated monitoring systems such as ICP Forests[1] programme and National Forest Inventories provide information on the state of ecosystems. Monitoring must be integrated closely with research and cooperation within and between monitoring networks on the EU level must be strengthened. Together with modern experimental and analytical facilities the monitoring systems support i) development of evidence-based biodiversity indicators and ii) adaptation and mitigation strategies to safeguard plants, soil, water, biodiversity and whole ecosystem health in managed ecosystems.

Example projects in Luke:

→ Operation Bilberry (2021-2022) is a biodiversity re-inventory of forest vegetation on a systematic sampling network covering whole Finland

Innovative measures are needed to combine support to biodiversity and material sourcing for bioeconomy

The recent debate on nature protection has mainly focused on strictly protected areas. At the same time, biodiversity is increasingly being considered in responsible and sustainable business and in the wellbeing of citizens. There is room for i) new, innovative and voluntary measures that inspire landowners to offer valuable sites for safeguarding biodiversity and landscape and ii) tools and incentives to increase biodiversity in managed forests without losing their economic use.

Example projects in Luke:

→ HE SINCERE develops new means to enhance forest ecosystem services in ways that benefit forest owners as well as serve broad societal needs

1 The International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests

3. Research aims to find solutions to boost economy and ensure security of supply simultaneously with reaching climate and biodiversity targets

Models and tools are needed to identify synergies and trade-offs

The relationship between climate, biodiversity and economy targets is highly complicated, being confounded by the time factor and spatial interdependencies. Prediction models, optimization and visualization tools are needed to find land uses where co-benefits could be found (Figure 1).

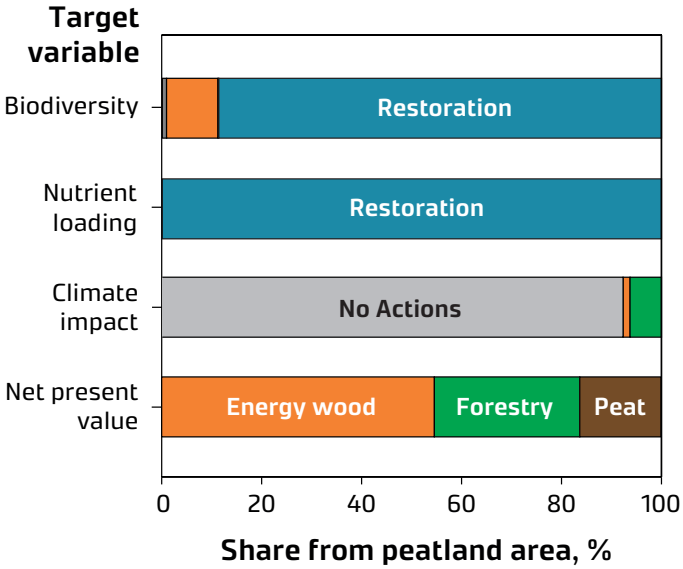


Figure 1: Example reveals strong trade-offs between biodiversity, water quality, climate and economy, when each target is optimized separately. Due to the trade-off, the distribution of optimal land uses depends on the target variable. In practice, land use decisions are based on optimization of many variables simultaneously. Numeric optimization was made for low-productive drained peatland forests for a 50-year time perspective. Based on Juutinen et al. 2020 Ecological Economics https://doi.org/10.1016/j.ecolecon.2020.106704.

Co-created knowledge, solutions and governance mechanisms advance just transformation

The call for a systemic change requires new ways of knowledge production. Co-creation, involvement of stakeholders from public sector, companies, NGOs and practitioners to citizens are means to that. Bringing diverse people and knowledge together, also the marginal voices, lead to innovative solutions and enhance learning of all actors. Policy coherence is needed to maintain future wellbeing and sustainable and just use of natural resources.

Example project in Luke:

→ HE ALFAWetlands (in contract negotiation) project evaluates mapping, modelling and field experiments related to wetland restoration in Europe and incorporates the knowledge base into a co-creation process (Figure 2). The aim is climate change mitigation, which also supports biodiversity and is socially just and rewarding.

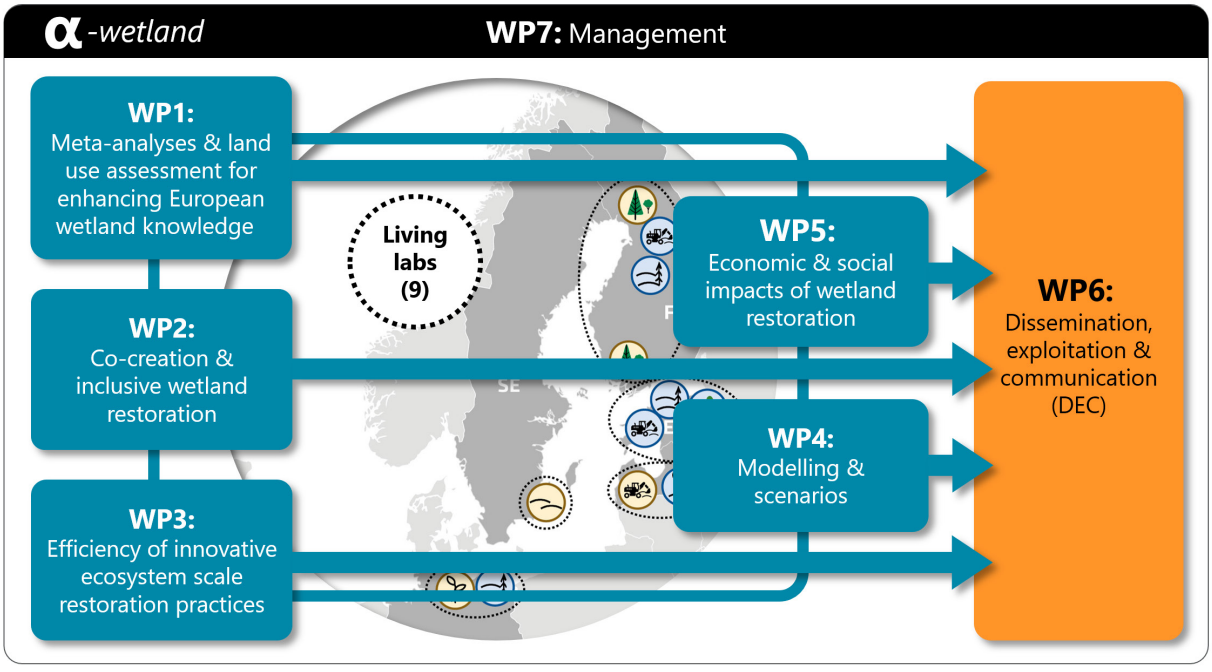


Figure 2. HE ALFAWetlands and living labs.

Natural Resources Institute Finland (Luke) is a research and expert organisation that creates well-being and sustainable future through the use of renewable natural resources.

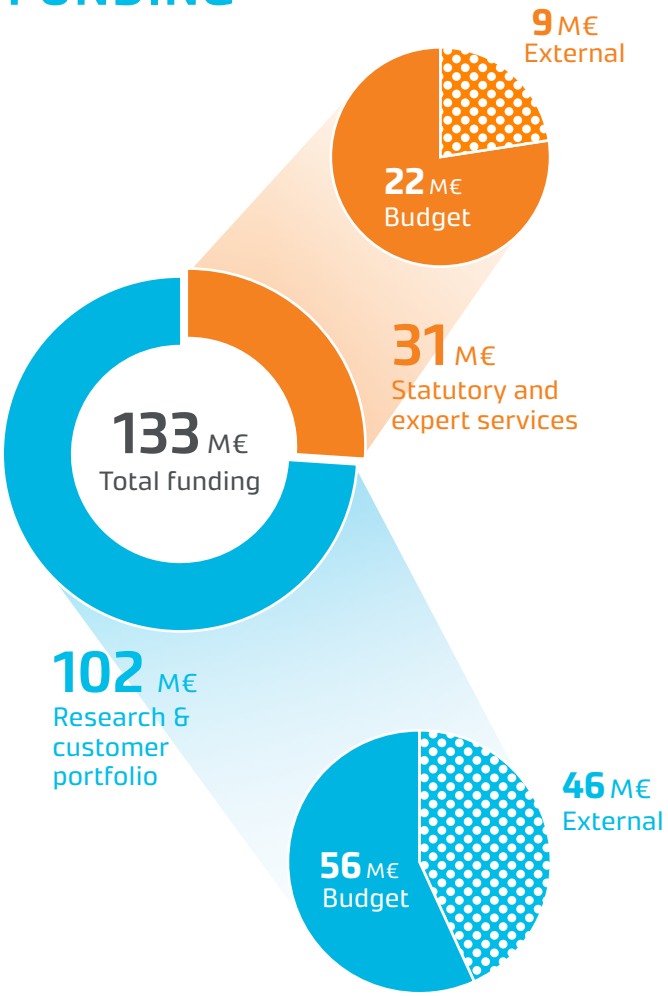
SCIENCE

723
on-going research projects, including

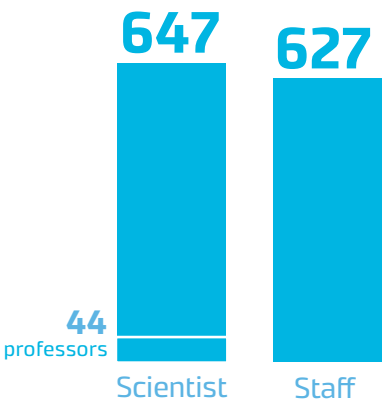
99
EU funded projects

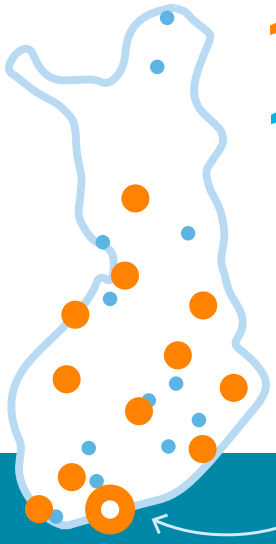
702
Scientific peer reviewed articles 2020

FUNDING



PERSONNEL





12 Locations

12 Experimental stations and Research co-operation sites

HEADQUARTER
in Viikki, Helsinki

CONTACT DETAILS

Johanna Buchert, President and CEO
Antti Asikainen, Executive Vice President, Research
Meri Kallasvuo, Programme director, Senior Scientist
Anne Tolvanen, Programme director, Professor

Natural Resources Institute Finland (Luke)
PO Box 2, FI-00791 HELSINKI
Switch: +358 29 532 6000
www.luke.fi

Luke
NATURAL RESOURCES INSTITUTE FINLAND